आज़ादी का अमृत महोत्सव

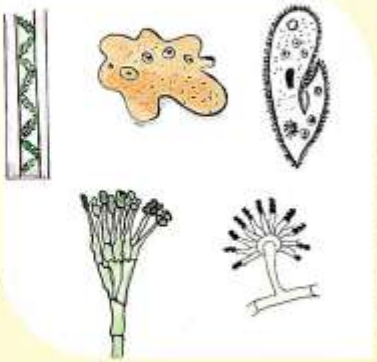
SCIENCE TEXTBOOK

Veda Bhushan III Year / Prathama - III Year / Class VIII

MAHARSHI SANDIPANI RASHTRIYA VEDA SANSKRIT SHIKSHA BOARD

(Established and Recognized by the Ministry of Education, Government of India)

आयं गौः पृश्निरक्रमीदु असदन् मातरं पुरः । पितरं च प्रयन्त्स्वः ॥
युनक्त सीरा वि युगा तनुध्वं कृते योनौ वपतेह बीजम्।
लोहञ्च मे सीसञ्च मे त्रपु च मे यज्ञेन कल्पन्ताम् ।
विश्वरूपं चतुरक्षं किमिं सारङ्गमर्जुनम् ।
श्रृणाम्यस्य पृष्ठीरपि वृश्चामि यच्छिरः ॥
यथेयं पृथिवी मही भूतानां गर्भमादधे।
सुषुम्णः सूर्यरश्मिश्चन्द्रमा गन्धर्वः।



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PREFACE

(In the light of NEP 2020)

The Ministry of Education (Department of Higher Education), Government of India established Rashtriya Veda Vidya Pratishthan in Delhi under the Chairmanship of Hon'ble Education Minister (then Minister of Human Resource Development) under the Societies Registration Act, 1860 (XXI of 1860) on 20th January, 1987. The Government of India notified the resolution in the Gazette of India vide no 6-3/85- SKT-IV dated 30-3-1987 for establishment of the Pratishthan for preservation, conservation, propagation and development of oral tradition of Vedic studies (Veda Samhita, Padapatha to Ghanapatha,Vedanga, Veda Bhashya etc), recitation and intonation of Vedas etc and interpretation of Vedas in scientific lines. In the year 1993 the name of the organization was changed to Maharshi Sandipani Rashtriya Veda Vidya Pratishthan (MSRVVP) and it was shifted to Ujjain, Madhya Pradesh.

The National Education Policy of 1986 and Revised Policy Formulations of 1992 and also Programme of Action (PoA) 1992 have mandated Rashtriya Veda Vidya Pratishthan for promoting Vedic education throughout the country. The importance of India's ancient fund of knowledge, oral tradition and employing traditional Guru's for oral education was also emphasized in the PoA.

In accordance with the aspirations of the nation, national consensus and policy in favour of establishing a Board for Veda and Sanskrit Education at national level, the General Body and the Governing Council of MSRVVP under the Chairmanship of Hon'ble Education Minister, Government of India, have set up "Maharshi Sandipani Rashtriya Veda Sanskrit Shiksha Board" (MSRVSSB) in tune with the mandate of the Pratishthan and its implementation strategies. The Board is necessary for the fulfillment of the objectives of MSRVVP as envisioned in the MoA and Rules. The Board has been approved by the Ministry of Education, Government of India and recognized by the Association of Indian

Universities, New Delhi. The bye-laws of the Board have been vetted by Central Board of Secondary Education and curriculum structure have been concurred by the National Council of Educational Research and Training, New Delhi.

It may also be mentioned here that the committee "Vision and Roadmap for the Development of Sanskrit - Ten year perspective Plan", under the Chairmanship of Shri N. Gopalaswamy, former CEC, constituted by the Ministry of Education Govt. of India in 2015 recommended for establishment of a Board of Examination for standardization, affiliation, examination, recognition, authentication of Veda Sanskrit education up to the secondary school level. The committee was of the opinion that the primary level of Vedic and Sanskrit studies should be inspiring, motivating and joyful. It is also desirable to include subjects of modern education into Vedic and Sanskrit Pathashalas in a balanced manner. The course content of these Pathashalas should be designed to suit to the needs of the contemporary society and also for finding solutions to modern problems by reinventing ancient knowledge.

With regard to Veda Pathashala-s it is felt that they need further standardization of recitation skills along with introduction of graded materials of Sanskrit and modern subjects so that the students can ultimately acquire the capabilities of studying Veda bhashya-s and mainstreaming of students is achieved for their further studies. Due emphasis may also be given for the study of Vikriti Patha of Vedas at an appropriate level. The members of the committee have also expressed their concern that the Vedic recitation studies are not uniformly spread all over India; therefore, due steps may be taken to improve the situation without in anyway interfering with regional variations of recitation styles and teaching method of Vedic recitation.

It was also felt that since Veda and Sanskrit are inseparable and complementary to each other and since the recognition and affiliation problems are same for all the Veda Pathashalas and Sanskrit Pathashalas throughout the country, a Board may be constituted for both together. The committee observed that the examinations conducted by the Board

should have legally valid recognition enjoying parity with modern Board system of education. The committee observed that the Maharshi Sandipani Rashtriya Veda Vidya Pratishthan, Ujjain may be given the status of Board of Examinations with the name "Maharshi Sandipani Rashtriya Veda Sanskrita Vidya Parishat with headquarters in Ujjain which will continue all programs and activities which were being conducted hitherto in addition to being a Board of Examinations.

The promotion of Vedic education is for a comprehensive study of India's glorious knowledge tradition and encompasses multi-layered oral tradition of Vedic Studies (Veda Samhita, Padapatha to Ghanapatha,Vedanga, Veda Bhashy aetc), recitation and intonation, and Sanskrit knowledge system content. In view of the policy of mainstreaming of traditional students and on the basis of national consensus among the policy making bodies focusing on Vedic education, the scheme of study of Veda stretching up to seven years in Pratishthan also entails study of various other modern subjects such as Sanskrit, English, Mathematics, Social Science, Science, Computer Science, Philosophy, Yoga, Vedic Agriculture, etc. as per the syllabus and availability of time. In view of NEP 2020, this scheme of study is with appropriate inputs of Vedic knowledge and drawing the parallels of modern knowledge in curriculum content focusing on Indian Knowledge System.

In Veda Pathashala-s, GSP Units and Gurukula-s of MSRVVP, affiliated to the Board transact the curriculum primarily based on oral tradition of a particular complete Veda Shakha with perfect intonation and memorization, with additional subsidiary modern subjects such as English, Sanskrit, Mathematics, Science, Social Science and SUPW. Gradually, the Veda Pathashala-s will also introduce other skill and vocational subjects as per their resources.

It is a well-known fact that there were 1131 shakha-s or recensions of Vedas; namely 21 in Rigveda, 101in Yajurveda, 1000 in Samaveda and 9 in Atharva Veda. In course of time, a large number of these shakhas became extinct and presently only 10 Shakhas, namely, one in Rigveda, 4

in Yajurveda, 3 in Samaveda and 2 in Atharvaveda are existing in recitation form on which Indian Knowledge System is founded now. Even in regard to these 10 Shakhas, there are very few representative Vedapathis who are continuing the oral Vedic tradition/ Veda recitation/Veda knowledge tradition in its pristine and complete form. Unless there is a full focus for Vedic learning as per oral tradition, the system will vanish in near future. These aspects of Oral Vedic studies are neither taught nor included in the syllabus of any modern system of school education, nor do the schools/Boards have the systemic expertise to incorporate and conduct them in the conventional modern schools.

The Vedic students who learn oral tradition/ recitation of Veda are there in their homes in remote villages, in serene and idyllic locations, in Veda Gurukulas, (GSP Units), in Veda Pathashala-s, in Vedic Ashrams etc. and their effort for Veda study stretches to around 1900 – 2100 hours per year; which is double the time of other conventional school Board's learning system. Vedic students have to have complete Veda by-heart and recite verbatim with intonation *(udatta, anudatta, swaritaetc),*on the strength of memory and guru parampara, without looking at any book/pothi. Because of unique ways of chanting the Veda mantras, unbroken oral transmission of Vedas and its practices, this has received the recognition in the UNESCO-World Oral Heritage in the list of Intangible Cultural Heritage of Humanity. Therefore, due emphasis is required to be given to maintain the pristine and complete integrity of the centuries old Vedic Education (oral tradition/ recitation/ Veda knowledge Tradition). Keeping this aspect in view the MSRVVP and the Board have adopted unique type of Veda curriculum with modern subjects like Sanskrit, English, Vernacular language, Mathematics, Social Science, Science, Computer Science, Philosophy, Yoga, Vedic Agriculture etc. as well as skill and vocational subjects as prescribed by NEP 2020.

As per Vedic philosophy, any person can become happy if he or she learns both *Para-Vidya and Apara-Vidya.* The materialistic knowledge from the Vedas, their auxiliary branches and subjects of material interest were called *Apara-Vidya*. The knowledge of supreme reality, the ultimate quest from Vedas, Upanishads is called *Para-Vidya.* In all the total

number of subjects to be studied as part of Veda and its auxiliaries are fourteen. There are fourteen branches of learning or *Vidyas* - four Vedas, Six Vedangas, Mimamsa (Purva Mimamsa and Uttara Mimamsa), Nyaya, Puranas and Dharma shastra. These fourteen along with Ayurveda, Dhanurveda, Gandharvaveda and Arthashastra become eighteen subjects for learning. All curriculum transaction was in Sanskrit language, as Sanskrit was the spoken language for a long time in this sub-continent.

Eighteen Shilpa-s or industrial and technical arts and crafts were mentioned with regard to the Shala at Takshashila. The following 18 skills/Vocational subjects are reported to be subjects of the study– (1) Vocal music (2) Instrumental music (3) Dancing (4) Painting (5) Mathematics (6) Accountancy (7) Engineering (8) Sculpture (9) Cattle breeding (10) Commerce (11) Medicine (12) Agriculture (13) Conveyancing and law (14) Administrative training (15) Archery and Military art (16) Magic (17) Snake charming (18) Art of finding hidden treasures.

For technical education in the above mentioned arts and crafts an apprenticeship system was developed in ancient India. As per the Upanishadic vision, the vidya and avidya make a person perfect to lead contented life here and liberation here-after.

Indian civilization has a strong tradition of learning of shastra-s, science and technology. Ancient India was a land of sages and seers as well as of scholars and scientists. Research has shown that India had been a Vishwa Guru, contributing to the field of learning (vidya-spiritual knowledge and avidya- materialistic knowledge) and learning centers like modern universities were set up. Many science and technology based advancements of that time, learning methodologies, theories and techniques discovered by the ancient sages have created and strengthened the fundamentals of our knowledge on many aspects, may it be on astronomy, physics, chemistry, mathematics, medicine, technology, phonetics, grammar etc. This needs to be essentially understood by every Indian to be proud citizen of this great country!

The idea of India like “Vasudhaiva Kutumbakam” quoted at the

entrance of the Parliament of India and many Veda Mantra-s quoted by constitutional authorities on various occasions are understood only on study of the Vedas and true inspiration can be drawn only by pondering over them. The inherent equality of all beings as embodiment of "sat, chit, ananda" has been emphasized in the Vedas and throughout the Vedic literature.

Many scholars have emphasized that Veda-s are also a source of scientific knowledge and we have to look into Vedas and other scriptural sources of India for the solution of modern problems, which the whole world is facing now. Unless students are taught the recitation of Vedas, knowledge content of Vedas and Vedic philosophy as an embodiment of spiritual and scientific knowledge, it is not possible to spread the message of Vedas to fulfill the aspiration of modern India.

The teaching of Veda (Vedic oral tradition/ Veda recitation/ Veda knowledge Tradition) is neither only religious education nor only religious instruction. It will be unreasonable to say that Vedic study is only a religious instruction. Veda-s are not religious texts only and they do not contain only religious tenets; they are the corpus of pure knowledge which are most useful to humanity as whole. Hence, instruction or education in Veda-s cannot be construed as only "religious education/religious instruction."

Terming "teaching of Veda as a religious education" is not in consonance with the judgment of the Hon'ble Supreme Court (AIR 2013: 15 SCC 677), in Civil Appeal no. 6736 of 2004 (Date of judgment-3rd July 2013). The Vedas are not only religious texts, but they also contain the knowledge in the disciplines of mathematics, astronomy, meteorology, chemistry, hydraulics, physics, science and technology, agriculture, philosophy, yoga, education, poetics, grammar, linguistics etc. which has been brought out in the judgment by the Hon'ble Supreme Court of India.

Vedic education through establishment of Board in compliance with NEP-2020

The National Education Policy-2020 firmly recognizes the Indian Knowledge Systems (also known as 'Sanskrit Knowledge Systems'), their

importance and their inclusion in the curriculum, and the flexible approach in combining various subjects. Arts' and Humanities' students will also learn science; try to acquire vocational subjects and soft skills. India's special heritage in the arts, sciences and other fields will be helpful in moving towards multi-disciplinary education. The policy has been formulated to combine and draw inspiration from India's rich, ancient and modern culture and knowledge systems and traditions. The importance, relevance and beauty of India's classical languages and literature is also very important for a meaningful understanding the national aspiration. Sanskrit, being an important modern language mentioned in the Eighth Schedule of Indian Constitution, its classical literature that is greater in volume than that of Latin and Greek put together, contains vast treasures of mathematics, philosophy, grammar, music, politics, medicine, architecture, metallurgy, drama, poetry, storytelling, and more (known as 'Sanskrit Knowledge Systems').These rich Sanskrit Knowledge System legacies for world heritage should not only be nurtured and preserved for posterity but also enhanced through research and put in to use in our education system, curriculum and put to new uses. All of these literatures have been composed over thousands of years by people from all walks of life, with a wide range of socio-economic background and vibrant philosophy. Sanskrit will be taught in engaging and experiential as well as contemporary relevant methods. The use of Sanskrit knowledge system is exclusively through listening to sound and pronunciation. Sanskrit textbooks at the Foundation and Middle School level will be available in Simple Standard Sanskrit (SSS) to teach Sanskrit through Sanskrit (STS) and make its study enjoyable. Phonetics and pronunciation prescriptions in NEP 2020 apply to the Vedas, the oral tradition of the Vedas and Vedic education, as they are founded upon phonetics and pronunciation.

There is no clear distinction made between arts and science, between curricular and extra-curricular activities, between vocational and academic streams, etc. The emphasis in NEP 2020 is on the development of a multi-disciplinary and holistic education among the sciences, social sciences, arts, humanities and sports for a multi-disciplinary world to

ensure the unity and integrity of all knowledge. Moral, human and constitutional values like empathy, respect for others, cleanliness, courtesy, democratic spirit, spirit of service, respect for public property, scientific temper, freedom, responsibility, pluralism, equality and justice are emphasized.

The NEP-2020 at point no. 4.23 contains instructions on the pedagogic integration of essential subjects, skills and abilities. Students will be given a large amount of flexible options in choosing their individual curriculum; but in today's fast-changing world, all students must learn certain fundamental core subjects, skills and abilities to be a well-grounded, successful, innovative, adaptable and productive individual in modern society. Students must develop scientific temper and evidence based thinking, creativity and innovation, aesthetics and sense of art, oral and written expression and communication, health and nutrition, physical education, fitness, health and sport, collaboration and teamwork, problem solving and logical thinking, vocational exposure and skills, digital literacy, coding and computational thinking, ethics and moral reasoning, knowledge and practice of human and constitutional values, gender sensitivity, fundamental duties, citizenship skills and values, knowledge of India, environmental awareness etc. Knowledge of these skills include conservation, sanitation and hygiene, current affairs and important issues facing local communities, the states, the country and the world, as well as proficiency in multiple languages. In order to enhance the linguistic skills of children and to preserve these rich languages and their artistic treasures, all students in all schools, public or private, shall have the option of learning at least two years in one classical language of India and its related literature.

The NEP-2020 at point no. 4.27 states that -"Knowledge of India" includes knowledge from ancient India and its contributions to modern India and its successes and challenges, and a clear sense of India's future aspirations with regard to education, health, environment, etc. These elements will be incorporated in an accurate and scientific manner throughout the school curriculum wherever relevant; in particular, Indian Knowledge Systems, including tribal knowledge and indigenous and

traditional ways of learning, will be covered and included in mathematics, astronomy, philosophy, yoga, architecture, medicine, agriculture, engineering, linguistics, literature, sports, games, as well as in governance, polity, conservation. It will have informative topics on inspirational personalities of ancient and modern India in the fields of medicinal practices, forest management, traditional (organic) crop cultivation, natural farming, indigenous sports, science and other fields.

The NEP-2020 at point no. 11.1 gives directions to move towards holistic and multidisciplinary education. India emphasizes an ancient tradition of learning in a holistic and multidisciplinary manner, including the knowledge of 64 arts such as singing and painting, scientific fields such as chemistry and mathematics, vocational fields such as carpentry, tailoring; professional work such as medicine and engineering, as well as the soft skills of communication, discussion and negotiation etc. which were also taught at ancient universities such as Takshashila and Nalanda. The idea that all branches of creative human endeavour, including mathematics, science, vocational subjects and soft skills, should be considered 'arts', has a predominantly Indian origin. This concept of 'knowledge of the many arts' or what is often called 'liberal arts' in modern times (i.e., a liberal conception of the arts) will be our part of education system.

At point No. 11.3 the NEP-2020 further reiterates that such an education system "would aim to develop all capacities of human beings - intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess critical 21st century capacities in fields across the arts, humanities, languages, sciences, social sciences, and professional, technical, and vocational fields; an ethic of social engagement; soft skills, such as communication, discussion and debate; and rigorous specialization in a chosen field or fields. Such a holistic education shall be, in the long term, the approach of all undergraduate programmes, including those in professional, technical, and vocational disciplines."

The NEP-2020 at point no. 22.1 contains instructions for the promotion of Indian languages, art and culture. India is a rich storehouse of culture – which has evolved over thousands of years, and is reflected in its art, literary works, customs, traditions, linguistic expressions, artifacts, historical and cultural heritage sites, etc. Traveling in India, experiencing Indian hospitality, buying beautiful handicrafts and handmade clothes of India, reading ancient literature of India, practicing yoga and meditation, getting inspired by Indian philosophy, participating in festivals, appreciating India's diverse music and art and watching Indian films are some of the ways through which millions of people around the world participate in, enjoy and benefit from this cultural heritage of India every day.

In NEP-2020 at point no. 22.2 there are instructions about Indian arts. Promotion of Indian art and culture is important for India and to all of us. To inculcate in children a sense of our own identity, belonging and an appreciation of other culture and identity, it is necessary to develop in children key abilities such as cultural awareness and expression. unity, positive cultural identity and self-esteem can be built in children only by developing a sense and knowledge of their cultural history, art, language and tradition. Therefore, the contribution of cultural awareness and expression is important for personal and social well-being.

The core Vedic Education (Vedic Oral Tradition / Veda Path / Veda Knowledge Tradition) of Pratishthan along with other essential modern subjects- Sanskrit, English, Mother tongue, Mathematics, Social Science, Science, Computer Science, Philosophy, Yoga, Vedic Agriculture, Indian Art, Socially useful productive work etc., based on the IKS inputs are the foundations/sources of texts books of Pratishthan and Maharshi Sandipani Rashtriya Veda Sanskrit Shiksha Board. These inputs are in tune with the NEP 2020. The draft books are made available in pdf form keeping in view the NEP 2020 stipulations, requirements of MSRVVP students and the advice of educational thinkers, authorities and policy of Maharshi Sandipani Rashtriya Veda Vidya Pratishthan, Ujjain. These books will be updated in line with NCFSE in future and finally will be made available in print form.

The Teachers of Veda, Sanskrit and Modern subjects in Rashtriya Adarsh Veda Vidyalaya, Ujjain and many teachers of Sanskrit and modern subjects in aided Veda Pathshalas of Pratishthan have worked for last two years tirelessly to prepare and present Sanskrit and modern subject text books in this form. I thank all of them from the bottom of my heart. Many eminent experts of the national level Institutes have helped in bringing quality in the textbooks by going through the texts from time to time. I thank all those experts and teachers of the schools. I extend my heartfelt gratitude to all my co-workers who have worked for DTP, drawing the sketches, art work and page setting.

All suggestions including constructive criticism are welcome for the improvement of the quality of the text books.

आपरितोषाद् विदुषां न साधु मन्ये प्रयोगविज्ञानम्।
बलवदपि शिक्षितानाम् आत्मन्यप्रत्ययं चेतः॥

(Abhijnanashakuntalam 1.02)

Until the scholars are fully satisfied about the content, presentation, attainment of objective, I do not consider this effort to be successful, because even the scholars are not fully confident in the presentation without feedback from the stakeholders.

Prof. ViroopakshaV Jaddipal
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Maharshi Sandipani Rashtriya Veda Sanskrit Shiksha Board, Ujjain

FOREWORD

The presented textbook of Science for Class 8th in Class Vedbhushan III/Prathama-III/School Education has been published in compliance with the guidelines of the National Education Policy 2020. This course includes knowledge of Vedic Vangmay and ancient India and its contribution towards modern India and its successes and challenges and a clear sense of India's future aspirations in relation to education, health, environment etc. In particular, indigenous methods of learning based on Indian knowledge system and specific curriculum on forest management, traditional (organic) crop cultivation, natural farming etc. have been included. While developing the curriculum, care has been taken to ensure that various points and subjects can be easily understood through games. Video documentaries on inspirational personalities of ancient and modern India in science and other fields will be shown throughout the school curriculum. Students will be encouraged to visit different states as participants in cultural exchange programs.

To check the students' understanding of the subject, practice questions have been included at the end of each lesson, which include multiple choice questions and descriptive questions. Model question papers have been included at the end of the book so that students can self-evaluate themselves.

CONTENTS

Chapter- 1

Crop Production and Management

1.1 Crop and its types -

We know that plants make their own food by the process of photosynthesis, but animals cannot make their own food,they depend on plants for their food. Regular production and proper management of crops are necessary to meet the food requirements of animals including humans.

Crop - When plants of the same type are grown on a large scale at a place, we call it a crop.

अन्नं वै प्राणाः, अन्नं ब्रह्मविजानीयात् ।

(ऐतरेयब्रा. 1.17.5)

Many mantras are found in the Vedas regarding food in the form of Prana,in which food has been given the name of Brahman and Prana.

अथेनं विकृषति, अन्नं वै कृषिः।

(शत.प. ब्रा. 7.2.2.6)

The relationship between food and agriculture is mentioned. Through agriculture, food is produced by plowing the land. Agriculture by internal traction is called agriculture.

ते कृषिं च सस्यं च मनुष्या ३ उप जीवन्ति
कृष्टराधिरुपजीवनीयो भवति य एवं वेद ।

(अथर्व. 8.10 (4) 12)

The life of all humans depends on agriculture and food. That's why everyone goes to the shelter of an agricultural expert.

सुसस्याकृषीस्कृधि ।

(यजु. 4.10)

There is mention of cultivation of good grains.

Types of crops -

There are mainly three types of crops :

1. Kharif crop
2. Rabi crop
3. Zaid's Crop

Kharif crop -

The crops grown in the rainy season are called Kharif crops. It is a crop from the middle of June to September. eg. - Paddy, Maize, Soybean, Jowar, Groundnut, Sesame, Moong, Urad etc.

Rabi crop -

The crops grown in the winter season are called rabi crops. It is a crop between October to March. eg. Wheat, Gram, Peas, Mustard, Barley etc.

Zayed's crop -

The crops grown in the summer season are called Zayed crops. It is a crop from the middle of March to June. eg. Cantaloupe, Watermelon, Cucumber, Gourd etc.

अन्नञ्चमेऽख्षुच्च मे व्रीहयश्च मे यवाश्च मे माषाश्च मे तिलाश्च मे मुद्गाश्च मे खल्वाश्च मे गोधूमाश्च मे मसुराश्च मे ।

(कृ.य.तै.सं. 4.7.9)

Sesame, Urad, Moong, Gram, Wheat, Lentils are mentioned in this mantra of Taittiriya Samhita.

तेनेयं पृथिवी दुग्धा सस्यानि दश सप्त च।

(महाभारत शान्तिपर्व. 59.126)

17 types of grains.

Activity 1 : List the plants growing in your school garden.

Serial number	Plant name
1.	

2.	
3.	
4.	
5.	

1.2 Agricultural Practices (Phases of Cultivation) -

The activities performed by the farmer for crop production are called agricultural methods.

The whole process till the farmer prepares the fields before sowing the crop and sells the finished crop to the mandi or any trader is called "crop production process". Following are the steps of agricultural work –

1. Soil Preparation
2. Sowing
3. Manure or Fertilizer
4. Irrigation
5. Protecting the crop
6. Harvesting
7. Storage of grain

1. Preparing the soil –

Fig: Tools for plowing the field

Before sowing the seeds, the farmer loosens the soil by turning the plow in the field. Plowing is the loosening of the soil by plowing the

field. By making the soil loose, the germination of plants is done easily and the exchange of gases is done easily till the roots of the plants.

शुनं वाहाः शुनं नरः शुनं कृषतु लाङ्गलम्।
शुनं वरत्रा बध्यन्तां शुनमष्ट्रामुदिङ्गय॥

(अथर्व. 3.17.6, ऋग्वेद. 4.57.4)

It is mentioned to prepare the field properly before sowing the seeds.

How to take work from oxen in plowing the field is also mentioned in the Vedas .

युनक्त सीरा वि युगा तनोत कृते योनौ वपतेह बीजम्।
विराजः श्नुष्टिः सभरा असन्नो नेदीय इत् सृण्यः पक्वमा यवन् ॥

(अथर्व. 3.17.2, ऋग्वेद. 10.101.3, यजुर्वेद.12.68)

Mention has been made of plowing on the shoulders of oxen and sowing of seeds.

Activity 1 : Make a tabular list of the names and functions of agricultural implements used in agricultural work in your area.

S. No.	Nomenclature of Agricultural	Equipment
1.		Hull
2.		Spade
3.		Cultivator
4.		
5.		

Agricultural Tools -

Tools are needed to pulverize or turn the soil of the field, which we call agricultural implements. eg. Plough,spade,cultivator etc.

Fig. 1.1: Plow and spade

लाङ्गलं पवीरवत् सुशीमं सोमसत्सरु।
उदिद् वपतु गामाविं प्रस्थावद् रथवाहनं पीबरीं च प्रफर्व्यम्।

(अथर्व. 3.17.3)

In the Atharvaveda the plow with iron spade is mentioned.

Activity 3 -Tabulate the crops grown in your area on the basis of time of sowing and time of harvesting.

Sr.	Name of the crop	Planting time	Harvesting time
1.	Soybean		
2.	Gram		
3.	Peas		
4.			
5.			
6.			

2. Sowing -

Before planting the seeds, the farmer selects the best seeds. Such seeds are selected, which are healthy and from which more crops can be produced. For the selection of seeds, they are put in a vessel filled with water. Some of those seeds float on the surface of the water, such seeds are called unhealthy seeds. The rest of the seeds settle at the bottom, which are called healthy seeds.

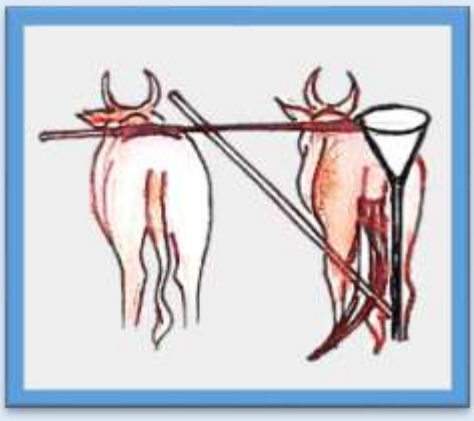


Fig: Traditional tool for sowing seeds

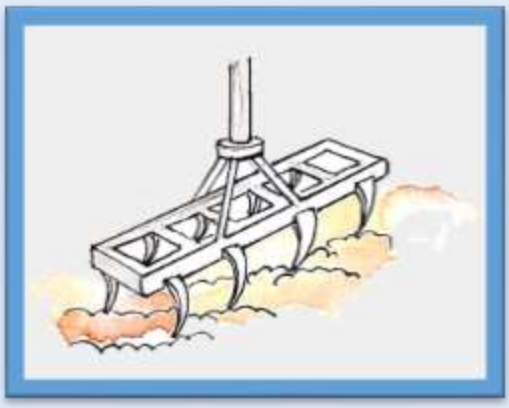


Fig: Modern tool for sowing seeds Seeddrill

यथा बीजमुर्वरायां कृष्टे फालेन रोहति।
एवा मयि प्रजा पशवोऽन्नमन्नं वि रोहतु॥

(अथर्व. 10.6.33)

In the present era, the fertilizers which are used to increase the fertility of the soil,those nutritious and fertilizing substances are being used in agriculture since the Vedic period.

युनक्त सीरा व्वि युगा तनुध्वं कृते योनौ व्वपतेह बीजम्।

(यजुर्वेद. 12.68)

In Yajurveda it has been mentioned to sow the seeds only after land preparation.

Activity 4 : Take three containers and fill them half full with soil. Mix cow dung manure in the soil of the first vessel, urea in the soil of the second vessel and keep only soil in the third vessel. Now sow the sprouted seeds of moong or gram in all the three vessels and mix certain amount of water. Keep giving fixed quantity daily, after 10 days assess the growth of the plants of all the three pots. Have the plants in all the three containers grown equally ? The growth of the plants in pots A and B is more than that of the plants in pot C. Why has this happened ? Because manure and fertilizer were added to the plants of vessels 'A' and 'B' respectively, due to which their growth increased. Manures and fertilizers help in the growth of plants.

3. Giving manure and fertilizers -

To maintain the fertility of the soil, some substances are added to the soil,which are called "manures and fertilizers". Fertilizers are natural and organic. They are formed from the decayed remains of animals and plants. It is manufactured by micro-organisms and earthworms. The amount of humus in compost is high. It works to increase the fertility and water holding capacity of the soil. Fertilizer is prepared in factories

by chemical reactions. eg. Urea, Ammonium sulphate, Super phosphate, Potash etc.

संजग्माना अबिभ्युषीरस्मिन् गोष्ठे करीषिणी:।
बिभ्रतीःसोम्यं मध्वनमीवा उपेतन॥

(अथर्व. 3.14.3)

शकमयं धूममारादपश्यं विषूवता पर एनावरेण।
उक्षाणं पृश्निमपचन्त वीरास्तानि धर्माणि प्रथमान्यासन्॥

(ऋग्वेद 1.164.43)

The Rigveda mentions the use of manure to make agricultural land fertile. The words Karish, Shakan and Shakrit (dung) are used for manure. It is clear from this that there was proper knowledge of agriculture in the Vedic period.

Activity 5 : Tabulate the crops grown in your area on the basis of irrigation as crops irrigated with less water and crops irrigated with more water.

S. No.	Name of the crop	Irrigated with less water / Irrigated with more water
1.		
2.		
3.		
4.		
5.		

4. Irrigation -

सृजामि पयसा पृथिव्याः सम्मा सृजाम्म्यद्भिरोषधीभिः ।
सोहं व्वाज ँसनेयमग्ने । *(यजु. 18.35)*

Yajurveda mentions the need of water for agricultural work. Water is needed for the seeds to germinate and for the crops to grow and bear fruit. Providing water to crops from time to time by artificial means is

called irrigation . Sources of water for irrigation – wells, ponds, canals, rivers, tubewells, dams etc.

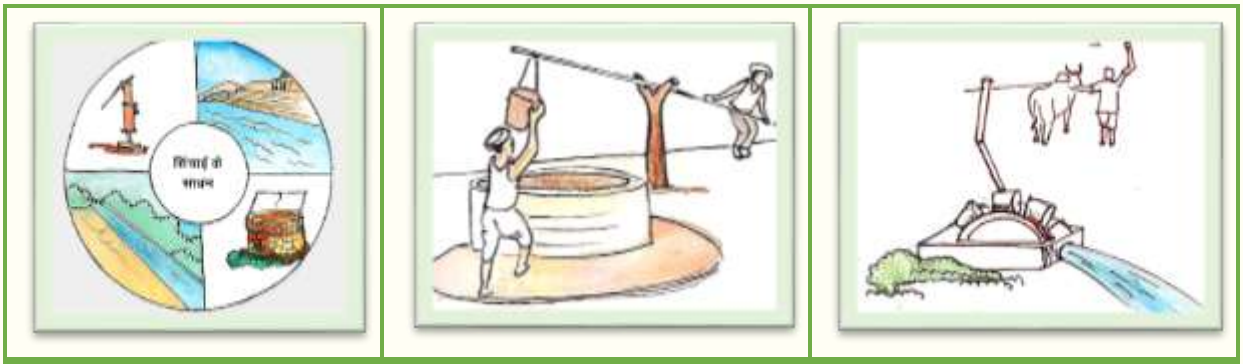


Fig – Water sources and means of irrigation

There are two types of means of irrigation – 1) Traditional means 2) Modern means

1) Traditional instruments – Chadas, Dhekali, Rahat, Moat, Nahar etc.
2) Modern means – electric pump, diesel pump etc.

Modern methods of irrigation are as follows –

1) Sprinkler system 2) Drip system

1) **Sprinkler System –** In this method, irrigation is done by sprinkling water on the plants. This method is used in uneven agricultural areas.
2) **Drip System –** In this method, irrigation is done by making water reach the roots of the plants drop by drop. This method is used in flat agricultural areas.

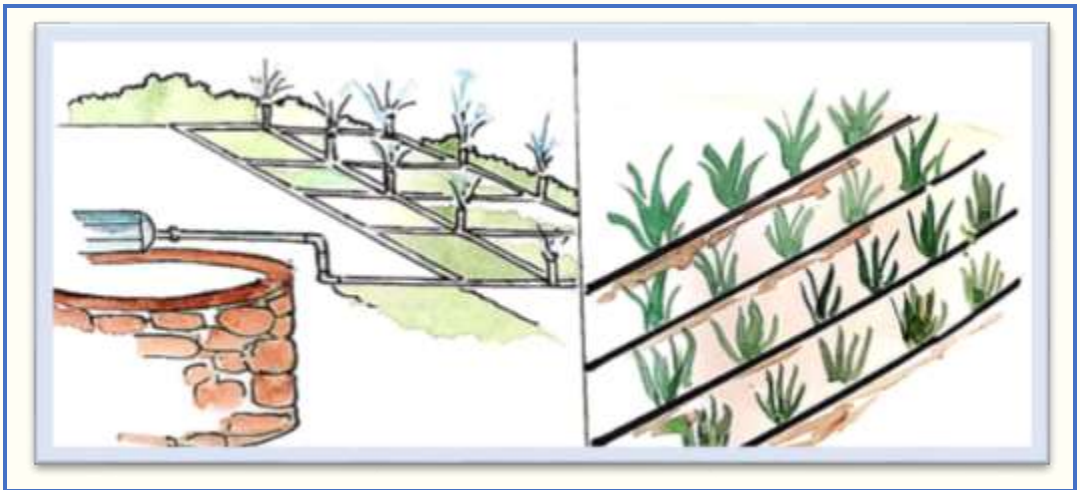


Fig – Methods of irrigation

या आपो दिव्या उत वा स्रवन्ति

खनित्रिमा उत वा याः स्वयंजाः । (ऋग्वेद. 7.49.2)

In Rigveda, the water of the river was called 'Swayanja' and the water of Kupadi was called 'Khanimitra'. The process of extracting water from the well has been explained. There is a mention of making a drain to deliver water to the field.

अथ कार्तिकसङ्क्रान्त्यां क्षेत्रे च रोपयेन्नलम्

केदारेशानकोणे च सयत्नं कृषकः शुचिः ॥ (कृ. पराशर. 198)

Tap planting is described in Krishi Parashara. Through this irrigation work is done in the absence of water.

5. **Protecting the crop -**

During the agricultural work, the farmer has to face many problems which are as follows-

a) Weed b) Natural outbreak

c) Diseases occurring in crops d) Loss of crops by animals

a) **Weeds -** Such unnecessary plants growing along with the crop which do not allow essential nutrients to reach the plant are called weeds. Crops can be protected from weeds by timely weeding and using weed killers.

b) **Natural Outbreaks** - Crops are protected by the farmer from natural outbursts like fire,drought,frost, flood etc.

c) **Diseases occurring in crops** - Crops can be protected from diseases occurring in crops by the use of insecticides and fungicides.

d) **Loss of crops by animals -** Crops can be protected from animals by fencing around the fields.

6. **Harvesting of crop -**

After the crop has matured, harvesting is done on a small scale by sickles and on a large scale by harvester machines.

Fig: Harvesting the crop

Threshing -

The process of separating the grain from the chaff is called threshing. After harvesting the crop, the crop is dried in the sun for some time,due to which its moisture is removed. After that, the grain grains are separated on a small scale by tossing them in the air. The grain grains being heavy fall on the ground. The husk being light, flies away. This method is called "Vinoig". Thresher machine is used to separate the grain from the husk on a large scale.

Fig: Threshing Equipment

7. Storage of grains -

After threshing the grain is stored. The stored grains are protected from moisture,insects,rats, micro-organisms. Grain storage houses are also constructed on a large scale,which are called 'silo'.

Fig: silo

1.4 Crop and Environment

Crops work to affect the environment in the following ways.

1. Keeps the environment pure.
2. Performs the function of temperature control.
3. Reduces air pollution.
4. Maintains the humidity of the atmosphere.
5. Provides habitat for animals to live in.

उपहूताऽ इह गाव ऽ उपहूता ऽ अजावय÷।

अथो ऽ अन्नस्य कीलाल ऽ उपहूतो गृहेषुनः।

क्षेमायवः शान्त्यै प्रपद्ये शिव ँ शग्ग्म ँशँय्योः शँय्योः॥

(यजु. 3.43)

Cow, Goat, Sheep etc. that give milk. There is mention of the presence of many types of good grains in the house.

Practice Work -

Q. 1 Select the correct option -

1. Maize is a crop of -

a) Rabi b) Kharif

c) Zayed d) all of the above

2. Gram is a crop -

a) Rabi b) Kharif

c) Zayed d) all of the above

3. How many mainly types of crops are there -

a) 2 b) 3 c) 4 d) 1

Q. 2 Fill in the blanks -

1. Kharif crop is grown in …… season.
2. Before sowing the seeds, it is necessary to do ..... of the field.
3. Unhealthy seeds are ..... in weight.

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Manure is used to make the land fertile.
2. Watermelon is a Kharif crop.
3. Soybean is a Rabi crop.

Q. 4 Match the correct pair.

	Column 'A'	Column 'B'
1.	Kharif crop	Silo
2.	Rabi crop	Cucumber
3.	Zayed's crop	Jowar
4.	Grain Storage	Mustard

Q. 5 Very short answer type questions

1. What is the method of separating the grain from the chaff called ?

Q. 6 Short Answer Type Questions -

1. Give one example each of Kharif, Rabi and Zayed crops.
2. What is Winnowing ?
3. How can the crop be protected from the diseases occurring in the Crop ?
4. What is Fertilizer ?

Q. 7 Long answer type questions -

1. Explain the working of agricultural tools with the help of diagram.
2. Write the method of germination of wheat, Gram and moong with illustrations.

Project work

1. Make a table of crops according to seasons.
2. Germinate wheat, gram, Moong in the nursery of your school.

Chapter- 2

Microorganism: Friend and Foe

We can see trees, plants and animals with the help of our eyes. Although some organisms are so small in size that they cannot be seen with the naked eye alone. Such organisms are called "micro-organisms". A “microscope” is used to see microscopic organisms.

Activity 1 - Bring a small amount of soil from the playground or garden of your Pathshala and put it in a small vessel of water. After settling at the bottom of the earthen vessel, observe with the help of a microscope by placing a few drops of water from the vessel on a glass slide. Do you see micro-organisms moving in the drops of water ? Many micro-organisms are present in soil particles and water,which we can see with the help of a microscope.

2.1 Classification of microorganisms -

Micro-organisms can be divided into four categories on the basis of their properties-

1. Bacteria 2. Fungi 3. Protozoa 4. Algae

Apart from these, viruses are also micro-organisms.

Fig: microbe

1. Bacteria

Bacteria are single celled organisms. The shape of bacteria can be rod-shaped, spiral, round etc. eg. Rhizobium, Bacillus etc. Diseases caused by bacteria - Typhoid, Tuberculosis (T.B.) etc.

2. Fungi -

Fungi are both unicellular and multicellular. It is a type of parasite, which germinates and feeds on dead and decomposing organic matter. eg. - Mushroom, Rhizops, Penicillium etc.

3. Protozoa -

Protozoa are unicellular organisms. eg. - Diseases caused by protozoa like Amoeba, Paramecium etc. - Diarrhoea, Malaria etc.

4. Algae -

Algae can be easily seen in moist places like stagnant water etc. eg. Chlamydomonas, Spirogyra etc.

Virus -

Viruses are different from other microscopic organisms. They are parasitic and multiply only in other organic matter. Diseases caused by viruses – Cold, Polio, Measles, Influenza etc. Some micro-organisms are very beneficial for us. That means we have friends. At the same time, some micro-organisms are harmful for us. That means we have enemies.

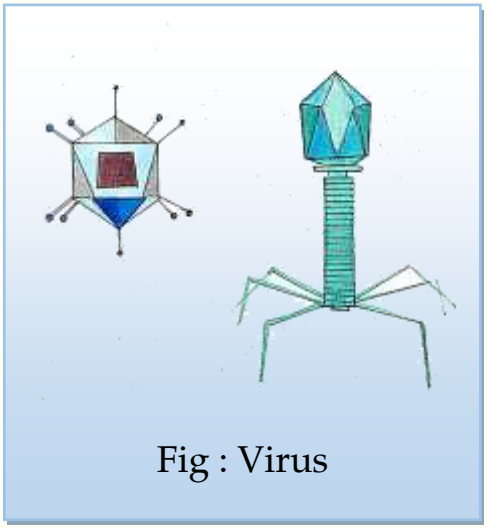


Fig : Virus

Kriminash –

यो अक्ष्यौ परिसर्पति यो नासे परिसर्पति ।
दतां यो मध्यं गच्छति तं क्रिमिं जम्भयामसि ॥

(अथर्व. 5.23.3)

In this mantra of Atharvaveda, it has been mentioned to destroy the worms found in the eyes,in the nails, between the teeth.

उत् पुरस्तात् सूर्य एति विश्वदृष्टो अदृष्टहा ।
दृष्टांश्च घ्नन्नदृष्टांश्च सर्वांश्च प्रमृणन् क्रिमीन् ॥

(अथर्व. 5.23.6)

In this Atharvaveda mantra, it has been mentioned that the light of the rising sun destroys the invisible worms.

विश्वरूपं चतुरक्षं क्रिमिं सारङ्गमर्जुनम् ।
शृणाम्यस्य पृष्टीरपि वृश्चामि यच्छिरः ॥ (अथर्व. 2.32.2)

In this mantra of the Atharvaveda, it is mentioned that insects of different sizes,four-eyed,colourful,white in color are destroyed by the rays of the sun.

2.2 Friendly Microoganism -

Yeast which is a bacterium, which is used in making cakes, bread and alcohol. Bacteria called lactobacillus breed in milk and convert it into curd. Bacteria and yeast help in fermentation of rice flour from which idli and dosa are made. Bacteria help in the manufacture of pickles, cheese and many other foods. Bacteria are also used to keep the environment clean. Bacteria break down vegetable peels and animal remains into harmless substances.

Commercial use of micro-organisms -

Micro-organisms are used in the production of alcohol,wine and acetic acid. When barley,wheat,rice and fruit juices are kept in a slightly warm place for a few days, the natural sugar present in them germinates a microbe called yeast,which converts them into alcohol. The conversion of fruit juice into alcohol by bacteria is called fermentation.

Medicinal uses of micro-organisms -

Medicines made by micro-organisms are called antibiotics. It works to destroy disease-causing micro-organisms. Antibiotics are added to the feed of livestock and poultry to prevent the transmission of microorganisms. Antibiotics are also used to control plant diseases.

Vaccine

When dead or inactive micro-organisms are introduced into the body of a healthy person, the cells of the body produce antibodies

accordingly and destroy the pathogen. Antibodies are produced in our body for protection from diseases. We are protected from that disease forever. Diseases like Corona,Smallpox,Polio,Cholera,Tuberculosis etc. can be prevented by vaccines etc.

Increase in soil fertility

Some bacteria (Rhizobium) and algae absorb nitrogen from the atmosphere and convert it into soil soluble nitrogen. Plants grow by using the soluble nitrogen in the soil. The process of making nitrogen available in the soil by micro-organisms is called nitrogen fixation. Soil fertility increases by increasing the amount of nitrogen in the soil.

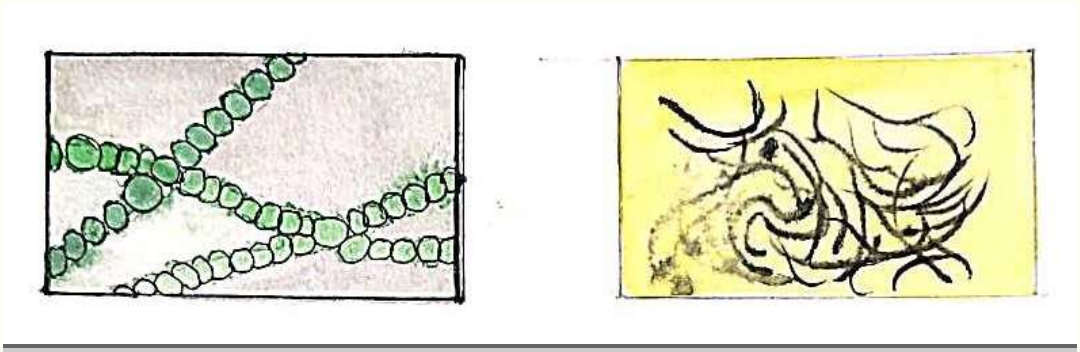


Fig: Bacteria that increase soil fertility

2.3 Harmful micro-organisms -

humans,animals and plants and contaminate food items are called harmful micro-organisms.

Disease causing micro-organisms

Fig 2.7 –Female Anopheles mosquito

Disease-causing micro-organisms are called pathogens or germs. These micro-organisms enter the body of a healthy person through breathing or through various means eg. Water, food, reach by coming in contact with an infected person and cause disease. Some examples of such diseases are tuberculosis, cholera, corona, chicken pox, common cold etc. House flies

and mosquitoes act as disease carriers of pathogenic micro-organisms. When a fly sits on litter and waste material,germs stick to its body. That fly flies and sits on the food items,due to which the germs are transferred to the food items. By eating such contaminated (poisonous) food, we can fall ill. That's why we should keep the food covered. The female Anopheles mosquito acts as a carrier of malaria. The female Aedes mosquito acts as the vector of dengue.

Ways to avoid malaria and dengue disease -

- Do not allow water to collect at one place for a long time.
- Do not store water in household utensils for a long time.
- Use mosquito net while sleeping.
- Ensure complete cleanliness arrangements around the houses.

Diseases like 'Khurpaki' and 'Muhhapka' (diseases related to hoof and mouth) and anthrax are caused in animals by micro-organisms. Microorganisms also work to cause diseases in plants.

Food Poisoning

Micro-organisms contaminate food items and make them poisonous. Consuming which can cause vomiting, diarrhea or even death. Therefore, we need to preserve the food items from these micro-organisms, which has the following solutions -

1. **Dehydration –** The moisture is removed from the foods by drying them in the sun. eg. Sun drying of pulses and grains.
2. **Refrigeration -** Keeping food at a low temperature does not allow the growth of micro-organisms. This method is called refrigeration. Food items like fruits, vegetables etc. can be kept safe for a long time by keeping them in cold storage.
3. **Using sugar, salt, oil and vinegar -** Preservation of mango, amla, tamarind, jam, jelly, vegetables and fruits can be done using sugar,salt, oil and vinegar.

4. **Preservation of foods can be done by using chemicals –** sodium-benzoate and potassium metabisulfate.

5. **Boiling -** Micro-organisms present in liquid foods can be destroyed by boiling them. Boiling milk at 70^0C for 15-30 seconds destroys the micro-organisms present in it. Then cool it down and store it. This method is called pasteurization.

2.4 Nitrogen cycle

Plants and animals cannot make direct use of atmospheric nitrogen. Plants use nitrogenous compounds converted by the method of nitrogen fixation through bacteria and algae present in the soil and animals obtain 'nitrogenous compounds' from plants . When dead plants and animals decompose,then the nitrogen gas present in them gets liberated and goes into the atmosphere. Thus this cycle goes on.

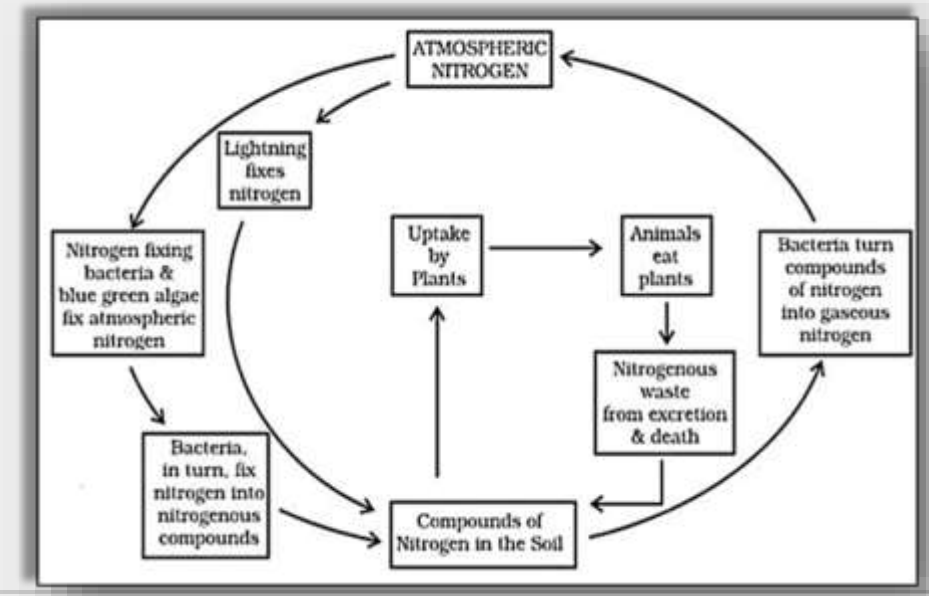


Fig: Nitrogen Cycle

Practice Work

Q. 1 Choose the correct option-

1. The carrier of dengue is -

   a) Female Aedes mosquito b) House fly

   c) Butterfly d) Female anopheles mosquito

2. Microorganisms are divided into how many classes -

   a) 3 b) 4 c) 5 d) 6

3. What is the name of the microbe which converts milk into curd?

   a) Rhizobium b) Lactobacillus

   c) Yeast d) None of these

Q. 2 Fill in the blanks -

1. The process of keeping food at low temperature is called .....
2. The process of converting sugar into alcohol is called .....
3. The bacterium which increases the fertility of the soil is…….

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Drying food in the sun removes the moisture.
2. Food preservation can be done using sodium benzoate.
3. Micro-organisms present in liquid foods can be destroyed by boiling them.

Q.4 Match the correct pair –

	Column 'A'	Column 'B'
1.	Bacteria	Amoeba
2.	Fungus	Spirogyra
3.	Protozoan	Mushroom
4.	Algae	Rhizobium

Q. 5 very short answer type questions -

1. With the help of which instrument, microscopic organisms can be seen ?

2. Alcohol can be produced with the help of which micro-organism ?
3. Write the name of any one antibiotic ?

Q. 6 Short Answer Type Questions -

1. Give medicinal uses of micro-organisms.
2. Write the commercial uses of micro-organisms.
3. What is pasteurization ?
4. What are harmful micro-organisms ?

Q.7 Long Answer Type Questions

1. Explain the nitrogen cycle with a diagram.
2. What is a microorganism ? Explain different types of micro-organisms with examples.
3. What is food poisoning ? Write the measures to prevent food poisoning.

Project work

1. Prepare yeast with the help of a microbe

Chapter- 3

Metals and non-metals

Dear students ! We use many things made of metals and non-metals in our daily life,the properties of these things are different. In this chapter, we will study in detail about the physical and chemical properties of metals and non-metals.

3.1 Metals and non-metals in nature –

लोहञ्च मे सीसञ्च मे त्रपु च मे यज्ञेन कल्पन्ताम्

(यजुर्वेद 18.13)

Such mantras are found in Vedas, where metals like Iron, Lead, Copper, Bronze etc. have been discussed. Therefore, its discussion in the Vedic Vangmay is the proof of the use of metals.

We use many things and substances in our daily life. Some of these objects are hard,solid and shiny,while some objects are soft,in liquid or gaseous state and without shine. On the basis of the nature of objects and substances, we can divide them into 2 parts –

(1) Metals (2) Non-metals

Those objects and substances,which are shiny,are called metals. Such objects and substances which are lustrous are called non-metals . In nature, some metals like Gold, Silver, Platinum, Mercury and some non-metals like Hydrogen,Sulphur,are found in free state. Most of the metals and non-metals are found in the combined state.

हिरण्यवर्णां हरिणीं सुवर्णरजतस्त्रजाम् *(ऋग्वेद पञ्चममण्डलस्यान्ते, परिशिष्ट)*

Suvarna (Gold) and Chandi (Silver) metals have been mentioned in this mantra.

यदि नो गां हंसि यद्यश्वं यदि पुरुषम्।
तं त्वा सीसेन विध्यामो यथा नोऽसो अवीरहा॥

(अथर्ववेद - 1.16.4)

In this mantra of Atharvaveda, it is mentioned to kill (punish) the thieves who steal animals like cow, horse etc. with the help of lead metal.

हरिते त्रीणि रजते त्रीण्ययसि त्रीणि तपसाविष्ठितानि।

(अथर्ववेद - 5.28.1)

Silver and iron metals have been mentioned in this mantra of Atharvaveda.

Activity 1 - Take a piece of chalk,an iron wire,an eraser,a sharpener in the presence of your Guruji. Now beat each object with a hammer and tabulate the observations.

No.	Item Name	Flattened / Shredded
1.	Chunk	Shredded
2.	Iron wire	Flattened
3.	Rubber	
4.	Shopner	

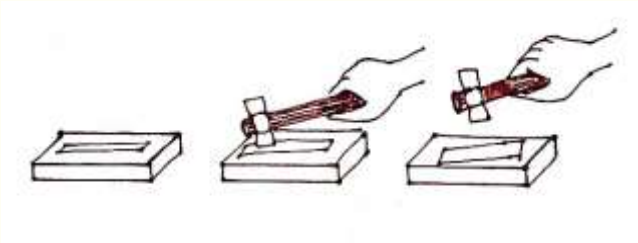
You have seen in the observations that when Chalk, Rubber, Sharpener is beaten with a hammer, the material gets divided into pieces here. While the iron wire gets flattened when it is beaten with a hammer. When metals are beaten, they get converted into thin sheets,this property of metals is called malleability.

3.2 Physical properties of metals and non-metals-

Physical properties of metals

Fig - Metal in the solid state

1. Metals are solid and shiny. Mercury is the only metal which is liquid at room temperature.
2. Metals are good conductors of heat and electricity. Silver (Ag) is the best conductor of heat and lead (Pb) is the least conductor.
3. Metals are ductile, they can be easily drawn into wire.
4. Metals are non-flammable, they can be changed into any shape by beating with hammer.



5. Metals are acoustic. That is, when metal is struck with an object,then sound is produced. Due to this quality of metal, it is used in making bells, musical instruments etc.

Fig – Bell

6. Generally the density of metals is more than that of water. Because of this it sinks in water. Due to the density of some metals being less than that of water, they float in water. eg. - The objects of the pot sink in water because they are heavier than water. Because the density of sodium and potassium is less than that of water, it floats in water.
7. The melting point of metals is high, that means more heat is required to melt metals.

" The temperature at which a solid substance changes into liquid state is called the melting point of the substance. "

Tungsten has the highest melting point and Gallium metal has the lowest melting point. This metal melts just by keeping it on the palm.

"Such substances which are hard, shiny, ductile, non-destructive, acoustic, good conductors of heat and electricity, high density, high melting point, are called metals. Some examples of metals Iron, copper, gold, silver, sodium, potassium etc.

Physical properties of nonmetals

1. Non-metals can exist in all the three states of solid, liquid and gas. It is lustreless, soft or friable. It can be of different colors.

S.No.	Name	State	Colour
1	Carbon	Solid	Black
2	Chlorine	Gas	Green-yellow
3	Bromine	Liquid	Red-brown

Diamond and iodine are the exceptions of non-metals, diamond is hard and shiny and iodine is also shiny.

2. Non-metals do not produce sound when struck with an object.
3. The density and melting point of non-metals are low. Diamond and graphite are exceptions to this. Their melting point is high.
4. Non-metals are bad conductors of heat and electricity. The exception is Graphite,which is a good conductor of electricity.
5. Non-metals are not malleable and ductile. On beating it, it turns into powder or pieces.

"Substances that are soft, lustreless, non - conductors of heat and electricity, low density, low melting point are called non-metals." Ex.- Carbon, Oxygen, Nitrogen, Bromine, Iodine etc.

3.3 Chemical Properties of Metals

Metals react chemically with air,water and acids to form new substances.

1. Reaction with air -

Metals react with oxygen in the air to form metal oxides.

Metal + Oxygen ----------› Metal oxides

Metal oxides are basic in nature.

Example -

a) The luster of copper and aluminum utensils starts decreasing gradually,because they react with oxygen to form oxides.

Copper + Oxygen ----------›Oxide of copper

$Cu + O_2$ ----------› CuO (Copperoxide)

$2Al + 3O_2$ ----------› Al_2O_3 (Aluminum oxide)

b) Silver utensils start turning black after some time,because it reacts with oxygen.

$4Ag + O_2$ ----------› $2Ag_2O$

silver oxygen silver oxide

2. Reaction with water-

Generally metals react with water to form metal oxide and hydrogen gas.

Metal + Water (H_2O) ----------› Metal oxide + Hydrogen (H_2)

ex. When sodium metal reacts with water, sodium hydroxide is formed and hydrogen gas is liberated.

$Na + H_2O$ ---------- › $NaOH + H_2$

sodium water sodium hydroxide hydrogen

Sodium metal is very reactive. To break its contact with water and air, it is kept in kerosene.

3. Reaction with acid -

Hydrogen gas is produced when metals react with acids.

ex. $Cu + H_2SO_4$ ---------- › $CuSO_4 + H_2$

copper sulfuric acid hydrogen copper sulfuric acid hydrogen

3.4 Chemical properties of non-metals -

1. Reaction with air - Non-metals react with oxygen to form oxides but it is acidic in nature.

$C + O_2$ ---------› CO_2

carbon oxygen carbon dioxide

2. **Reaction with water -** Generally non-metals do not react with water. That's why phosphorus is stored in water.

3. Reaction with acids - Metals do not react with dilute acids. But sulfur is an exception. It reacts with concentrated nitric acid.

$S + 4HNO_3$ -----› $SO_2 + NO_2 + H_2O$

Sulfur + Nitric acid -----› Sulfur dioxide + Nitrogen dioxide + Water

3.5 Uses of metals and non-metals in daily life

Some uses of metals

1. Copper wires are used in making electrical equipment.
2. Mercury metal is used in thermometer.
3. Metals are used in utensils for making food.
4. Gold and silver metals are used in making jewelery and coins .
5. Iron metal is used in house construction.

Some uses of nonmetals -

1. Graphite is used in making pencils.
2. Red phosphorus is used in making matches used at home.
3. Graphite is used as an electrode in a watch cell.

3.6 Noble metals

Metals which are very less reactive. They are not affected by air, water, acid and alkali. are called noble metals. eg. Gold, silver etc.

3.7 Alloy -

An alloy is obtained by mixing two or more metals in a definite proportion.

ex. - Brass -------› Copper + Zinc

Stainless steel ------› Iron + Nickel + Chromium

Alloys are made to prevent metals from rusting.

त्रयः पोषास्त्रिवृति श्रयन्तामनक्तु पूषा पयसा घृतेन ।

(अथर्व. 5.28.3)

In Atharvaveda, the mixture of three metals is called Trikrit.

नव प्राणान् नवभिः सं मिमीते दीर्घायुत्वाय शतशारदाय।
हरिते त्रीणि, रजते त्रीण्ययसि त्रीणि तपसाविष्ठितानि॥

(अथर्व. 5.28.1)

Gold, silver, iron mixed wire.

Practice Work

Q. 1 Select the correct option -

1. Which gas is liberated by the reaction of metals with acids-

   a) Nitrogen b) Chlorine

   c) Hydrogen d) Fluorine

2. Which metal is kept in kerosene.

   a) Sodium b) Phosphorus

   c) Potassium d) Silver

3. Which of the following non-metal is used in making pencils?

   a) Sulfur b) Graphite

   c) Bromine d) Chlorine

Q. 2 Fill in the blanks -

1. Non-metals are …… of heat and electricity.
2. Oxides of metals are of …… nature.
3. The best conductor of heat is ..... metal.

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Brass alloy is made by mixing copper and zinc metals in a fixed ratio.
2. Gold is a noble metal.
3. Mercury metal is used in thermometer.

Q. 4 Match the correct pairs -

	Column 'A'	Column 'B'
1.	Lustrous non-metal	Electrical conductors
2.	Soft Metal	Gold
3.	Graphite	Brass
4.	Noble metal	Sodium
5.	Alloy	Iodine

Q. 5 Very short answer type questions -

1. Which metal does not rust easily ?
2. What is the name of the metal found in liquid state at normal temperature ?
3. Which metal is used in making electric wire ?

Q. 6 Short Answer Type Questions-

1. What is called acoustic ? Give example.
2. What is an alloy ? Write the names of two alloys.

Q. 7 Long answer type questions -

1. Write the physical properties of metals and non-metals.

Project work

1. Perform activities and experiments based on the physical and chemical properties of metals and non-metals.

Chapter- 4

Coal and Petroleum

We get various resources from nature. These resources are called natural resources, natural resources can be divided into two categories –

1. Renewable Natural Resources
2. Exhaustible Natural Resources

1. Renewable natural resources -

Such resources,which we will continue to receive from nature till eternity, are called renewable natural resources, their quantity is unlimited. It is a never ending resource. eg. Sunlight, air etc.

2. Exhaustible natural resources -

Such natural resources, which are present in nature in limited quantities and which can be exhausted after some time due to continuous use, are called exhaustible natural resources. eg. Coal, petroleum, natural gas, minerals, wildlife, forests etc.

Activity 1 :-Tabulate the objects/substances around you into substances and natural substances.

S. No.	Name of the article	Synthetic material/Natural material
1.	Soil	Natural Matter
2.	Water	
3.	Synthetics	
4.	Plastic Chair	

4.1 Coal-

Coal is a black or brown solid organic flammable substance. It is used in cooking and as a fuel in various industries. Coal is also used to generate electricity in thermal power plants.

Fig –Coal

Formation of coal

About 300 million years ago, due to natural calamities like floods, the dense forests got buried under the soil. With the passage of time, they went on sinking down. Due to high pressure and high temperature, the dead plants and trees were gradually converted into coal. This process is called carbonization. Coal is also called fossil fuel,because it is made from the remains of trees and plants.

Fig. – Coal Mine

Coal products

Some useful products are obtained when coal is heated. eg. Coke, bitumen and coal-gas.

Fig. - Bitumen

1. **Coke -** It is a hard substance of black colour. It is an almost pure form of carbon. Coke is used in metal extraction and steel making.
2. **Bitumen -** It is a very thick liquid of black or brown colour. It is used in making explosives,naphthalene bullets to repel insects, synthetic dyes, road construction materials.
3. **Coal gas -** obtained as a by-product during the fractional distillation of coal or the manufacture of coke. It is used as a source of heat.

4.2 Petroleum

It is a natural fuel that is extracted from the middle of the sedimentary layers below the earth's crust. It is used as fuel in vehicles.

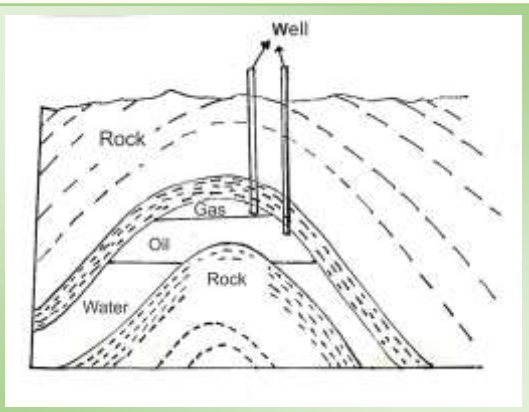


Fig. : Petroleum and natural gas

Manufacture of Petroleum

Petroleum is made from

the organisms living in the sea. After the death of these creatures, their bodies went to the bottom of the ocean and got buried with sand and mud. After millions of years, these dead organisms were converted into petroleum and natural gas due to high pressure and high temperature. Petroleum in India is found in the basins of Gujarat,Bombay,Assam,Krishna and Godavari rivers.

Refining of petroleum

Various constituents of petroleum by petroleum refineries,eg. - The process of separating petrol, diesel, kerosene, lubricating oil, paraffin, wax, petroleum gas etc. is called refining.

Fig.: Refining of Petroleum

Different constituents of petroleum and their uses-

1. **L.P.G. -** L.P.G. Its full name is Liquefied Petroleum Gas. It is used as domestic fuel and fuel in industries.
2. **Petrol -** It is used as a fuel for light motor vehicles and as a solvent for dry washing.
3. **Kerosene -** It is widely used as fuel for aircraft (jet fuel) and some rocket engines. Its main use is in lamps, stoves, lamps.
4. **Use of Diesel -** It is used in heavy motor vehicles,eg. - Used as fuel for tractors, buses, trucks, earthmoving machines and electric generators.

5. **Lubricating Oil –** It is a fluid applied between two moving surfaces of a machine to reduce friction. By using lubricating oil, the parts of the machine can be protected for a long time.

6. **Paraffin wax -** It is used in making candles and cosmetics (Vaseline). It is also used as medicine (ointment).

7. **Bitumen -** It is used in the construction of paved roads and in paint.

4.3 Natural Gas -

देवस्यत्त्वा सवितुः प्रसवेश्श्विनोर्व्वाहुब्भ्यां पूष्णणो हस्त्ताब्भ्याम्।
पृथिव्याः सधस्त्थादग्ग्निम्पुरीष्ष्यमङ्गिरस्वत्त्खनामि॥
ज्योतिष्म्मन्तं त्वाग्ग्ने सुप्रतीकमजस्त्रेण भानुना दीद्यतम्।
शिवं प्रजाब्भ्योहि ँ सन्तं पृथिव्याः सधस्त्थादग्ग्नि पुरीष्ष्यमङ्गिरस्वत्खनामः॥

(यजुर्वेद. 11.28)

Shuklayajurveda mentions extraction of natural gas by digging the earth.

There is a mantra in the Yajurveda regarding extraction and use of natural gas. Natural gas is a fossil fuel. It is compressed at high pressure and stored as natural gas. It is used as a fuel for transport vehicles,in energy production,in the industrial manufacture of chemicals and fertilizers. It is a clean fuel as it is less polluting. In India, natural gas is found in the delta region of Maharashtra,Rajasthan,Tripura, Krishna Godavari. (The deposited area of soil brought by rivers is called delta.)

Practice Work

Q. 1 Select the correct option -

1. Which one of the following fossil fuels is a clean fuel -

   a) Diesel b) Petrol

   c) Natural gas d) Coal

2. Bitumen is used for -

   a) Fuel b) Industries

   c) In road construction d) None of these

3. Which of the following is almost pure form of carbon?

   a) Bitumen b) Coal gas

   c) Coke d) None of these

Q. 2 Fill in the blanks -

1. Kerosene is a …… fuel.
2. The slow process of conversion of dead plants into coal is called …….
3. Refinement of petroleum is done by …….

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Natural gas is a fossil fuel.
2. The constituents of petroleum can be separated by petroleum refining.
3. Bitumen is used in making naphthalene tablets.

Q. 4 Match the correct pair.

	Column 'A'	Column 'B'
1.	Renewable Natural Resource	a. Coal
2.	Exhaustible natural resource	b. Sunlight
3.	Coke	c. in road construction
4.	Bitumen	d. In metal extraction

Q. 5 Very short answer type questions -

1. Name two renewable natural resources.
2. Write the names of two fossil fuels.
3. Write one use of Coke.

Q. 6 Short Answer Type Questions -

1. What is Bitumen ?
2. What is the full form of LPG ? What is the use of this ?
3. How is coal gas obtained ? Write its use.

Q. 7 Long answer type questions -

1. What is Coal ? Explain the process of coal formation.
2. What is Natural Gas ?

Project work -

1. Prepare a list of major petroleum refineries of India.

Chapter- 5

Combustion and Flame

We use many substances in our daily life,eg. - Candles are lit when it is dark, while wood ,coal, LPG are used as fuel. We see that the candle burns with the flame,but the coal does not burn with the flame. In this chapter, we will study about the chemical process of combustion (burning).

5.1 Combustion -

Chemical process in which an external substance reacts with oxygen to produce heat is called combustion. The substances that burn are called combustible substances. eg. Burning of wood, burning of paper etc. Some substances also produce light in the form of flame or flame during combustion. Every substance requires air (oxygen) and heat for combustion. The minimum temperature at which a substance starts burning is called the ignition temperature of that substance. The ignition temperature of each substance is different. The substances which catch fire quickly, their ignition temperature is low, such substances are called inflammable substances. Examples of inflammable substances are as follows - Liquefied Petroleum Gas (LPG), Petrol, Alcohol etc.

5.2 Types of combustion

There are three types of combustion –

(1) Spontaneous combustion (2) Rapid combustion (3) Explosion

1) **Spontaneous combustion -** The combustion in which a substance starts burning on its own is called spontaneous combustion. eg. When phosphorus is left open in the air, it automatically starts burning.

2) **Rapid combustion -** The combustion in which a substance,coming in contact with fire, starts burning rapidly,is called rapid combustion. eg. - L.P.G., CNG, Petrol etc. burn vigorously.

3) **Explosion -** When substances produce loud sound, excessive heat and light on combustion, it is called explosion.

5.3 Flame -

Some substances vaporize during combustion and form a flame. For example, a candle evaporates to form a flame, while coal does not vaporize and does not produce a flame.

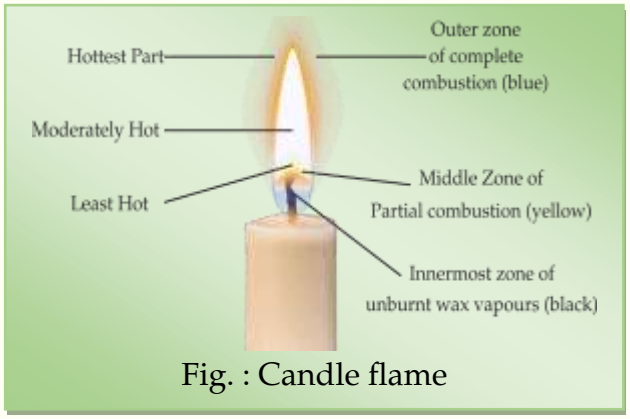


Fig. : Candle flame

5.4 Fuel -

Such substances which burn easily in the presence of oxygen and produce heat are called fuels. There are three types of fuel.

1) Solid fuel - Wood, coal etc.
2) Liquid fuel - Diesel, petrol, kerosene.
3) Gaseous fuel - L.P.G., CNG, Hydrogen etc.

Ideal fuel

The ideal fuel is one which does not leave any undesirable substance after combustion, does not generate any toxic gas or smoke during combustion, which is less in quantity, produces more heat,is cheap and easily available. And whose transportation and storage is easy, it is called an ideal fuel. eg. - L.P.G. and CNG is considered an ideal fuel.

Calorific value -

The amount of heat produced when 1 kg of a fuel is burnt in the presence of oxygen is called the calorific value of that fuel. The calorific value of a fuel is measured in units of kilo joules per kilogram. Each fuel has a different calorific value. Harmful elements produced by the combustion of fuel act to affect the environment.

1. Fuels like petrol, wood, coal etc emit carbon particles during combustion, which affect our respiratory system. These fine particles cause asthma eg. Diseases can arise.

2. Incomplete combustion of fuels produces toxic carbon monoxide gas.

3. Combustion of fuels releases carbon dioxide gas, which pollutes the environment. It works to increase the temperature of the environment. The increase in the temperature of the atmosphere is called global warming. Because of this, glaciers start melting and sea level starts rising.

4. Dioxide of sulfur produced from the combustion of diesel and coal and oxides of nitrogen produced from the combustion of petrol dissolve in rain water. Such rain is called 'acid rain', due to which soil, crops, buildings are affected.

5.5 Carbon dioxide as a fire extinguisher –

Electrical Appliances & Petrol, L.P.G. eg. Carbon dioxide gas is used to extinguish the fire in flammable materials. Being heavier than oxygen, it breaks the contact between fuel and oxygen, thereby controlling the fire.

Fig. : Fire Extinguisher

Water is not used to extinguish fire in electrical equipment because water is a good conductor of electricity, which can harm the person extinguishing the fire. Carbon dioxide gas is used to extinguish fires in electrical equipment.

Practice Work

Q. 1 Choose the correct option -

1. Which of the following is a combustible substance -

   a) Iron nail b) Glass

   c) Piece of stone d) Wood

2. Fuel is -

   a) Solid b) Liquid

   c) Gas d) Solid,liquid and gas all three

3. Inflammable substances are called -

   a) Those who catch fire with difficulty

   b) Those that catch fire easily

   c) Sometimes catches fire and sometimes does not

   d) None of these

Q. 2 Fill in the blanks -

1. ..... is the minimum temperature at which a substance starts burning.
2. Fire in electrical equipment can be controlled by .....
3. Incomplete combustion of fuel produces …… gas.

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Carbon dioxide gas is used to extinguish the fire.
2. When phosphorus is left open in the air, it automatically starts burning.
3. The ignition temperature of each substance is different.

Q. 4 Match the correct pair.

	Column 'A'	Column 'B'
1.	Solid fuel	a. LPG
2.	Liquid fuel	b. Coal
3.	Gaseous fuel	c. Petrol

Q. 5 Very short answer type questions -

1. In how many ways does combustion take place ?
2. Which is the gas required for combustion ?
3. What is the name of the liquid fuel used for cooking food in homes ?

Q. 6 Short Answer Type Questions -

1. What is an ideal fuel ?
2. What is inflammable material ? Write the names of inflammable substances.
3. What is the calorific value of the fuel ?

Q. 7 Long answer type questions -

1. What is Jwala ? Draw a labeled diagram of a candle flame.
2. Explain how carbon dioxide acts as a fire extinguisher ?

Project work

1. Prove experimentally that air is necessary for combustion ?

Chapter- 6

Conservation of Plants and Animals

Dear students ! You know that different types of plants and animals are present on our earth. To preserve the existence of plants and animals, it is necessary to preserve their natural habitat, ecosystem and environment. In this chapter, we will study about the conservation of plants and animals.

Deforestation -

Destruction of forests due to human activities and natural causes is called 'deforestation'. The following are the reasons for deforestation -

1. The main reason for deforestation is the conversion of forest land into agricultural land for the food supply of the growing population.
2. Wood is used in the manufacture of furniture, paper, match boxes, plywood, packing boxes, decorative items, etc. Forests are being cut continuously for these works.
3. Deforestation is taking place due to deforestation for urbanization and development projects.
4. Using forest wood as fuel is also a reason for deforestation.

Side effects of deforestation -

1. Due to deforestation, the rain water carries away the upper surface of the soil (fertile land) along with it, due to which the fertilizer capacity of the soil is decreasing.
2. The roots of plants work to bind the soil. Landslides are increasing due to deforestation in mountainous areas. eg. Tragedy of Uttarakhand.
3. Plants take carbon dioxide gas from the atmosphere for making their food and release oxygen gas. Due to deforestation, the amount of carbon dioxide gas in the atmosphere is increasing,due

to which the temperature of the atmosphere is increasing. This is called global warming.

4. Forests are the habitats of plants, animals and birds. Their habitat has been destroyed due to deforestation.

5. Trees are helpful in raining. Due to the destruction of forests, there is continuous decrease in rainfall.

Wild and wildlife -

इमम्मा हि ꣳसीरेकशफं पशुं कनिक्क्रदं व्वाजिनं व्वाजिनेषु ।

(यजु. 13.48)

इमम्मा हि ꣳसीर्द्विपादं पशु ꣳसहस्त्राक्क्षो मेधाय चीयमानꣳ ।

(यजु. 13.47)

इम ꣳसाहस्त्र ꣳशतधारमुत्त्सं व्यच्च्यमान ꣳ सरिरस्यमद्ध्ये ।

घृतं दुहानामदितिं जनायाग्ग्ने मा हि ꣳ सीꣳ परमे व्योमन् ॥

(यजु. 13.49)

In Yajurveda, it is mentioned not to do violence to two legged, two hoofed, one hoofed etc animals.

इमम्मा हि ꣳसीर्द्विपादं पशु ꣳसहस्त्राक्क्षो मेधाय चीयमानꣳ ।

मयुं पशुं मेधमग्ने जुषस्व तेन चिन्वानस्तन्व्वो निषीद॥

मयुं ते शुगृच्छतु यं द्विष्म्मस्तं ते शुगृच्छतु॥ *(यजुर्वेद. 13.47)*

Do not violence to animals.

यो अघ्न्याया भरति क्षीरमग्ने तेषां शीर्षाणि हरसापि वृश्च।

(अथर्व. 8.3.15)

According to Atharvaveda, animal violence has been considered a punishable crime.

यावद्भूमंडलं धत्ते सशैल वन काननम् ।

तावत् तिष्ठति मेदिन्याम् सन्ततिः पुत्र पौत्रिकी॥ (दुर्गा सप्तशती)

That is, as long as our earth is rich with forests containing trees and mountains,it will continue to nurture the children of human beings.

यथाश्वत्थ वानस्पत्यानारोहन् कृणुषेऽधरान्। *(अथर्ववेद - 3.6.6)*

Ashwattha (Peepal) tree has been mentioned in this Atharvaveda mantra.

कर्शफस्य विशफस्य द्यौः पिता पृथिवी माता।
यथाभिचक्र देवास्तथाप कृणुता पुनः॥

(अथर्ववेद - 3.9.1)

It is mentions various creatures like animals with nails and hooves like tiger,snake,animals with cloven hooves like cow,bull, buffalo etc.

इडायास्पदं घृतवत् सरीसृपं जातवेदः प्रति हव्या गृभाय।
ये ग्राम्याः पशवो विश्वरुपास्तेषां सप्तानां मयि रन्तिरस्तु॥

(अथर्ववेद - 3.10.6)

In this mantra of Atharvaveda, cow giving milk and ghee,fast running horse and domestic animals living in the village like Goat,Sheep,Camel etc. have been mentioned and 7 types of animals have been mentioned in this mantra.

Forest Conservation Act,Tiger Conservation Project etc. are being run by the government. National parks,sanctuary zoos, botanical gardens, etc. have been established to provide natural habitats to wildlife and plants.

ओषधे त्र्यास्वैनं स्वधितेमैनं हिंसीः (सामवेद छा.म.ब्रा. 4/5)

Tree-medicines protect us from diseases. That's why trees-medicines and animals living in them should not be killed unnecessarily. But the Vedas give us instructions to protect and enhance them.

National Park and Wildlife Sanctuary-

Important species of plants,birds and animals in their natural habitat. India's first national park Jim Corbett National Park was

established in 1936 in Nainital district of Uttarakhand. At present India has more than 104 national parks and more than 544 wildlife sanctuaries. Some of these are as follows –

Sl.	National park	State	Animal protection
1	Bandhavgarh National Park	Madhya Pradesh	Tiger
2	Bandipur National Park	Karnataka	Tiger
3	Gir National Park	Gujarat	Asiatic Lion
4	Kaziranga National Park	Asma	Genda
5	Periyar National Park	Kerala	Asian Elephant
6	Ranthambore Wildlife Sanctuary	Rajasthan	Tiger

The place where animals and birds are kept for information and display of wildlife for the common citizens. Here arrangements are made for the breeding and treatment of animals and birds. The main objective of establishing a zoological park or zoo is to create attachment to wildlife among people.

Botanic Garden -

Flora and gardens have been established for the conservation and promotion of endangered and endangered plant species. The most famous botanical garden in India is Jagdish Chandra Basu's in Howrah, West Bengal.

Fig. : Siberian Crane

Migration places of migratory birds -

Foreign birds come to India during their breeding season to avoid extreme cold during winter. They are also called migratory birds. eg. - Siberian Crane

Red data book

The details of endangered species are kept is called Red Data Book. There are separate Red Data Books for plants and animals.

Plants and animals -

The animals found in a particular area are called the fauna of that area. eg. Deer, wolf, nilgai, leopard etc. The plants and trees found in a particular area are called the flora of that area. eg. Jamun, Babul, Teak etc.

Special regional species -

plants which are found only in a particular area are called endemic species. eg. Indian giant squirrel and flying squirrel and sal and wild mango trees are found naturally only in the Panchmarhi Biosphere Reserve. Gangetic river dolphins (Ganges River) are found in Snotedua (Himalayan Range),Su-Phog, Indrok Rajasthan.

Fig. : Gangetic river dolphin Fig. : Snow leopard

Practice Work

Q. 1 Choose the correct option -

1. Due to increase in the amount of carbon dioxide gas in the atmosphere, the temperature -

   a) Decreases b) Increases

   c) Remains unchanged d) None of these

2. Records of all endangered species are kept -

   a) Green Data Book b) Red Data Book

   c) Blue Data Book d) None of these

3. What do deer, wolf, nilgai, leopard together represent in a forest?

   a) Animals b) Plants

   c) Ecosystem d) Species

Q. 2 Fill in the blanks -

1. Due to deforestation, there is a decrease in the …….. capacity of the soil.
2. The species found in a particular area are called .....
3. The area in which animals are preserved in their natural habitat is called ……

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Indian giant squirrel is an example of endemic species.
2. Foreign birds come to India during their breeding season to avoid extreme cold during winter.
3. Due to deforestation, the amount of carbon dioxide gas in the atmosphere is increasing.

Q. 4 Match the correct pairs -

	Column 'A'	Column 'B'
1.	Bandhavgarh National Park	a) Unicorn

2.	Kaziranga National Park	b) Tiger
3.	Himalayan Range	c) Dolphin
4.	River Ganga	d) Snow leopard

Q. 5 very short answer type questions -

1. Migratory birds come to India to escape from which weather?
2. What are the species of animals and plants found in a particular area called ?
3. Periyar National Parkwas established for the protection of which animal ?

Q. 6 Short Answer Type Questions -

1. Why were zoological parks or zoos established ?
2. What do you understand by National Park or Wildlife Sanctuary ?
3. What do you understand by deforestation ?

Q. 7 Long answer type questions -

1. Write the causes and side effects of deforestation.

Project work -

1. Display of forest reserve areas on the map.

Chapter- 7

Cell Structure and Function

We know that building construction is done by joining several bricks. Similarly, our body is made up of many cells. Cell is the basic structural and functional unit of the body.

Cells together form tissue. Different tissues make up the organs. Similarly, the body is made up of different parts.

Discovery of cells -

The cell was discovered in 1665 by Robert Hooke. The cell cannot be seen by the naked eye. Cells can be seen with the help of a "microscope".

Number of cells -

Countless cells are found in the body of living beings. Only one cell is found in the body of some organisms,which are called unicellular organisms. eg. Amoeba, Paramecium, Euglena etc. In contrast to these, more than one cell is found in multicellular organisms. eg. Man,cow,goat etc. A single celled organism also performs the same functions as multicellular organisms. In a single celled organism like Amoeba, the functions of food intake, digestion, respiration, excretion, growth, reproduction etc. are done by a single cell, whereas in multicellular organisms all these functions are performed by different organs.

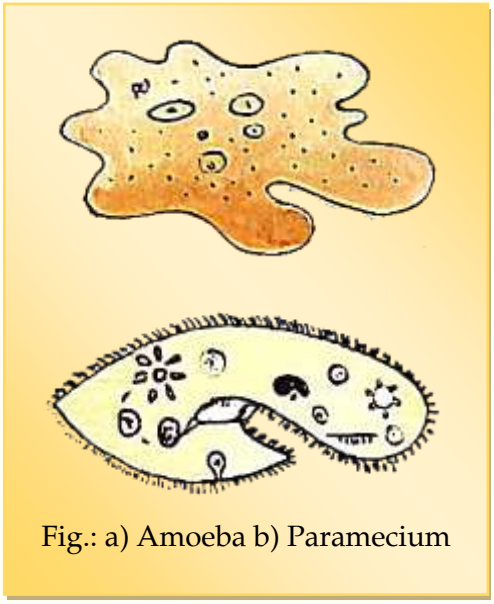


Fig.: a) Amoeba b) Paramecium

Cell shape -

The shape of unicellular organisms is irregular. It keeps on changing its shape. eg. - The shape of amoeba is not fixed. It keeps

changing its shape. In multicellular organisms, the shape of cells is spherical,flat or elongated. eg. Blood cells are spherical. Both the ends of muscle cells are pointed. Their shape is in square form. Nerve cells are branched.

त्रिशीर्षाणं त्रिककुदं किमिं सारङ्गमर्जुनम्।

(अथर्ववेद 5.23.9)

The description of the shape of the cell is found in the Atharvaveda. Worms are white at some places,pit graves,some have three heads or three fronts.

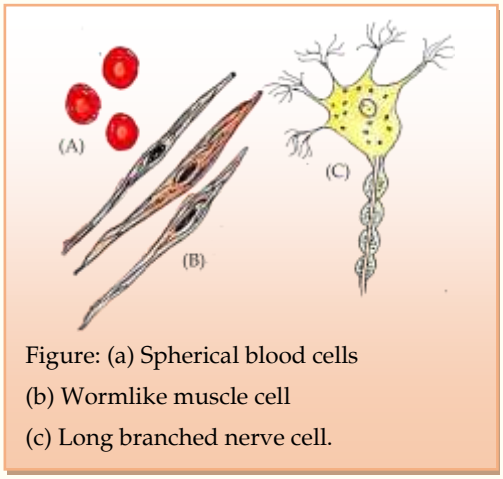


Figure: (a) Spherical blood cells
(b) Wormlike muscle cell
(c) Long branched nerve cell.

Cell size -

Cells of different animals and plants have different sizes. The smallest cell is (mycoplasma). This is a bacterial cell. Its size is 0.1 to 0.5 micrometer. The largest cell is the egg of the ostrich,which measures 170mm×130 mm. Cells are very small in size. They are measured in micrometres.

Parts of the cell

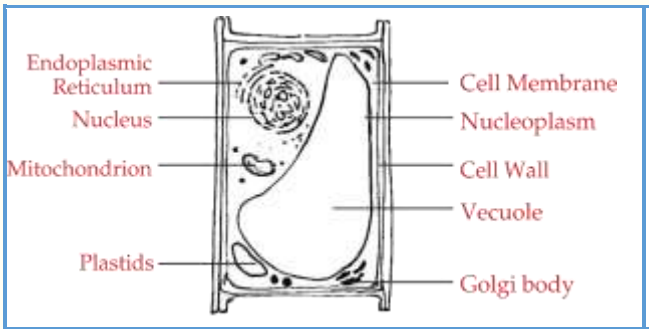


Fig: Plant cell

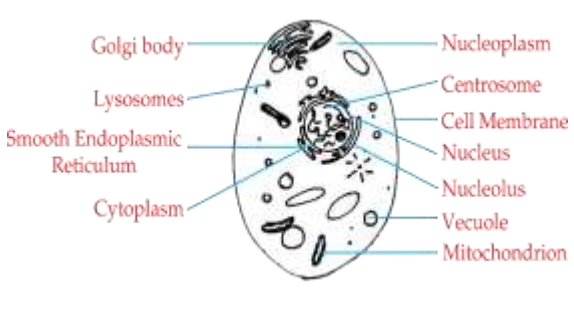


Fig: Animal cell

The main parts of the cell are as follows -

1. **Cell wall** - It is found in plant cell. The cell wall is made of cellulose,which helps to give structure and a definite shape to the cell. It is selective and determines the substances going in and out of the cell.
2. **Cell membrane -** It is found in animal cell. Cell membrane is made of proteins. It is also called plasma membrane. It is semipermeable,

under which it determines the substances going inside and outside the cell.

3. **Cytoplasm -** It is present in both plant cell and animal cell. It is a very thick, sticky substance, which is found between the cell membrane and the nucleus. The following organelles are found in the cytoplasm. These are- Mitochondria, Golgi body, Ribosome etc.

Mitochondria - It is called the energy house of the cell. It stores energy within itself and provides energy to the cell for various biological functions.

Golgi body - It is a sac like structure. It helps in the storage and transport of secreted substances inside the cell.

Ribosome - It is an important component for protein production. That is why it is called 'Factory of Porcelain'.

4. **Plastid (Plastid) -** It is found in the plant cell,depending on the presence of pigments there are three types of plastids -

a) **Green plastids (chloroplasts)** - They are green in colour. Chlorophyll (chlorophyll) is present in these,which participates in the process of photosynthesis. They store light energy for photosynthesis, which makes food. Hence it is also called the kitchen of the plant cell.

B) **Varnolavak -** These are colored lobules,which are usually red, yellow, orange in colour. These contain pigments like carotene, xanthophyll etc. They are found in flower, fruit wall, seed coat.

c) **Avarnoluk -** These are colorless plastids. Food items are stored in them.

5. **Nucleus -** Nucleus is located in the central part of the cell. It is separated from the cytoplasm by a membrane called the 'nuclear membrane',which is semipermeable. It determines the substances going in and out of the nucleus. The nucleus contains thread-like structures called chromosomes. They work to transfer genetic properties from one generation to another.

Practice Work

Q. 1 Choose the correct option -

1. Who discovered the cell -

   a) Leeuwenhoek b) Brown

   c) Robert Hooke d) None of these

2. Which work will not be performed in the absence of ribosome in the cell -

   a) Respiration b) Excretion

   c) Protein synthesis d)Carbohydrate synthesis

3. The outermost covering of plant cell is called -

   a) Cell membrane b) Cell wall

   c) Plastid d) Nucleus

Q. 2 Fill in the blanks -

1. Amoeba is a …… organism.
2. The smallest cell is …….
3. The energy house of the cell is called …….

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Ribosome is called the factory of proteins.
2. Paramecium is a multicellular organism.
3. Tissue is made up of cells.

Q. 4 Match the correct pair.

	Column 'A'	Column 'B'
1.	Cell wall	a. Proteins
2.	Cell membrane	b. Cellulose
3.	Unicellular organism	c. Cow
4.	Multicellular organism	d. Euglena

Q. 5 very short answer type questions -

1. What is called the kitchen of the cell ?
2. In which food items are stored ?
3. What is the function of Golgi body ?

Q. 6 Short Answer Type Questions -

1. What is a cell ?
2. Where are chromosomes found in the cell ? State their work.
3. What is tissue ?
4. Write short note on -

   1) Cell wall 2) Plastid

Q. 7 Long answer type questions -

1. Draw labeled diagram of plant cell and animal cell and explain their different parts.

Chapter- 8

Reproduction in Animals

Dear students ! You know that every living being lives on this earth only for a limited period of time. Therefore, it is necessary to have new organisms in place of dead organisms. In this chapter, we will study about the reproduction of animals.

The process by which animals produce offspring similar to themselves is called reproduction. Methods of reproduction

1) Sexual reproduction 2) Asexual reproduction

1) Sexual reproduction - Animals have male and female sex organs. Male and female reproductive organs unite to form gametes,which fuse to form a zygote. It later develops into an organism,this is called sexual reproduction.

यथेयं पृथिवी मही भूतानां गर्भमादधे। *(अथर्व 6/17/1)*

This Mother Earth holds all the living beings in her womb. This message is mentioned in the Atharvaveda.

Male reproductive organs

Fig.: Male genitalia in humans

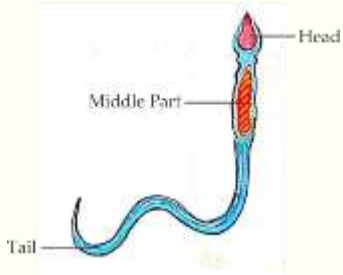


Fig.: Human spermatozoa

In the male reproductive organs, a penis (penis),a pair of testes which produce sperms and are called male gametes. Sperms are very small in size.

पुंसि वै रेतो भवति तत् स्त्रियामनु षिच्यते ।

(अथर्ववेद 6.11.2)

There is semen (sperm) in the man,by which the woman conceives.

शेपो गर्भस्य रेतोधाः सरौ पर्णमिवा दधत् ।

(अथर्ववेद 5.25.1)

According to Atharvaveda, for conception, a man puts the seed of his shape (urinary organ) in a woman's womb.

Female reproductive organs

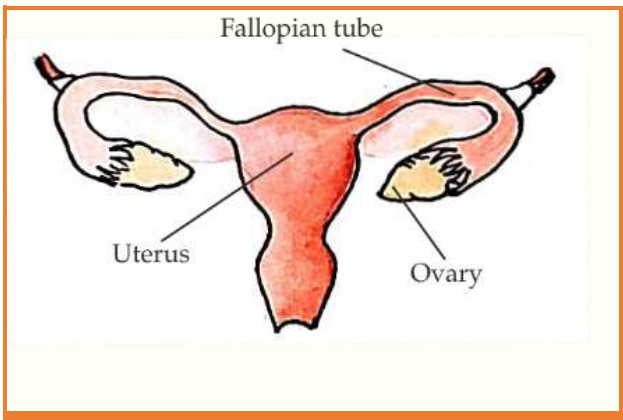


Fig. : Female genitalia

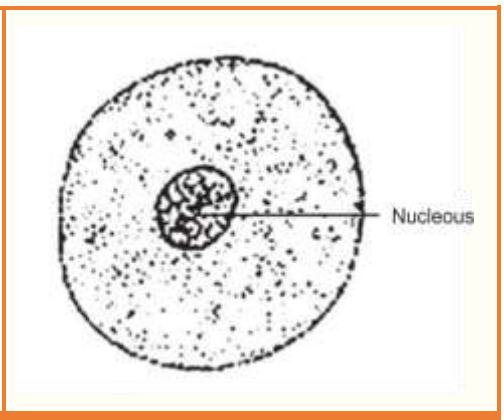


Fig. : Human egg

Female genitals have a uterus,a pair of ovaries,and two oviducts. Ovaries produce ovules,which are called female gametes. The development of the baby takes place in the uterus.

धातः श्रेष्ठेन रूपेणास्या नार्या गवीन्योः ।
पुमांसं पुत्रमा धेहि दशमे मासि सूतवे ॥

(अथर्ववेद - 5.25.10)

In this Atharvavedic mantra, there is mention of the nadis that take the urine from the intestines of the woman to the bladder and the birth of the child in the tenth month has been mentioned.

आ ते योनिं गर्भ एतु पुमान् बाण इवेषुधिम्।
आ वीरोऽत्र जायतां पुत्रस्ते दशमास्यः ॥

(अथर्ववेद - 3.23.2)

In this mantra of Atharvaveda, the mechanism of reproduction in animals has been mentioned. The semen (sperm) of the male reaches the

genitals of the female and performs the process of fertilization. As a result of this action, it has been told about the birth of a child after ten months.

यानि भद्राणि बीजान्यृषभा जनयन्ति च।
तैस्त्वं पुत्रं विन्दस्व सा प्रसूर्धेनुका भव॥ *(अथर्ववेद - 3.23.4)*

In this Atharvavedic mantra, it has been told that the way the semen of Vrishabha (bull) reaches the genitals of a cow and produces a calf as a result of fertilization. Similarly, the semen (sperm) of a man interacts with the ovum located in the genitals of a woman and produces a child.

Fertilization

Female gametes (eggs) come in contact with male gametes (sperms) and get aggregated. This process is called fertilization. Fertilization results in the formation of a zygote.

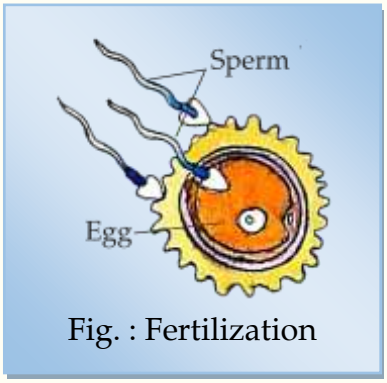


Fig. : Fertilization

Fertilization is mainly of two types –

1) Internal fertilization
2) External fertilization

1) Internal Fertilization - The fertilization in which the fusion of male and female gametes takes place inside the body of the female is called internal fertilization . eg. Man, cow, dog, chicken etc.

2) External fertilization - The fertilization in which the fusion of ovum and sperm takes place outside the body of the female is called external fertilization. eg. - Fish, frogs etc. floating in ponds etc. female,secretes eggs,which keep floating in the water. These ova fuse with the sperm released by the male fish, frog to form the zygote.

पुंसि वै रेतो भवति तत् स्त्रियामनु षिच्यते।
तद् वै पुत्रस्य वेदनं तत् प्रजापतिरब्रवीत्॥

(अथर्ववेद - 6.11.2)

In this mantra of Atharvaveda, the process of fertilization of male and female has been described. The semen (sperm) of the male reaches the uterus of the female and fertilizes the ovum to produce a child.

Development of Embryo

As a result of the fusion of male and female gametes, a zygote is formed,which develops into an embryo. The zygote divides to form a ball of cells. After that the cells group and grow into tissues and organs. This developed structure is called 'embryo'. The embryo develops in the uterus and various body parts are formed. When the development of the fetus is complete in the uterus,then the mother gives birth to the newborn.

वि ते भिनद्मि मेहनं वि योनिं वि गवीनिके ।
वि मातरं च पुत्रं च वि कुमारं जरायुणाव जरायु पद्यताम् ॥

(अथर्व 1.11.5)

In the Atharvaveda, it is mentioned to dilate the veins around the urethra and vagina to get the fetus out of the womb,as it obstructs the delivery. There is a detailed description of the separation of the child from the placenta.

एवा त्वं दशमास्य साकं जरायुणा पताव जरायु पद्यताम् । *(अथर्व 1.11.6)*

There is mention of the birth of a child after 10 months.

31st chapter of the third chapter of Shrimad Bhagwat, the order of development of the fetus is described which is as follows –

कर्मणा दैवनेत्रेण जन्तुर्देहोपपत्तये ।
स्त्रियाः प्रविष्ट उदरं पुंसो रेतःकणाश्रयः ॥

(श्रीमद्भागवत तृतीय स्कन्ध 31.1)

In this shloka of the third chapter of Shrimad Bhagwat, it has been told that the living entity enters the womb of a woman in the form of a semen particle (sperm) of a man in order to get a body.

कललं त्वेकरात्रेण पञ्चरात्रेण बुद्बुदम् ।

दशाहेन तु कर्कन्धूः पेश्यण्डं वा ततः परम् ॥

(श्रीमद्भागवत तृतीय स्कन्ध 31.2)

In this shloka of the third chapter of Shrimad Bhagwat, it has been told that in one night the sperm and Raja (ovum) meet and in the fifth night this mixture takes the form of a bubble. On the 10th night, this bubble grows to the size of a plum and after that it gradually turns into a mass of meat.

मासेन तु शिरो द्वाभ्यां बाहवङ्घ्र्याद्यङ्गविग्रहः ।

नखलोमास्थिचर्माणि लिङ्गच्छिद्रोद्भवस्त्रिभिः ॥

(श्रीमद्भागवत तृतीय स्कन्ध 31.3)

In this shloka of the third chapter of Shrimad Bhagwat, it has been told that in one month the head is formed and at the end of two months the hands,feet and other organs take form. By the end of the third month nails,fingers,thumb and bones and skin and genitals develop and eyes,nose,ears,mouth and anus are formed.

चतुर्भिर्धातवः सप्त पञ्चभिः क्षुत्तृडुद्भवः ।

षड्भिर्जरायुणा वीतः कुक्षौ भ्राम्यति दक्षिणे ॥

(श्रीमद्भागवत तृतीय स्कन्ध 31.4)

In this shloka of the third chapter of Shrimad Bhagwat, it has been told that within four months of conception, the seven main components of the body such as Ras,blood,flesh,fat,bone,marrow and semen are produced. Hunger and thirst starts in the fifth month and by the end of six months, the fetus inside the membrane starts moving in the right part of the abdomen.

मातुर्जग्धान्नपानाद्यैरेधद्धातुरसम्मते ।

शेते विण्मूत्रयोर्गर्ते स जन्तुर्जन्तुसम्भवे ॥

(श्रीमद्भागवत तृतीय स्कन्ध 31.5)

In this shloka of the third chapter of Shrimad Bhagwat, it has been told that the fetus grows by getting its nourishment from the food and water taken by the mother.

एवं कृतमतिर्गर्भे दशमास्यः स्तुवन्नृषिः ।
सद्यः क्षिपत्यवाचीनं प्रसूत्यै सूतिमारुतः ॥

(श्रीमद्भागवत तृतीय स्कन्ध 31.22)

In this shloka of Shrimad Bhagwat III Chapter it is said that in the tenth month the fetus is pushed downwards by the labor wind.

In SriVishnuDharmottarPuranam, the sequence of development of a child in the mother's womb has been explained.

पुष्कर उवाच ॥ जीवः प्रविष्टो गर्भे तु कललं प्रति तिष्ठति ॥ मूढस्तु कलले तस्मिन्मासमात्रं हि तिष्ठति ॥ द्वितीयं तु तदा मासं घनीभूतः स तिष्ठति ॥ तस्यावयवनिर्माणं तृतीये मासी जायते ॥ त्वक्चर्मपञ्चमे मासि षष्ठे रोम्णां समुद्भवः ॥ सप्तमे च तथा मासि प्रबोधश्चास्य जायते ॥ स जीवोऽपि हि माण्डूकः शीते शीतादितोभ्यसुः ॥ मूढस्तिष्ठति धर्मज्ञ षण्मासान्गर्भगस्तथा ॥ मातुराहारपीतं तु सप्तमे मास्युपाश्नुते ॥ अष्टमे नवमे मासि भृशमुद्वि जते तदा ॥ जरायुवेष्टितो देहो मूध्नि बद्धाञ्जलिः सदा ॥ मध्ये क्लीबस्तु वामे स्त्री दक्षिणे पुरुषस्तथा ॥

(श्रीविष्णुधर्मोत्तरपुराणम् 2.114.1)

The child enters the mother's womb in the form of a particle, then in the second month it turns into flesh. In the third month the organs of the baby are formed. In the fifth month, the skin of the baby is formed. In the sixth month, the development of Roman (Ruhe) takes place. The complete development of the child takes place in the seventh. In the eighth and ninth months, the development sequence of the child is complete.

Viviparous and oviparous animals -

Gestation animals - Those animals which directly give birth to the child are called Gestation animals. eg. Man,cow,goat etc.

Egg-laying animals - Those animals which lay eggs,which later develop into babies,are called egg-laying animals. eg. Chicken,bird etc.

हिरण्यगर्भः समवर्ततााग्रे भूतस्य जातः पतिरेक आसीत् ।

(ऋग्वेद 10.121.1)

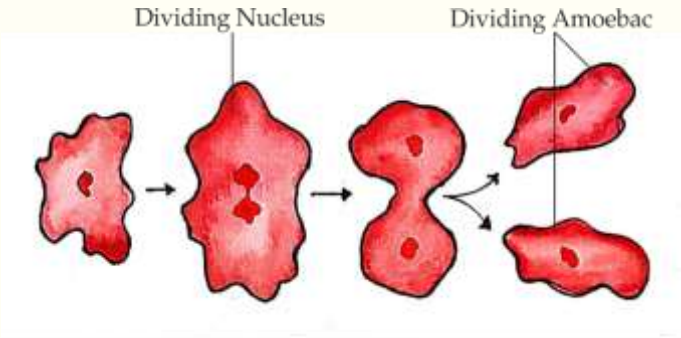
According to the Rigveda, from the beginning of the universe, first of all Hiranyagarbha (the womb like gold) was born in a bright form.

2) **Asexual reproduction -** The reproduction in which only one parent gives rise to the new organism is called asexual reproduction. Some of the methods of asexual reproduction are as follows -

i) **Budding -** Such a reproduction in which one or more buds develop in the parent to give rise to a new organism is called budding . eg. - Hydra.

ii) **Binary fission** - Such a reproduction in which an organism divides to produce two new organisms is called binary fission. eg. Binary fission in Amoeba.

Figure: Binary fission in Amoeba



Practice Work

Q. 1 Choose the correct option -

1. Which of the following is not a part of the female reproductive system?

   a) Ovaries b) Uterus

   c) Oviduct d) Spermatic cord

2. In Amoeba, reproduction takes place by the method of -

   a) Budding b) Fission

   c) Fermentation d) None of these

3. Sperm is formed in -

   a) In the testes b) In the uterus

   c) In ovary d) Any nine of these

Q. 2 Fill in the blanks -

1. The fertilization which takes place outside the body of the female is called …….
2. Reproduction in Hydra takes place by …… method.
3. The fusion of male gamete and female gamete is called …… fertilization.

Q. 3 Mark True (✓) or False (✗) against the following statements. 1. 1.

1. Cow is a gestation animal.
2. Bird is an oviparous animal.
3. Hydra reproduce by budding method.

Q. 4 Match the correct pair.

Column 'A'	Column 'B'
1. Male	a. Egg
2. Female	b. Sperm
3. Gestation	c. Hen
4. Oviparous animal	d. Goat

Q. 5 very short answer type questions -

1. How many types of reproduction are there in animals ?
2. What is the fertilization that takes place inside the female body called ?
3. What type of fertilization takes place in reproduction in fish?

Q. 6 Short Answer Type Questions -

1. Write the names of female and male genitals in humans.
2. What are the embryos called ?
3. What is called reproduction ?

Q. 7 Long answer type questions -

1. What is asexual reproduction ? Describe two methods of asexual reproduction.
2. Explain the female reproductive organ with a diagram.
3. Explain the male reproductive organ with a diagram.
4. Explain the process of fertilization in humans. How many types of fertilization are there ?

Project work

1. Draw a picture of oviparous animals and paste it on the soft board of your class.

Chapter- 9

Reaching The Age of Adolescence

In this chapter, you will read about the hormonal changes that take place in the human body due to which a child grows up to become an adult.

Adolescence and Puberty

The stage in which such changes occur in the body after the age of 10 or 12, as a result of which the development of reproductive capacity starts,it is called adolescence. Girls reach this stage one or two years earlier than boys. Adolescence ends with reproductive maturity at age 18 or 19 .

जायते, अस्ति, विपरिणमते, वर्द्धते, अपक्षीयते, विनश्यतीति षड्भावविकाराः।

(निरु. 1.2)

According to the Nirukta Granth, the Development of the body takes place in 6 forms.

Increase in length

At this time, there is an increase in the length of the bones of the hands and feet, due to which the height of the person increases. The height of a person depends on the genetic genes. Initially, girls grow faster than boys. The height of girls increases up to 18 years and the height of boys up to 20 years.

Changes in body shape –

Boys and girls go through different changes at puberty. The shoulder and chest area of boys expands and becomes wider. In girls, the lower part of the waist becomes wide. The physical muscles of boys appear stronger than that of girls.

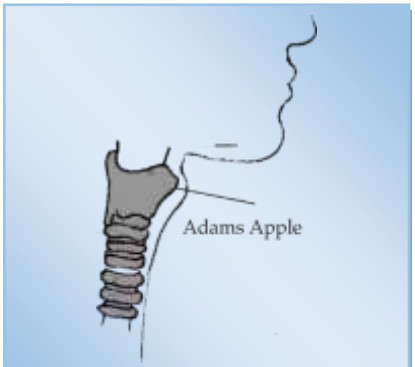


Fig : larynx

Change in tone

At the time of puberty, the voice of boys becomes heavier than that of girls. This is because the larynx of boys develops and becomes larger while the larynx of girls is smaller than that of boys.

Increase in the activity of sweat and oil glands -

At the time of puberty, hormones are secreted in excess from these glands,due to which pimples appear on the face.

Development of reproductive organs

In puberty, the female genital and male genital are fully developed.

Mental, Intellectual and Emotional maturity -

In adolescence, mental,intellectual and emotional maturity comes in a person. In this stage, the adolescent has the maximum capacity to learn and the ability to think develops and the adolescent is more conscious of himself.

स्वयं यजस्व दिवि देवान् किं ते पाकः कृणवदप्रचेताः ।

(ऋग्वेद 10.7.6)

We are the nurturer of our body. This mantra of Samveda gives the message to keep the body strong.

अमूर्या यन्ति योषितो हिरा लोहितवाससः।

(अथर्ववेद - 1.17.1)

In this mantra of Atharvaveda, it has been told that the red blood stream of women, which flows continuously due to disease, should stop when the disease is destroyed.

Secondary sex characteristics -

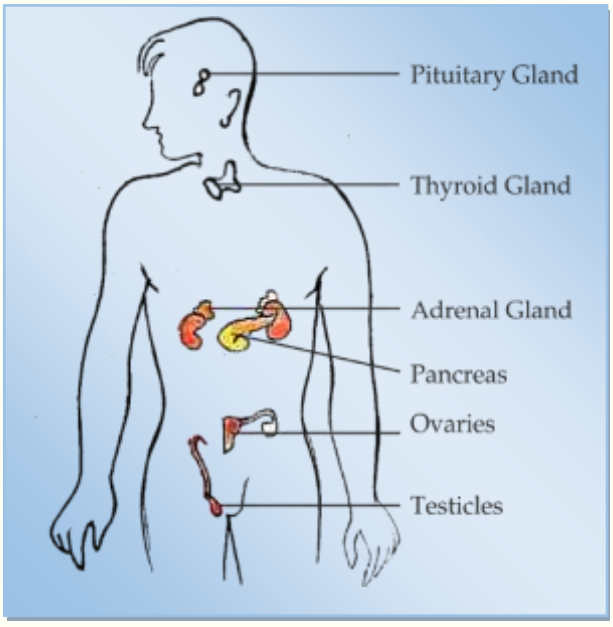
At the onset of puberty, the testes start secreting the male hormone or testosterone,which initiates changes in boys. eg. Beard and mustache

starts coming. Hair starts coming on the chest. Breasts develop due to the secretion of female hormones or estrogen in girls. These characters help in distinguishing between girls and boys. These are called secondary sex characters.

Role of hormones in initiating reproductive function

Hormone - It is a chemical substance that is secreted by endocrine glands or ductless glands in our body. It regulates and controls various biochemical activities, growth and development, reproduction etc. occurring in living beings. Endocrine glands secrete hormones into the bloodstream in our body. Hormones reach different parts of the body through the blood. Sperm is secreted by the testis and ovum is secreted by the ovary, it is a sex hormone. Sex hormones are controlled by the pituitary gland.

Hormones other than sex hormones



The pituitary gland controls and coordinates the hormones released from other glands of the body, hence it is also called the 'master gland'. It is an endocrine gland,which is connected to the brain. Thyroxine hormone is secreted by the thyroid gland among other glands. Due to its deficiency, the throat becomes bloated and bulging,which is called 'goiter' disease. Insulin hormone is secreted from the pancreatic gland. Its deficiency causes diabetes. The adrenal gland secretes the hormone adrenaline,which balances the amount of salt in the blood. In the state of anger,anxiety and excitement, it acts as a combination of tension.

Practice Work

Q. 1 Select the correct option.

1. Which of the following is a disease caused by iodine deficiency?

   a) Goiter b) Diabetes

   c) Scurvy d) Night blindness

2. At what age ,does adolescence begin?

   a) 9 b) 11 c) 13 d) 15

3. What are the changes in boys during puberty

   a) Increase in height b) Shoulders become broad

   c) Development of body muscles d) All of the above

Q. 2 Fill in the blanks.

1. ..... hormones act to control stress.
2. The pituitary gland is associated with the …… of the body.
3. Adolescence lasts till the age of …….

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Insulin hormone is secreted from the pancreatic gland.
2. Sex hormones are controlled by the pituitary gland.
3. Hormone is a chemical substance.

Q. 4 Match the correctly.

	Column 'A'	Column 'B'
1.	Thyroxine	Salt imbalance
2.	Growth Hormone	Diabetes
3.	Insulin	Goiter
4.	Adrenaline hormone	Dwarfism

Q. 5 Very short answer type questions -

1. At what age, does adolescence begin ?

2. Which gland is called the master gland ?

3. What is the name of the hormone secreted by the testes ?

Q. 6 Short Answer Type Questions -

1. What are secondary sexual characteristics ?

2. What is hormone ?

3. Write the physical changes that take place during adolescence.

Q. 7 Long answer type questions –

1. What is called an endocrine gland? Write the names of hormones secreted by endocrine glands.

Project -

1. Collect information about HIV/AIDS. Write an article on this in 15 to 20 sentences.

Chapter- 10

Force, Pressure and Friction

You certainly push or pull the windows and doors of your house to open them. In daily life we pull or push many objects from a state of rest to a state of motion. Generally pushing,pulling is called 'force'. A force is a factor that can bring about a change in an object at rest. When an object is moving on a path,the factor which is used to stop it or to accelerate its motion is called force.

Fig. : Pulling a horse by the force of a girl

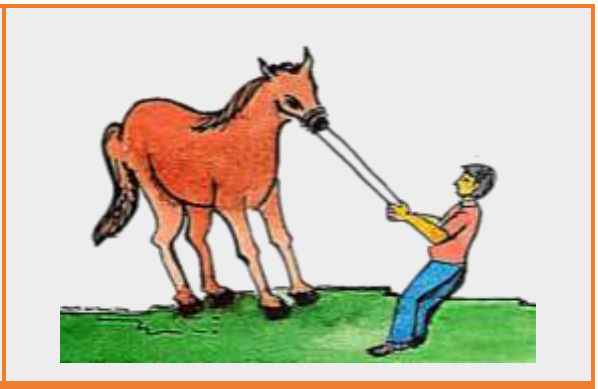


Fig. : Pulling a horse by the force of a boy

बलं तोकाय तनयाय जीवसे त्वं हि बलदा असि *(ऋग्वेद 3.53.18)*

सजोषता उषसा सूर्येण चोर्जं नो धत्तमश्विना *(ऋग्वेद 8.35.10)*

आ न इन्द्रो वाजे भज *(ऋग्वेद 1.43.8)*

In the Rigveda, prayers have been made to the gods for the attainment of strength.

तिस्रो दिवः पृथिवीस्तिस्र इन्वति त्रिभिर्व्रतैरभि नो रक्षति त्मना *(ऋग्वेद 4.53.5)*

According to Rigveda, the Sun with its rays (light) gives speed to the three worlds, (Devlok) and the three earths .

10.1 Effects of force

Different objects have different effects when a force is applied.

1) Change in the state of the object -

Can change the position of an object, that is, by applying a force, a stationary object becomes mobile.

Activity - 1

Take a pen, put it on the table and then give it a light push. What is the change in the position of the pen ? Does its position change ? Find out other such examples from your surroundings-

2) Change in the speed of the object -

When a force is applied to a moving object in the direction of motion, its speed increases.

Activity - 2

Roll a soccer ball on the ground and apply a small force with your hand on the moving ball in the direction of its motion. What is the effect on the speed of the ball ? When two forces act on an object in mutually opposite directions, the object will move in the direction of the greater force.

Activity - 3

Take a rope. Hold the ends of the rope with the help of your friend. Now pull the rope in opposite directions from each other, then tell in which direction the rope will move ?

3) Change in the direction of motion of the object -

The direction of motion of moving objects can be changed by a force.

Activity - 4

Take a cricket bat and a ball. Now ask your friend to throw the ball. If you hit the ball with the help of the bat,then what is the change in the direction of motion of the ball ?

4) Change in the size or shape of the object -

The shape or size of an object changes by applying a force.

Activity - 5

Take a rubber band and hold both the ends of the rubber band and pull it in opposite directions. Tell what was the change in the size or shape of the rubber band ?

Unit of force - The SI unit of force is the newton.

10.2 Different Types of Forces

1. Gravitational force (gravitational force) -

pulls objects towards itself is called the force of gravity. The value of Earth's gravitational force is 9.8 meters per second . eg. When we throw a ball upwards. The ball comes back to the earth after some time because the earth pulls the ball towards itself.

2. Muscular force -

To lift a heavy object,the force exerted by the muscles to push or pull the object is called muscular force.

3. Electrostatic force -

The force between electrostatic charges is called electrostatic force.

Ex.- By rubbing the comb on the hair without applying oil, a static electric charge comes in the comb. When the comb is brought near small pieces of paper, the comb attracts the pieces of paper towards itself due to electrostatic force.

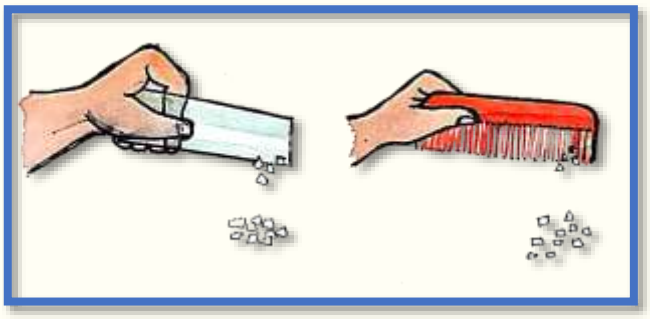


Fig. Demonstration of electrostatic force

4. Frictional force -

When an object moves on a surface,then a force is exerted on it by the surface in the opposite direction,which is called the force of friction. The force of friction always opposes the motion. Grease or oil is used to reduce friction on a rough surface as compared to a smooth surface.

5. Magnetic force -

The force of attraction or repulsion exerted by a magnet on other magnets or magnetic materials is called magnetic force. eg. When an

iron rod is brought near a magnet, the magnet will attract the iron rod towards itself.

10.3 Pressure -

The force acting perpendicular to the unit area of the surface of an object is called pressure.

$$\text{Pressure (P)} = \frac{\text{Force (F)}}{\text{Contact Area (A)}}$$

$$\text{Unit of pressure} = \frac{\text{Newton}}{\text{Meter}^2}$$

Pascal

Dependence of pressure on area -

1. If the force remains the same and the area is decreased, then the pressure increases.

Activity - 5

Take a nail with a thick end and a nail with a thin end. Apply both of them alternately on the wall with equal force with the help of hammer. Which nail will go into the wall sooner ? A nail with a thinner end will go into the wall faster because it has less surface area .

If the force remains the same and the area is increased,then the pressure decrease.

1. A camel can walk easily in the sand, while we have difficulty in walking, because the pressure on the sand is less due to the large surface area of the camel's feet.
2. The wall of the dam is made less wide than the top but wider than the bottom, so that the water pressure on the wall of the dam is less.

Air pressure

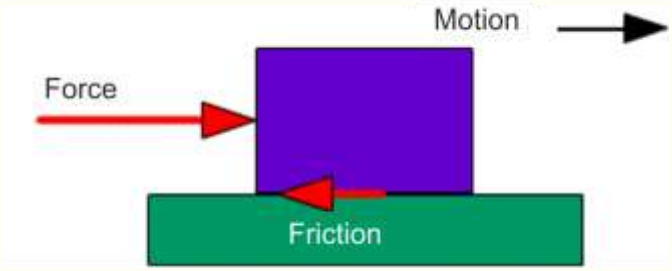
The force exerted by air on a square meter area is called air pressure. Air exerts equal pressure everywhere in all directions. Air pressure is measured with the help of a "barometer" device.

10.4 Buoyant force

When an object is partially or completely immersed in a liquid, the liquid exerts an upward force on the object, this force is called buoyant force. This force pushes the object upwards.

Frictional force -

When two bodies are in contact with each other,then there is a force of friction. The force of friction always acts in the opposite direction to the motion and opposes the motion. The force of friction can be reduced by applying oil or grease between the surfaces.



Practice Work

Q. 1 Choose the correct option -

1. Which force does the bull use to pull the bullock cart?

   a) Electrostatic force b) Magnetic force

   c) Muscular force d) Frictional force

2. On which force is the fruit breaking from the tree on the earth?

   a) Frictional force b) Gravitational force

   c) Muscular force d) Electrostatic force

3. The upward force acting on objects immersed in a liquid is -

   a) Magnetic force b) Muscular force

   c) Buoyant force d) Frictional force

Q. 2 Fill in the blanks.

1. The south pole of a magnet …… the north pole of another magnet.
2. The force exerted by the bowler to throw the ball during a cricket match is an example of ……..force.
3. To reduce friction, …… is used.

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. When a force is applied to a moving object in the direction of motion, its speed increases.
2. The act of pushing, pulling, pressing, lifting etc. on an object is called force.
3. The north pole of a magnet repels the south pole of another magnet.

Q. 4 Match the correct pair.

Column 'A'	Column 'B'
1. Gravitational force	a. Lifting an object

2.	Muscular force	b. Throwing an object upwards but back to earth
3.	Force	c. Pascal
4.	Pressure	d. Newton

Q. 5 Very short answer type questions -

1. What is the force between static electric charges called?
2. What is the pulling or pushing of an object called?
3. What is the name of the force of attraction of the earth?

Q. 6 Short Answer Type Questions -

1. What is pressure? Write the SI unit of pressure .
2. What is the reason that the wall of the dam is made less wide at the top but wider at the bottom?
3. What is the reason that it is easier to fix a nail with a pointed end in a wall than a nail with a thick end?

Q. 7 Long answer type questions -

1. State the various effects of force.

Project work

1. Explaining pressure by sponge, brick, balloon and pin and telling the dependence on area and force.

Chapter- 11

Stars and Solar System

When you look at the sky at night,you will see innumerable stars like tiny dots, some bright, some less bright. You must have also seen some other bodies like stars,which do not twinkle. All those bodies are planets,moon etc.

Stars,planets, moon and other bodies of the sky are called celestial bodies. The study of events related to celestial bodies is called astronomy.

11.1 Moon -

The moon is not illuminated by its own light like the Sun and other stars. It is illuminated by sunlight. The moon reflects the light falling on it towards us,due to which we can see the moon.

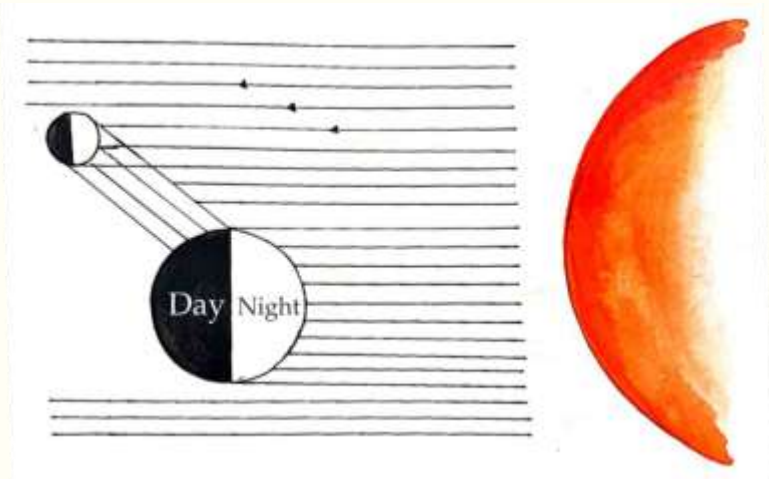


Fig.: The moon is visible due to the reflected light of the sun.

सुषुम्णः सूर्य्यरश्मिश्चन्द्रमा गन्धर्व्वस्तस्यनक्षत्राण्यप्सरसोभेकुरयोनाम।

(यजुर्वेद. 18.40)

अथाप्यस्यैको रश्मिश्चन्द्रमसं प्रति दीत्यति आदित्यतोऽस्य दीप्तिर्भवति।

(निरुक्त. 2.6)

The Sun's ray called Sushumna illuminates the moon. The moon does not have its own light.

Do you know that the moon is illuminated by the light of the sun. In this regard, this mantra of Yajurveda clarifies that out of the seven rays emanating from the Sun, only the rays named 'Sushumna' illumine the moon.

Yasak has also confirmed this in the Nirukta.

Activity 1 : With the help of your teacher, draw a picture of the changes in the shape of the moon from waning phase to full moon and from waning phase to new moon in your note book.

11.2 Stars -

Such celestial bodies, which are illuminated by their own light, are called stars. The Sun is also a star. Due to the rotation of the earth from west to east, we see the stars moving from east to west. The pole star does not appear to move because it is located in the direction of the earth's axis . On looking at the sky, the stars seem to be twinkling. The light produced by the stars reaches our eyes after refracting through different layers of the atmosphere. That's why we see the stars twinkling.

11.3 Constellation -

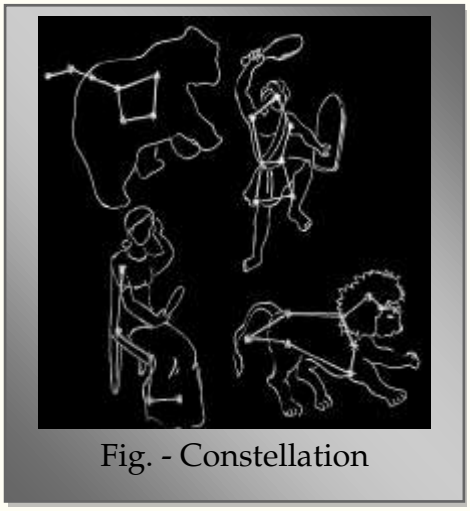


Fig. - Constellation

If you look at the night sky, you will see some groups of stars. "A group of stars is called a constellation." eg. - Saptarshi Tarandal, Orion, Cassiopeia, Leomajor etc.

The Saptarshi constellation is visible in the first half of the night in summer. It is also called "Big Dipper, Great Bear or Arsamezer".

11.4 Solar Family

The solar family is made up of a group of planets, asteroids, comets, meteors orbiting around the Sun and the Sun. Due to the force of gravity, all celestial bodies revolve around the Sun.

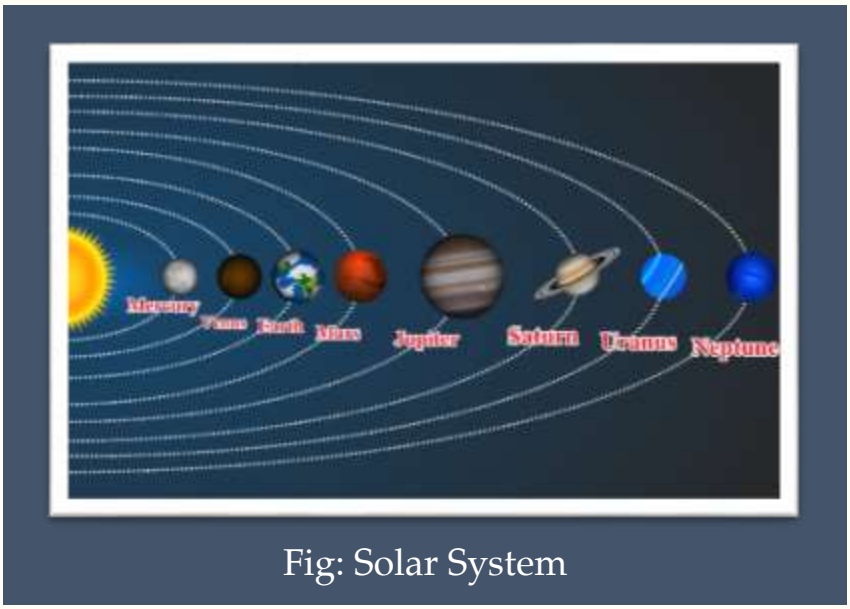


Fig: Solar System

Sun -

The Sun is the main source of energy of heat and light of all the planets. We get energy and light from the sun only. It is the nearest star to the Earth.

यमेन दतं त्रित एनमायुनगिन्द्र एणं प्रथमो अध्यतिष्ठत् ।
गन्धर्वो अस्य रशनामगृभ्णात् सूरादश्वं वसवो निरतष्ट॥

(ऋग्वेद. 1.163.2) (यजुर्वेद. 29.13)

Solar energy is mentioned in Yajurveda.

Sun, the controller of the solar system

अवर्तयत्सूर्यो न चक्रं भिनद् बलमिन्द्रो अङ्गिरस्वान् । (ऋग्वेद - 2/11/20)

Indra rotated the thunderbolt to kill the demons in the same way as the sun rotates the wheel . Here chakra means the solar system.

अहस्ता यदपदी वर्धत क्षाः शचीभिर्वेद्यानाम् ।
शुष्णं परि प्रदक्षिणिद्विश्वायवे नि शिश्नथः ॥ (ऋग्वेद – 10/22/14)

This Ksha (Earth) is moving even without arms and legs. It is orbiting around Shushna (Sun).

सविता यन्त्रैः पृथिवीमरम्णादस्कम्भने सविता द्यामदृंहत् ।

(ऋग्वेद – 10/149/1)

The Sun binds the earth with its attraction like a rope and also holds the other planets situated around it in the baseless sky firm.

तस्येमे नव कोशा विष्टम्भा नवधा हिताः । (अथर्ववेद – 13/4/10)

These nine sheaths (planets) of him have kept him in nine different ways.Rishidrishta has been mentioned in the above Veda mantras about the movement of earth and other planets and constellations around the Sun. In modern science, the reason for the planets to travel around the Sun in their respective orbits is the Sun's attractive power.

Planet -

Fig – Rotatary motion

Planets do not have their own light. They are illuminated by the light of the sun. Each planet revolves around the Sun in a certain orbit. The time taken by the planets to complete one revolution around the Sun is called 'period of revolution'. The rotation period of the planets is different. Along with orbiting the Sun, the planets also rotate on their axis. The time taken by a planet to complete one rotation is called its 'period of rotation'.

Fig. – Mercury

Satellite - The celestial bodies that revolve around the planets are called satellites. The names of the planets are as follows -

1. **Mercury -** It is the closest planet to the Sun and the smallest planet in the Solar System. It is visible two hours before

sunrise. It completes the orbit of the Sun in the shortest time.

2. **Venus** - It is the closest, brightest and hottest planet to the earth. It is called the morning and evening star because it appears in the east in the morning and in the west in the evening. It rotates on its axis in the east to west direction unlike other planets. It is also called 'Twin sister of Earth'. It is similar to the Earth in density,size and diameter. It has no satellite.

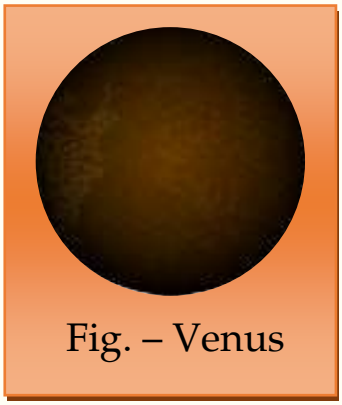


Fig. – Venus

3. **Earth** - This is the only planet in the solar system,on which there is life. Its only satellite is the Moon. It completes its revolution around the Sun in 365 days and 6 hours. It completes one revolution on its axis in 23 hours 56 minutes and 4 seconds. This speed is called the 'rotational speed' of the earth. Day and night are due to the rotation of the earth. Due to the presence of water, it is also called the 'Blue Planet'.

Fig. – Earth

आयं गौः पृश्निरक्रमीदसदन् मातरं पुरः । पितरं च प्रयन्त्स्वः ॥

(यजुर्वेद. 3.6)

The earth (cow) revolves around the sun in the form of the father while living in front of the mother in the form of space.

अहस्ता यदपदी वर्द्धत क्षाः शचीभिर्वेद्यानाम् ।
शुष्णं परि प्रदक्षिणिद् विश्वायवे नि शिश्नथः ॥ *(ऋग्वेद 10.22.14)*

The motion of the earth around the sun has been mentioned in this Rigvedic mantra. It has been told in the mantra that the earth without arms and legs is revolving around the sun.

Important facts related to earth have been revealed in Vedic Vangmay –

चक्राणासः परीणहं पृथिव्या हिरण्येन मणिना शुम्भमानाः । (ऋग्वेद 1.33.8)

In this Rigvedic mantra, the earth has been described as having a round shape.

उदस्तभ्ना नाकमृष्वं बृहन्तं दाद्यर्थं प्राचीं ककुभं पृथिव्याः । (ऋग्वेद 7.99.2)

It is mentioned in this mantra of Rigveda that the earth revolves around the sun from west to east direction, tilted on its axis.

पञ्चभमहाभूतमयस्तारा गण पंजरे महीगोलाः ।
स्वेयस्कान्तान्तः स्थो लोह इवावस्थितो वृत्तः ॥ (पञ्चसिद्धान्तिका पृष्ठ 31)

In his book Panchasiddhantika, Varahamihira has described the round earth in the form of constellations as stopped in the same way as iron stops between two big magnets.

Maharishi Vedvyas had presented the geographical map of the earth, which is mentioned in the Mahabharata.

सुदर्शनं प्रवक्ष्यामि द्वीपं तु कुरुनन्दन ।
परिमण्डलो महाराज द्वीपोऽसौ चक्रसंस्थितः ॥
यथा हि पुरुषः पश्येदादर्शे मुखमात्मनः ।
एवं सुदर्शनद्वीपो दृश्यते चन्द्रमण्डले ॥
द्विरंशे पिप्पलस्तत्र द्विरंशे च शशो महान् । (महाभारत, शांति पर्व)


Fig. – Earth Map

In this verse of Mahabharata, the earth has been touted an island called 'Sudarshan'. This island is circular like a wheel. Just as a person sees his reflection in a mirror, similarly the reflection of the Earth is seen in the Moon. On seeing the reflection of the island, it is seen in the form of Peepal (leaves) in two parts and the shape of a rabbit in two parts. If a picture is made on the basis of the above description, then a map of our earth is obtained. In the 11th century,

Ramanujacharya prepared a map of the earth based on the description given in the Mahabharata,in which the map of Europe and Asia and Africa and Australia is formed by the reverse shape of the rabbit and the continent of America is formed by two leaves of Peepal.

4. **Mars -** Due to the presence of iron oxide, it appears light red. That's why it is also called the planet of 'red color'. It has two satellites - Phobos and Deimos.


Fig. – Mars

5. **Jupiter -** This is the largest planet of the solar system. It has many satellites. Its satellite Ganymede is the largest of all satellites. It is called the planet of 'yellow color'.


Fig. -Jupiter

6. **Saturn -** This is the second largest planet of the solar system. Its largest satellite is 'Titan'. Saturn has 7 rings around its base . Due to the presence of rings, it is also called 'Beautiful Planet'. Its density is less than that of water. That is, on keeping it in water, it will float.


Fig. – Saturn

7. **Uranus -** It is the third largest planet in size. It rotates on its axis like Venus from east to west. Due to being tilted on its axis, it is also called 'recumbent planet'.

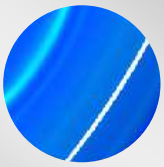


Fig. – Uranus

8. **Neptune -** It is located at the most distance from the Sun. It appears green due to the presence of methane gas. Triton is prominent among its satellites.


Fig. – Neptune

11.5 Solar Eclipse

यत्त्वा सूर्य स्वर्भानुस्तमसा विध्यदासुरः ।

अक्षेत्रविद्यथा मुग्धो भुवनान्यदीधयुः ।।

यं वै सूर्य स्वर्भानुस्तमसा विध्यदासुरः ।

अत्रयस्तमन्वविन्दन् न ह्यन्ये अशक्नुवन् ॥ *(ऋग्वेद - 5/40/5, 9)*

O Sun! When Swarbhanu Nasak Asura covered you with darkness, then this world was bewitched in the same way as a man who does not know his place is bewitched. The Sun which was covered with darkness by the Asura Swarbhanu,was obtained by the Atris. Others could not get it.

In Rigveda, in these mantras, a cloud-like cover called Swarbhanu gives the impression of a solar eclipse. Just as a solar eclipse occurs due to the shadow of a cloud called Swarbhanu, in the same way, in modern science, a solar eclipse has been said to occur due to the shadow of the moon. In the Atharvaveda there is an indication of the eclipse of the Sun by Rahu. As -

शं नो ग्रहाश्चान्द्रमसाः शमादित्यश्च राहुणा । (अथर्ववेद-19/9/10)

This theory of solar eclipse propounded by ancient sages was a great guide for modern astronomy.

Fig. : View of solar eclipse in the sky

11.6 Some other members of the solar family -

1. **Asteroids** - There are some small celestial bodies between the orbits of Mars and Jupiter, which are orbiting the Sun, they are called asteroids.

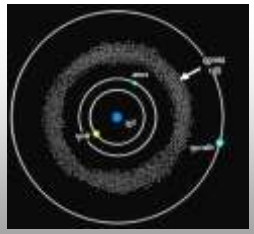


Fig. : Asteroid

2. **Comet -** It is a collection of gas and dust, which appear in the sky as a bright circle of light with a long shiny tail. A comet is visible only when it is moving towards the Sun. Sun-rays make its gas bright.

Fig. : Comet

3. **Meteors and Meteorites -** When small bodies enter the Earth's atmosphere with a very fast speed, due to atmospheric friction, they get heated up and burn up. Evaporates quickly along with the glow. As a result, we see a bright streak of light for a very short time,which is called a meteor or shooting star' (shooting star). Meteors that are large in size reach the earth before evaporating, which are called 'meteorites'.

Artificial satellite -

It is a man-made satellite,which revolves in the Earth's orbit. To maintain their balance, they also rotate on their axis. eg. Aryabhata was the first artificial satellite of India. Apart from this, other Indian satellites are Insat, IRS, Kalpana- I, EDUSAT etc.

Fig. – Some Indian satellites

Artificial satellites are used for weather forecasting,transmission of radio and television signals. They are also used for telecommunication and remote sensing.

Practice Work

Q. 1 Select the correct option.

1. Which of the following is the largest planet in the solar system?

   a) Mercury b) Saturn

   c) Jupiter d) Uranus

2. The closest planet to the Sun is –

   A) Varuna b) Mars

   c) Earth d) Mercury

3. Such celestial bodies which have their own light.

   a) Star b) Planet

   c) Satellite d) None of these

Q. 2 Fill in the blanks -

1. The number of planets in our solar system is …….
2. ..... is the satellite of the earth.
3. The red colored planet is …….

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. Artificial satellites are used in the field of telecommunication.
2. Neptune is the smallest planet in the solar system.
3. Venus is also called the twin sister of the Earth.

Q. 4 Match the correct pair.

	Column 'A'	Column 'B'
1.	The most beautiful planet of the solar system	a. Earth
2.	Blue planet	b. Saturn
3.	Constellation	c. Satellite
4.	Celestial body orbiting the planets	d. constellation

Q. 5 Very short answer type questions -

1. What is the group of stars called?
2. What are the celestial bodies that revolve around the planets called?
3. Asteroids are found between the orbits of which two planets?

Q. 6 Short Answer Type Questions -

1. Why does n't the Pole Star appear to be moving?
2. What are meteors?
3. Whatis artificial satellite? Write the names of any two Indian satellites.

Q. 7 Long answer type questions -

1. Describe the different members of the Solar System.

Project

1. Draw the picture of the solar system.

Chapter- 12

Air and Water pollution

Dear students ! You know that our land,water and air are getting polluted due to human activities, due to which we are facing new diseases every day. In this chapter, we will study in detail about air and water pollution.

Air and water are getting polluted due to continuous cutting of forests, increase in means of transport, industrialization, increase in population, waste materials of factories etc.

pollution -

Accumulation of harmful life-killing, toxic substances in the environment is called pollution. eg. Air pollution,water pollution etc.

Pollutant

Those substances which cause pollution are called pollutants . eg. - Gas,dust,smoke,plastic,waste material etc.

On the basis of nature, pollutants are divided into two categories –

1. **Non-degradable pollutants -**

These pollutants are not decomposed by micro-organisms. eg. - Plastic.

2. **Biodegradable pollutants -**

These types of pollutants are decomposed by micro-organisms. eg. Paper,wood etc.

द्रोणाहावमवतमश्मचक्रमंसत्रकोशं सिञ्चता नृपाणम् ।

(ऋग्वेद 10.101.7)

There is mention of a water source.

ताभिः सयुक् सरथं देव ईयते ऽस्य विश्वस्य भुवनस्य राजा।

(ऋग्वेद 10.168.2)

According to Rigveda, Vayu is the king of the whole world.

आत्मा देवानां भुवनस्य गर्भो यथावशं चरति देव एषः ।

(ऋग्वेद 10.168.4)

Vayu is the soul of all the gods. She is the mother of the world. So keep the air clean, don't contaminate it.

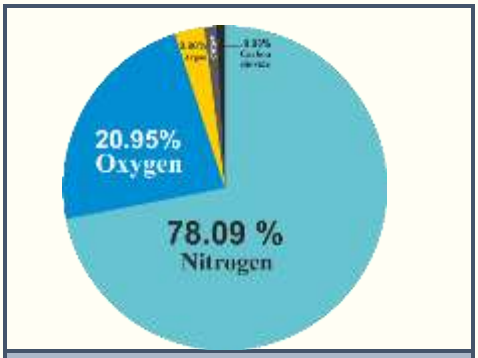


Fig. Composition of Air

Activity 1 : Tabulate the causes of air pollution and water pollution.

Sl.No.	Causes of Air Pollution	Causes of Water Pollutants
1.		
2.		
3.		
4.		

12.1 Air pollution

The accumulation of harmful pollutants like carbon dioxide,carbon monoxide,sulfur dioxide,dust, smoke etc. in the air is called air pollution.

Causes of air pollution

1. Harmful gases emanating from fuel combustion in vehicles pollute the air.
2. The smoke coming out of industries increases air pollution.
3. Chemicals used to protect crops from pests pollute the air.

4. The smoke emanating from the use of wood as a domestic fuel pollutes the air.
5. Due to deforestation, the balance of gases in the atmosphere is deteriorating,due to which the air is getting polluted.
6. The atmosphere is getting polluted due to rapid growth of population.

Fig.: Smoke coming out of the factory

Side effects of air pollutants -

1. Carbon monoxide gas present in the smoke coming out of motor vehicles is a toxic gas. It reduces the oxygen carrying capacity of the blood.
2. The smoke coming out of the factories causes burning sensation in the eyes and diseases of the throat because sulfur dioxide,nitrous oxide etc. are present in this type of smoke.
3. Sulfur dioxide gas is generated by the combustion of fuel used in power plants, which causes lung diseases.
4. Chlorofluoro carbon used in refrigerators, air conditioners, perfumes harms the ozone layer of the atmosphere. The ozone layer protects us from harmful ultraviolet rays coming from the sun.
5. The layer made of smoke and fog coming out of motor vehicles in winter causes diseases like cough, asthma , asthma etc.

12.2 Acid rain

Sulfur and carbon dioxide present in the smoke coming out of various industries, factories, power plants, motor vehicles react with rain water to form nitrous acid,nitric acid, sulfuric acid and organic acid. By making the rain acidic, it rains on the earth along with the rain,which is called acid rain. Acid rain is the reason for the yellowing of the Taj Mahal. Acid rain causes irritation to the eyes and skin.

12.3 Green Planet Effect (Plant House Effect) -

Some part of the sun rays coming from the sun is absorbed by the earth. Some part is reflected. Some part of the reflected rays stops in the atmosphere itself. These stagnant rays work to increase the temperature of the atmosphere. This effect is called green planet effect or green house effect. The continuous increase in the temperature of the atmosphere is called global warming. Carbon dioxide,methane,nitrous oxide and water vapor are responsible for this effect . These gases are called green planet gases.

12.4 Air pollution control measures -

1. Stopping deforestation and planting new plants.
2. Using CNG as fuel in vehicles .
3. Use of electric vehicles.
4. Use of ideal fuel LPG as domestic fuel .
5. Use of alternative sources of energy.

Fig. : Planting trees

12.5 Water pollution

materials coming out of factories,excreta, urine etc. in the water. This is called water pollution.

देवीरापो मातरः सूदयित्न्वो घृतवत् पयो मधुमन्नो अर्चत ।

(ऋग्वेद 10.64.9)

Rivers provide us sweet and restorative water. That's why it is mentioned not to contaminate them.

Fig. - Water Pollution

Due to water pollution

1. Water is getting polluted due to discharge of excreta,bathing of cattle,dumping of garbage, mixing of dirty water coming out of houses in water bodies like rivers, ponds,wells etc.
2. Water is getting polluted due to the mixing of waste materials coming out of factories and water sources.
3. Water is getting polluted due to mixing of fertilizers and insecticides used in crops.

Effects of water pollution -

1. Cholera, dysentery, skin diseases etc. are caused by drinking polluted water .
2. The fertilizer capacity of the land is decreasing due to mixing of polluted water in the soil.

Water pollution control measures -

1. Urine should not be discarded in water bodies.
2. The dirty water coming out of the houses should be stopped from getting into the water bodies like river, pond etc.
3. The waste materials and dirty water coming out of the factories should be prevented from mixing in the water bodies.
4. Garbage should not be thrown in water bodies.
5. Washing clothes, bathing animals etc should not be done in water sources.

Water purification

The process of making pure water by treating impure water through various physical and chemical processes is called 'water purification'.

Main methods of purifying water –

1. By boiling water.

2. By using alum, the impurities present in the water sink to the bottom and the water becomes pure.
3. Water can be purified by chlorination. The harmful bacteria present in the water are destroyed by this process.
4. Worms present in water can be destroyed by adding lime, potassium permanganate etc. to the water.

Practice Work

Q. 1 Select the correct option.

1. Which of the following is a green house gas?

   a) Oxygen b) Hydrogen

   c) Carbon dioxide d) Oxygen

2. The factor of damage in ozone layer is -

   a) Hydrogen b) Nitrogen

   c) Chlorofluorocarbons d) Oxygen

3. The reason for yellowing of Taj Mahal is -

   a) Acid rain b) Carbon monoxide gas

   c) Carbon dioxide gas d) None of these

Q. 2 Fill in the blanks -

1. Those substances which cause pollution are called …….. pollutants.
2. The ozone layer protects us from the …… rays coming from the sun.
3. ..... is a poisonous gas.

Q. 3 Mark True (✓) or False (✗) against the following statements.

1. By drinking polluted water, diseases like cholera, dysentery etc. arise.
2. Water can be purified by boiling it.
3. Air pollution can be reduced by using electric vehicles.

Q. 4 Match the correct pair.

	Column 'A'	Column 'B'
1.	Biodegradable pollutant	Plastic
2.	Non degradable pollutant	Paper
3.	Water purification	Acid rain
4.	Causes yellowing of Taj Mahal	Chlorination

Q. 5 Very short answer type questions -

1. Name any one pollutant which is not decomposed by micro-organisms.
2. What is the continuous increase in the temperature of the atmosphere called?
3. Write the names of green house gases.

Q. 6 Short answer type questions -

1. What is acid rain?
2. Write the measures to control air pollution.
3. State the main methods of water purification.

Q. 7 Long answer type questions -

1. What is air pollution? Write the causes of air pollution. Write the ill effects of air pollutants.

Project work

With the help of your Guruji, try to purify a bucket of water by different methods of water purification like boiling, using alum, chlorination.

आदर्श प्रश्नपत्र/ Model Que. Paper : III/23-24/ विज्ञान /
वेदभूषण तृतीय-वर्ष / Vedabhushan Third Year/
कक्षा 8वीं / प्रथमा - III / Class 8th / Prathama - III
वर्ष / Year 2023-24
विषय – विज्ञान/Science

पूर्णांक/M.M. – 100 समय/Time – 3 घण्टे

• सभी प्रश्न हल करना अनिवार्य हैं। • सभी प्रश्न के उत्तर पेपर में यथास्थान पर ही लिखें। • इस प्रश्न पत्र में कुल 38 प्रश्न हैं, प्रत्येक प्रश्न के सामने निर्धारित अंक दिये गये हैं। • उत्तीर्णता हेतु न्यूनतम 40% अंक निर्धारित हैं। • आदर्श प्रश्न पत्र का छात्रों को लिखित परीक्षा हेतु अभ्यास कराएँ।	• It is mandatory to attempt all the questions compulsorily. • Write down the answers at the appropriate places provided. • This question paper contains 38 questions. Marks for each question are shown on the side. • The minimum pass marks are 40%. • The model question paper should be used by the students for written examination practice.

सही विकल्प का चयन कीजिए / Choose the correct option - 10 × 2 = 20

नोट – दिए गए प्रश्नों मे आंतरिक विकल्पों (अ, ब, स, द) में से किसी एक का चयन करें –

Note – Select any one of the internal options (A, B, C, D) in the given questions -

1. निम्न में से साईलो का उपयोग किस कार्य में किया जाता है -

In which of the following silo are used -

(i) अनाज भण्डारण में / In grain storage

(ii) बीज बुआई में / In seed sowing

(iii) सिचाई में / In irrigation

(iv) कीटनाशक के रूप में / As insecticide

(अ) केवल (i) / Only (i)

(ब) (i) और (ii) / (i) and (ii)

(स) केवल (ii) / Only (ii)

(द) (i), (ii), (iii) तीनों / (i), (ii), (iii) all the three

2. निम्न में से रबी की फसल है -

Which of the following is a Rabi crop?

(i) सोयाबीन Soybean (ii) चना Gram (iii) मक्का Maize (iv) गेहूँ Wheat

(अ) केवल (ii) Only (ii) (ब) (i), (iii) और (iv) (i), (iii) and (iv)

(स) (i) और (iv) (i) and (iv) (द) केवल (iv) Only (iv)

3. जीवाणु द्वारा होने वाले रोग है -

Diseases caused by bacteria are -

(i) टायफाइड Typhoid (ii) टी.बी. T.B. (iii) मलेरिया Malaria (iv) अतिसार Diarrhea

(अ) केवल (iii) Only (iii) (ब) (i) और (ii) (i) and (ii)

(स) (i), (ii) और (iii) (i), (ii) and (iii) (द) (i), (ii) और (iv) (i), (ii) and (iv)

4. **लोहञ्च मे सीसञ्च मे त्रपु च मे यज्ञेन कल्प्पन्ताम्।** (यजुर्वेद 18.13)

उपर्युक्त वेद मन्त्र में किन धातुओं का उल्लेख है –

Which metals are mentioned in the above Veda Mantra –

(i) तांबा Copper (ii) लोहा Iron (iii) सीसा Lead (iv) सोना Gold

(अ) केवल (ii) Only (ii) (ब) केवल (iv) Only (iv)

(स) (ii) और (iii) (ii) and (iii) (द) (i) और (ii) (i) and (ii)

5. अम्लों के साथ धातु की अभिक्रिया से कौन सी गैस मुक्त होती है-

Which gas is liberated by the reaction of metals with acids-

(i) नाइट्रोजन Nitrogen (ii) क्लोरीन Chlorine (iii) हाइड्रोजन Hydrogen (iv) फ्लोरीन Fluorine

(अ) (i) और (ii)
(i) and (ii)

(ब) केवल (iii)
Only (iii)

(स) केवल (ii)
Only (ii)

(द) (ii) और (iii)
(ii) and (iii)

6. निम्न में से कोयले के उत्पाद है –

Which of the following is a product of coal –

(i) कोक
Coke

(ii) कोलतार
Bitumen

(iii) LPG
LPG

(iv) कोयला गैस
Coal gas

(अ) केवल (iii)
Only (iii)

(ब) केवल (iv)
Only (iv)

(स) (i), (ii), (iii) तीनों
(i), (ii), (iii) all the three

(द) (i), (ii) और (iv)
(i), (ii) and (iv)

7. निम्न में से ठोस ईधन है -

Which of the following is a solid fuel?

(i) लकड़ी
Wood

(ii) डीजल
Diesel

(iii) पेट्रोल
Petrol

(iv) CNG
CNG

(अ) केवल (i)
Only (i)

(ब) केवल (ii)
Only (ii)

(स) (i) और (ii)
(i) and (ii)

(द) केवल (iii)
Only (iii)

8. **धातः श्रेष्ठेन रूपेणास्या नार्या गवीन्योः।**
पुमांसं पुत्रमा धेहि दशमे मासि सूतवे॥ (अथर्ववेद - 5.25.10)

उपर्युक्त वेद मन्त्र में गर्भावस्था के किस माह में शिशु के जन्म का उल्लेख है –

In which month of pregnancy is the birth of a child mentioned in the above Veda Mantra?

(i) 6
(ii) 8
(iii) 10
(iv) 9

(अ) केवल (i)
(ब) केवल (ii)

Only (i) Only (ii)

(स) केवल (iv) (द) केवल (iii)

Only (iv) Only (iii)

9. कथन (A) – वह निषेचन जिसमें नर एवं मादा युग्मक का संलयन, मादा के शरीर अन्दर होता है, आन्तरिक निषेचन कहलाता है।

Assertion (A) – The fertilization in which the fusion of male and female gametes takes place inside the body of the female is called internal fertilization.

कथन (R) – मनुष्यों में आंतरिक निषेचन होता है ।

Reason (R) – Internal fertilization takes place in humans.

(अ) A एवं R दोनों सही है । R, A की सही व्याख्या करता है ।

Both A and R are correct. R is the correct explanation of A.

(ब) A एवं R दोनों सही है । R, A की सही व्याख्या नही करता है ।

Both A and R are correct. R does not explain A correctly.

(स) A सही है परन्तु R गलत है ।

A is correct but R is incorrect.

(द) A गलत है परन्तु R सही है ।

A is wrong but R is correct.

10. कथन (A) - 10 या 12 वर्ष की आयु के बाद शरीर में ऐसे परिवर्तन होते हैं जिसके फलस्वरूप जनन क्षमता का विकास होने लगता है

Assertion (A) - After the age of 10 or 12 years such changes take place in the body as a result of which the development of reproductive capacity starts.

कथन (R) - मानव शरीर मे होने वाले हार्मोन परिवर्तन के फलस्वरूप जनन क्षमता का विकास होता है ।

Reason (R) – Hormonal changes in the human body result in the development of fertility.

(अ) A एवं R दोनों सही है । R, A की सही व्याख्या करता है ।

Both A and R are correct. R is the correct explanation of A.

(ब) A एवं R दोनों सही है । R, A की सही व्याख्या नही करता है ।

Both A and R are correct. R does not explain A correctly.

(स) A सही है परन्तु R गलत है ।

A is correct but R is incorrect.

(द) A गलत है परन्तु R सही है ।

A is wrong but R is correct.

रिक्त स्थानों की पूर्ति कीजिए / Fill in the blanks – $5 \times 1 = 5$

11. काजीरङ्गा राष्ट्रीय उद्यान ..... राज्य मे स्थित है।

Kaziranga National Park is situated in the state of .....

12. लाल रङ्ग का ..... ग्रह है ।

The red colored planet is .....

13. वे पदार्थ जो प्रदूषण फ़ैलाते हैं ..... कहलाते हैं।

The substances which cause pollution are called .....

14. खरीफ़ की फ़सल ..... ऋतु में उगाई जाती हैं।

Kharif crops are grown in the ..... season.

15. मिट्टी की उर्वरता में वृद्धि करने वाला जीवाणु ..... है।

The bacterium which increases the fertility of the soil is .....

16. निम्नलिखित युग्मों पर विचार कीजिए – $5 \times 0.5 = 2.5$

Consider the following pairs –

	स्तम्भ क Column A		स्तम्भ ख Column B
(i)	चमकदार अधातु Shiny non-metal	(अ)	पीतल Brass
(ii)	मुलायम धातु Soft metal	(ब)	सोना Gold
(iii)	ग्रेफ़ाइट Graphite	(स)	आयोडीन Iodine

(iv) नोबल धातु
Noble metal

(v) मिश्र धातु
Alloy

(द) सोडियम
Sodium

(य) विद्युत सुचालक
Electrical conductor

(र) पोटेशियम
Potassium

उपर्युक्त युग्मों के आधार पर सही विकल्प का चयन कीजिए –

Select the correct option based on the above pairs –

(A) (i) (स), (ii) (द), (iii) (य), (iv) (ब), (v) (अ)

(B) (i) (ब), (ii) (र), (iii) (य), (iv) (अ), (v) (स)

(C) (i) (ब), (ii) (स), (iii) (द), (iv) (य), (v) (र)

(D) (i) (द), (ii) (स), (iii) (ब), (iv) (अ), (v) (र)

17. निम्नलिखित युग्मों पर विचार कीजिए – 5 x 0.5 = 2.5

Consider the following pairs –

स्तम्भ क Column A		स्तम्भ ख Column B	
(i)	अक्षय प्राकृतिक संसाधन Renewable natural resource	(अ)	कोयला Coal
(ii)	समाप्त होने वाला प्राकृतिक संसाधन Exhaustible natural resource	(ब)	सूर्य का प्रकाश Sunlight
(iii)	कोक Coke	(स)	सड़क निर्माण में In road construction
(iv)	कोलतार Bitumen	(द)	धातु निष्कर्षण Metal extraction
(v)	प्रोटोजोआ Protozoa	(य)	मोमबत्ती Candle
		(र)	अमीबा Amoeba

उपर्युक्त युग्मों के आधार पर सही विकल्प का चयन कीजिए –

Select the correct option based on the above pairs –

(A) (i) (द), (ii) (स), (iii) (ब), (iv) (अ), (v) (र)

(B) (i) (ब), (ii) (अ), (iii) (द), (iv) (स), (v) (र)

(C) (i) (स), (ii) (अ), (iii) (र), (iv) (य), (v) (द)

(D) (i) (ब), (ii) (अ), (iii) (र), (iv) (स), (v) (य)

18. निम्नलिखित कथनों पर विचार कीजिए – 5 x 0.5 = 2.5

Consider the following statements –

(i) सोयाबीन रबी की फ़सल हैं।

Soybean is a rabi crop.

(ii) तरबूज खरीफ़ की फ़सल है।

Watermelon is a Kharif crop.

(iii) गाय, जरायुज जन्तु है।

Cow is a geriatric animal.

(iv) हार्मोन एक रासायनिक पदार्थ है।

Hormone is a chemical substance.

(v) घर्षण कम करने के लिए ग्रीस का उपयोग किया जाता है।

Grease is used to reduce friction.

उपर्युक्त (i से v तक) कथनों में से कौन – से सही है ?

Which of the statements given above (i to v) are correct?

(A) i और iii
i and iii

(B) i, ii, iv
i, ii, iv

(C) i और v
i and v

(D) iii, iv, v
iii, iv, v

19. निम्नलिखित कथनों पर विचार कीजिए – 5 x 0.5 = 2.5

Consider the following statements –

(i) सोडियम बेन्जोएट का उपयोग खाद्य पदार्थों के परिरक्षण में किया जाता है।

Sodium benzoate is used in the preservation of food items.

(ii) सोना उत्कृष्ट धातु है।

Gold is noble metal.

(iii) प्राकृतिक गैस जीवाष्म ईंधन नहीं हैं।

Natural gas is not a fossil fuel.

(iv) प्रत्येक पदार्थ का ज्वलन ताप समान होता है।

The ignition temperature of all substances is the same.

(v) भारतीय गिलहरी विशेष क्षेत्री प्रजाति का उदाहरण है।

Indian squirrel is an example of endemic species.

उपर्युक्त (i से v तक) कथनों में से कौन – से सही है ?

Which of the statements given above (i to v) are correct?

(A) i और iii
i and iii

(B) i, ii, v
i, ii, v

(C) ii और iv
ii and iv

(D) i, iii, iv
i, iii, iv

अति लघूत्तरीय प्रश्न (पूर्ण पक्ति में उत्तर लिखना है) 5 x 2 = 10

Very Short Answer Type Questions (Answer to be written in full line)

20. तारों के समूह को क्या कहते हैं ?

What is a group of stars called?

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21. किसी वस्तु को खीचना या धक्का देना क्या कहलाता है ?

What is the pulling or pushing of an object called?

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22. वृषण द्वारा स्त्रावित होने वाले हार्मोन का क्या नाम है ?

What is the name of the hormone secreted by the testes?

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23. कोशिका का रसोई घर किसे कहते हैं ?

What is called the kitchen of the cell?

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24. घरों में भोजन बनाने में प्रयुक्त द्रव ईंधन का क्या नाम है ?

What is the name of the liquid fuel used for cooking food in homes?

लघूत्तरीय प्रश्न 5 x 3 = 15

Short Answer Type Questions

25. खरीफ़, रबी एवं जायद की फ़सल का एक एक उदाहरण दीजिए। फसलों (अन्न) से सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

Give one example each of Kharif, Rabi and Zayed crops. Write Veda Mantra or Shloka related to crops (food).

मन्त्र या श्लोक/ Mantra or Shloka

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26. सूक्ष्मजीवों के औषधीय उपयोग बताइए। सूक्ष्मजीवों सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

Mention the medicinal uses of microorganisms. Write the Vedic mantra or shloka related to microorganisms.

मन्त्र या श्लोक/ Mantra or Shloka

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27. ध्वनि किसे कहते हैं ? उदाहरण दीजिए । ध्वनि से सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

What is sound? Give examples. Write Veda mantra or shloka related to sound.

मन्त्र या श्लोक/ Mantra or Shloka

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28. ईंधन का ऊष्मीय मान किसे कहते है ?

What is the calorific value of fuel?

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29. संक्षिप्त टिप्पणी लिखिए -

Write short note on –

(1) कोशिका भित्ती Cell wall (2) प्लेस्टिड (लवण) Plastid

विवरणात्मक प्रश्न Descriptive Questions 5 x 4 = 20

30. वायु प्रदुषण क्या है ? वायु प्रदुषण के कारण लिखिए । इसका दुष्प्रभाव लिखिए ।

What is air pollution? Write the causes of air pollution. Write its side effects.

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31. सौर परिवार के विभिन्न सदस्यों के बारे मे बताइए। सौरमण्डल से सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

Mention the different members of the solar family. Write Veda mantra or shloka related to solar system.

मन्त्र या श्लोक/ Mantra or Shloka

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32. बल के विभिन्न प्रभाव बताइए। बल से सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

State the different effects of force. Write Veda Mantra or Shloka related to force.

मन्त्र या श्लोक/ Mantra or Shloka

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33. अन्तः स्रावी ग्रन्थि किसे कहते है? अन्तः स्रावी ग्रन्थियों से स्रावित होने वाले हार्मोंन के नाम लिखिए।

What is called endocrine gland? Write the names of hormones secreted by endocrine glands.

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34. मादा जनन अङ्ग को सचित्र समझाइए ।

Explain the female reproductive organ with a diagram.

चित्र/Diagram

व्याख्या/Explanation

दीर्घ उत्तरीय प्रश्न 4 x 5 = 20

Long Answer Type Questions

35. ज्वाला क्या है? मोमबत्ती की ज्वाला का चित्र बनाइए ।

What is flame ? Draw a picture of a candle flame.

चित्र/Diagram

व्याख्या/Explanation

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36. धातुओं एवं अधातुओं के भौतिक गुण लिखिए । धातुओं से सम्बद्ध वेद मन्त्र या श्लोक लिखिए।

Write the physical properties of metals and non-metals. Write Veda Mantra or Shloka related to metals.

मन्त्र या श्लोक/ Mantra or Shloka

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37. नाइट्रोजन चक्र को सचित्र समझाइए।

Explain the nitrogen cycle with a diagram.

चित्र/Diagram

व्याख्या/Explanation

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38. खाद्य विषाक्तन क्या है ? खाद्य पदार्थों को विषाक्त होने से बचाने के उपाय लिखिए।

What is food poisoning? Write the measures to prevent food poisoning.

Rashtriya Adarsh Veda Vidyalaya Run and Proposed by
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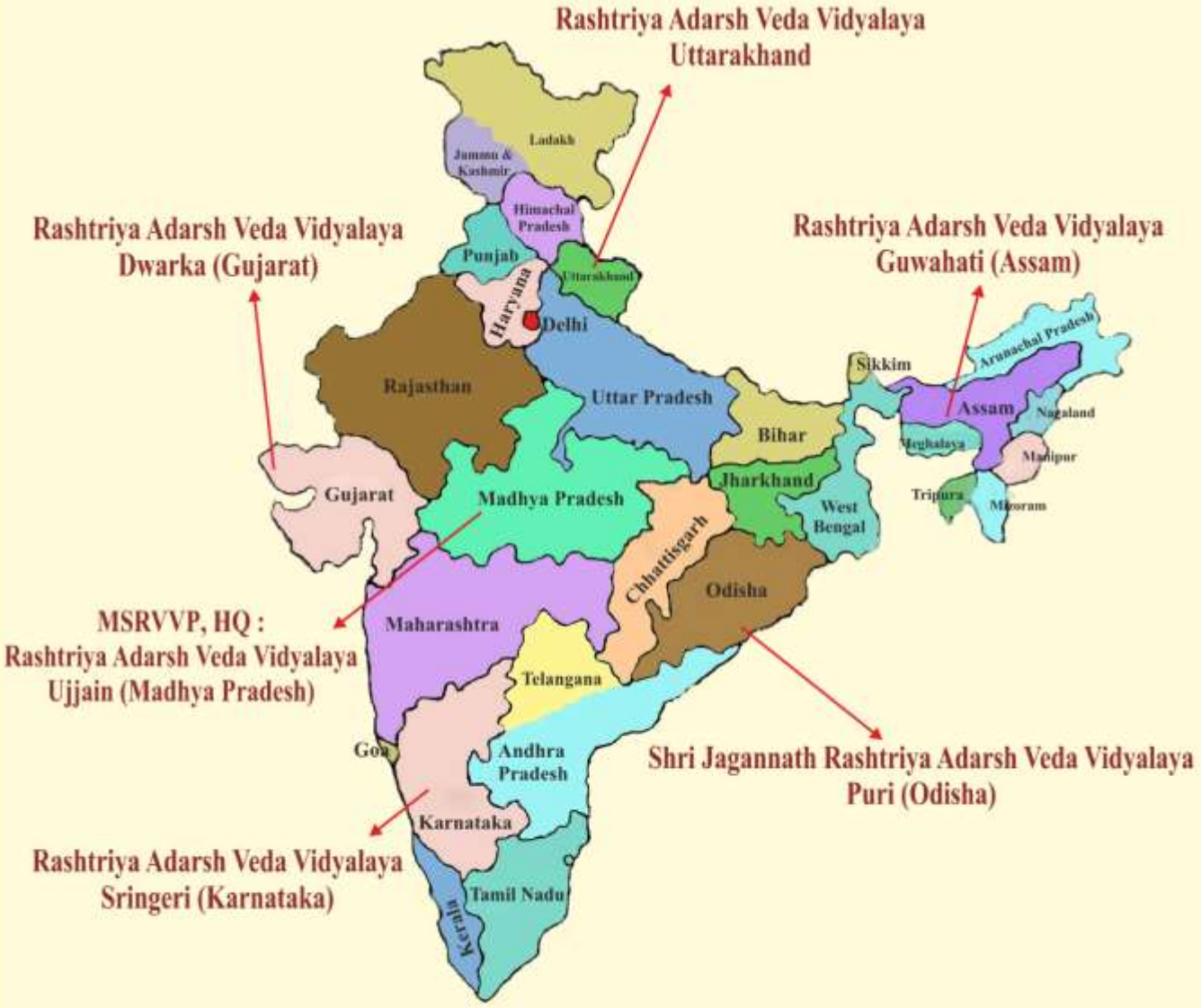
(Ministry of Education, Government of India)



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