



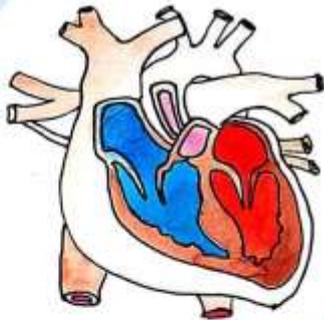
SCIENCE TEXTBOOK

Veda Bhushan II Year / Prathama - II Year / Class VII

MAHARSHI SANDIPANI RASHTRIYA VEDA SANSKRIT SHIKSHA BOARD

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

अधुक्षत् पिप्युषीमिषम् मुर्जे । सूर्यं सप्तपदीमरिः रश्मिभिः ॥
अग्निर्मूर्धा दिवः ककुत् पतिः पृथिव्या अयम् । अपां रेतासि जिन्वति ॥
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लोहकं षड्विधं तच्च यथापूर्वं तदक्षयम् ॥
तद्वित्तं सौदामिनी विद्युत् चञ्चला चपला अपि ।
शतस्य धमनीनां सहस्रस्य हिराणाम् ।
अविन्दन् दशतमप्वरुन्तः ।



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Text book developed by :

Cover and decoration :

Drawing :

Technical Support :

Composed by :

Reviewers :

©Maharshi Sandipani Rashtriya Vedavidya Pratishtan, Ujjain ISBN :

Price :

Edition : 1st Edition.

Published Copies :

Paper usage : Printed on 80 GSM paper with RSTB Watermark

Publisher : Maharshi Sandipani Rashtriya Vedavidya
Pratishtan (Under the Ministry of
Education, Govt. of India) Vedavidya Marg,
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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. Gopaldaswamy, 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 Bhashya etc), 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 MSRVP, 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, 101 in 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 Aparā-Vidya*. The materialistic knowledge from the Vedas, their auxiliary branches and subjects of material interest were called *Aparā-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 MSRVP 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
Secretary

Maharshi Sandipani Rashtriya Veda Vidya Pratishthan, Ujjain
Maharshi Sandipani Rashtriya Veda Sanskrit Shiksha Board, Ujjain

FOREWORD

The presented textbook of Science for Class 7th in Class Vedbhusan II/Prathama-II/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.

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Chapter - 1

Nutrition in Plants and Animals

All living beings require energy to function, this energy is received by living beings from food. Plants (plant) manufacture their own food but other animals including human, unable to prepare their own food (food material). They depend on plants or, organisms that feed on plants for their food.

Modes of Nutrition in plants -

Nutrition is the process of taking food by an organism and its utilization by the body. There are two types of nutrition –

1) **Autotrophic Nutrition** – It is the mode of nutrition, in which organisms make their own food, is called autotrophic nutrition. All green plants get food from this type of nutrition.

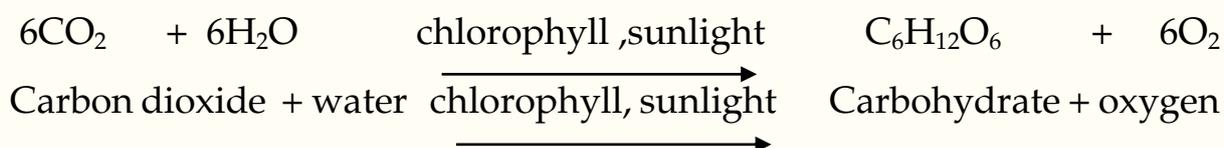
2) **Heterotrophic Nutrition** – It is the mode of nutrition in which those organisms cannot prepare their own food, they depend on plants or animals for their food. This mode of nutrition is called heterotrophic nutrition. For example – Human, animal, amoeba, fungus etc.

Photosynthesis -

Process of food synthesis in plants -

Green plants absorb water and mineral salts from the soil through the stem in the presence of sunlight and carbon dioxide gas enters through the microscopic pores present on the surface of the leaf. Green pigment (chlorophyll) is found in the leaves, which is necessary for this action.

Photosynthesis is the process in which chlorophyll containing cells of leaves in the presence of sunlight, use carbon dioxide and water to synthesis carbohydrates.



During the process oxygen is released, carbohydrates are ultimately get converted into starch. The presence of starch in leaves indicates the occurrence of photosynthesis .

अधुक्षत् पिप्युषीमिषम्मुर्जं सप्तपदीमरिः । सूर्यस्य सप्त रश्मिभिः ॥

(ऋग्वेद - 8.72.16)

तमू अकृण्वन् त्रेधा भुवे कं स ओषधीः पचति विश्वरूपाः । (ऋग्वेद - 10.88.10)

अग्नेणीरसि स्वावेश ऽ उन्नेतृणामेतस्य वित्तादधि त्वा स्थास्यति देवस्त्वा सविता
मध्वानक्तु सुपिप्पलाभ्यस्त्वौषधीभ्यः । (यजुर्वेद - 6.2)

The rays of the sun indicate the process of photosynthesis. Plants receive powerful energy from the rays of the seven colors of the sun.

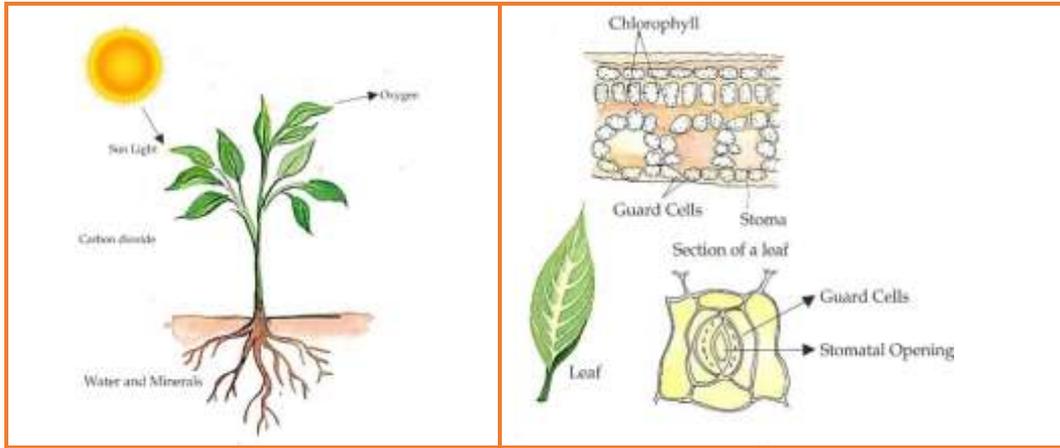


Figure 1.1 – Section of a leaf showing chlorophyll-containing cells.

Synthesis of plant food other than carbohydrate -

Nitrogen gas is required for the growth of plants, Nitrogen is found in abundance in the gaseous form in the air. However plants cannot absorb it in this form. Soil has certain bacteria that convert gaseous nitrogen into useful compounds and release it into the soil. These soluble substances are absorbed by the plants along with water.



Fig. 1.2 – Cuscuta (Amarbel)

Other Modes of Nutrition in Plants -

There are some plants in which do not have chlorophyll. They cannot synthesis their own food. Like humans and other animals, such plants also depend on the food produced by other plants for their nutrition. They use the heterotrophic system. In the picture is the plant of Cuscuta (Amarbel), on which it is climbing. The plant on which it climbs is called a host and Cuscuta is called parasite.

The pitcher plants also use the heterotrophic system. Its pitcher-like structure is actually a modified part of its leaf. The apex of the leaf forms a lid of the pitcher. There are many hairs inside the pitcher, which are facing downwards, that is, they are downward facing. When an insect enters through the pitcher, it gets trapped between its hairs. The Insect is digested by the digestive juices secreted in the pitcher. Such insect-eating plants are called insectivorous plants.

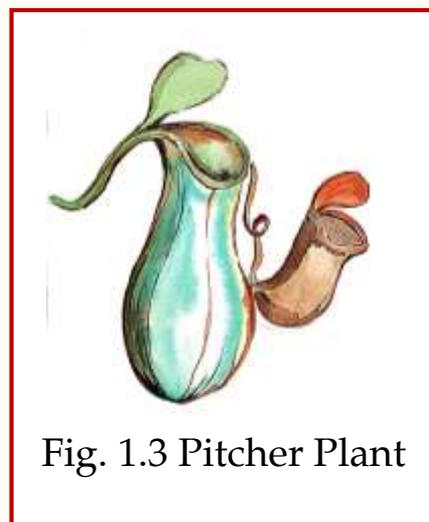


Fig. 1.3 Pitcher Plant

Activity 1 - Soak a roti in water and keep it in a moist and warm place for 2-3 days. After 2-3 days, a hair-like structure appears on the surface of the roti. What is this roan like structure? This hair-like speckled structure is called Fungus or Fungi.

Saprophytes - These organisms are called fungi. They have a different mode of nutrition. They secrete some digestive juices on the surface of dead and decaying (rotting) matters (organic matter) which convert them into solution. Then they absorb this solution in the form of food (nutrients). Plants using this mode of nutrition are called saprophytes.

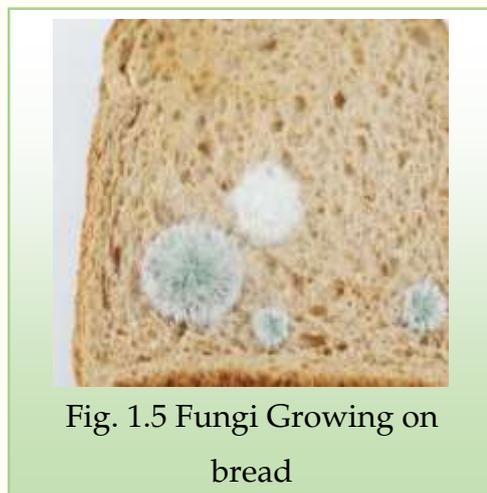


Fig. 1.5 Fungi Growing on bread

Fungi also grow on pickles, leather, clothes and other materials. The rainy season provides the best conditions for the growth of fungi. For this reason, many things get destroyed or unusable during the rainy season due to the growth of fungi.

अवकोल्बा उदकात्मान ओषधयः । व्यूषन्तु दुरितं तीक्ष्णशृङ्गयः ॥

(अथर्ववेद - 8.7.9)

According to Atharvaveda some plants like algae, are produced in moss.

Symbiotic Relationship - Some organisms live together and share their habitat and nutrients with each other. This is called symbiotic relationship.

Algae have chlorophyll, while fungi do not have chlorophyll. The fungus provides habitat, water and nutrients to the algae and, in return, the alga provides food synthesized by photosynthesis.

कच्चित्तुलसि कल्याणि गोविन्दचरणप्रिये ।

सह त्वालिकुलैर्बिभ्रद् दृष्टस्तेऽतिप्रियोऽच्युतः ॥

(श्रीमद्भागवत दशमः स्कन्धः अथ त्रिंशोऽध्यायः 07)

In this verse of Shrimad Bhagwat, there is a hint towards the symbiotic relationship between Basil (Tulsi) and Bumblebee. Bumblebees get basil (Tulsi) pollen as food and the process of pollination in basil is completed by bumblebees.

Nutrition in animals - Nutrition of animals includes the requirement of nutrients, the method of ingestion of food (food intake) and the method of its utilization in the body. You have learned in the first year (class-6) that there are many components of food.

Remember and write their names -

1.
2.
3.
4.
5.

Some components like carbohydrates are complex substances. Many animals cannot use these complex substances directly in this form. Therefore, it is necessary to convert them into simpler substances.

The breaking down or conversion of complex food into simpler substances is called decomposition. And this process is called digestion.

Digestion in humans -

The whole process of digestion of food passes through five stages.

1. Ingestion
2. Digestion
3. Absorption
4. Assimilation
5. Excretion

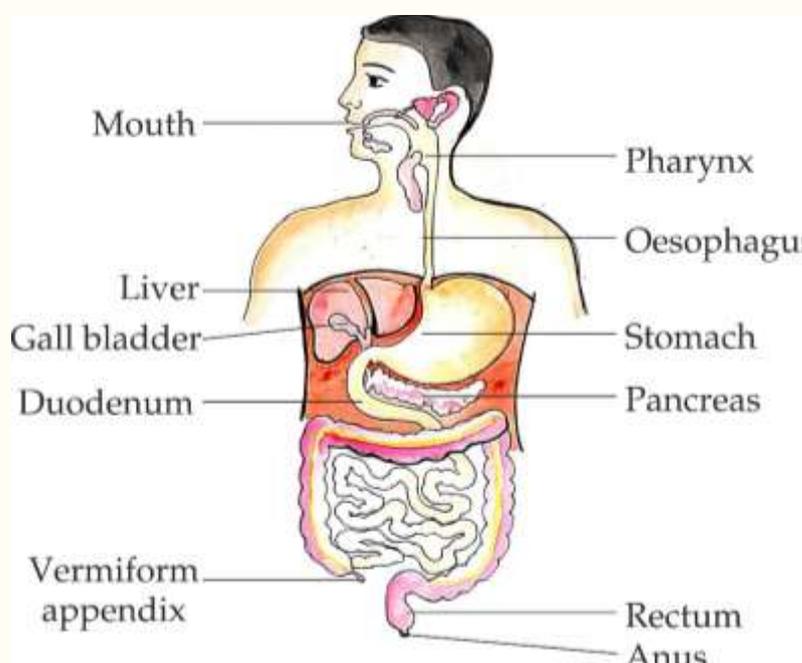


Fig . 1.5 - Human digestive system

Ingestion – Intake of food in the mouth is called ingestion.

Digestion - Digestion of food in humans starts from the mouth and continues till the small intestine. Food is chewed with the help of teeth located in the mouth, due to which the food is divided into small pieces. Saliva is secreted from the salivary glands located in the mouth, which converts the starch in the food into sugar (glucose). The enzymes present in saliva destroy the harmful bacteria present in the food.

Digestion in the stomach - Food reaches the stomach through the oesophagus. Stomach is a sac-like structure with thick wall, it is flat and

U-shaped. Food stays in the stomach for about four hours. Gastric juice (digestive juice) and hydrochloric acid emerge from the pyloric glands of the stomach. Digestive juice (gastric juice) decomposes proteins into simpler substances and hydrochloric acid destroys the bacteria that came with the food and makes the food acidic, which helps in the action of digestive juices. .

Digestion in the small intestine - The small intestine is a highly coiled tube about 7.5 meters long. As soon as the food reaches the stomach, first of all bile juice coming out of the liver comes in it. Bile juice is alkaline and it turns food from acidic to alkaline. Bile juice plays an important role in the digestion of fats. Liver is the largest gland of the body which is present in the upper part of the abdomen.

Here pancreatic juice comes from the pancreas and is mixed in the food. Pancreas is a large gland of light yellow color which is located just below the stomach. Pancreatic juice converts carbohydrates and proteins into simpler forms.

Absorption in the small intestine – The digested food is absorbed and moves into the blood vessels located in the wall of the small intestine. This process is called absorption.

Assimilation – Absorbed substances are transported by blood vessels to different parts of the body, where they are used to form complex substances. This process is called assimilation.

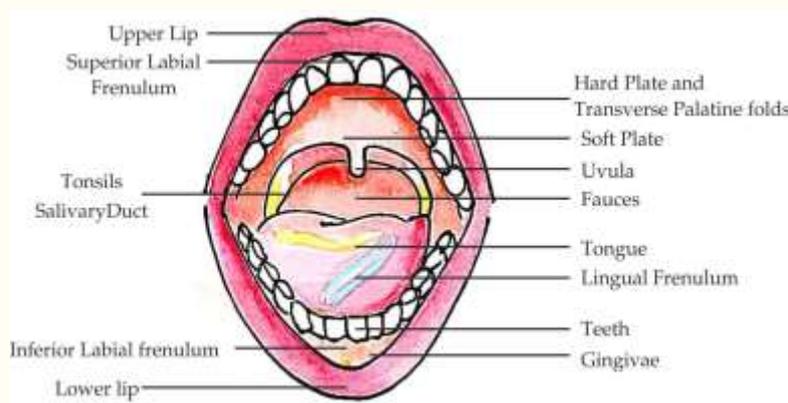


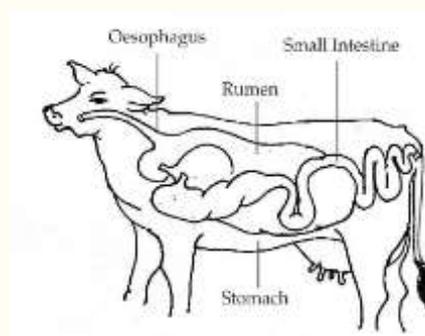
Fig. 1.6 – Mouth and oral cavity

Digestion in the colon - The colon is wider and shorter than the small intestine. It is about 1.5 meters long. Its main function is to absorb water and some salts. The remaining undigested material passes into the rectum and the semi-solid material remains as feces. Stool (feces) is expelled from time to time through the anus. This is called excretion.

Digestion in herbivores -

Cows, buffaloes and grass-eating herbivorous animals continue to chew their cud even at that time. When they are not eating. In fact, they first swallow the grass quickly and store it in a part of the stomach. This part is called rumen (first stomach). In ruminants, the stomach is divided into four compartments or chamber. Partial digestion of food takes place in the rumen which is called chewing. But later the animal brings it back to the mouth in the form of a small lumps. This process is called rumination and such animals are called ruminants.

Grass is rich in cellulose, which is a type of carbohydrate. Many animals and humans cannot digest cellulose. In ruminants, there is a sac-like large structure between the small intestine and the large intestine, which is called the oesophagus. The cellulose of the food is digested here by some bacteria which are absent in the alimentary canal of man.



Activity 2 - Prepare a table on the basis of food and method of food consumed by the animals around you.

S.No.	Animal Name	Type of Diet	Diet Plan
1.	Mosquito	Human blood	Suction
2.	Cow	Grass	Chew
3.			
4.			
5.			

Practice Work

Q.1. Select the correct option -

1. Cuscuta (Amarbel) is an example of a -
(a) Autotrophic (b) Parasitic
(c) Saprophyte (d) Heterotopic
2. The name of the plant which prepares its diet by catching insects is
(a) Cuscuta (Amarbel) (b) Hibiscus
(c) Ghataparni (Pitcher plant) (d) Rose
3. The part by which mainly plants obtain carbon dioxide from the atmosphere is
(a) Root (b) Stem
(c) Flowers (d) Leaves
4. The organ in which mainly absorption of digested food takes place is -
(a) Stomach (b) Small intestine
(c) Large intestine (d) Mouth
5. The organ through which water is mainly absorbed is -
(a) Stomach (b) Oesophagus
(c) Small intestine (d) Large intestine

Q.2. Fill in the blanks -

1. Because green plants prepare their own food, they are called
2. The pigment by which solar energy is stored in the process of photosynthesis is called
3. In photosynthesis, plants take from the atmosphere and produce.....

4. The name of the largest gland of the human body is
5. In the stomach, there is a discharge of hydrochloric acid andwhich act on the food.

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

1. There is a symbiotic relationship between algae and fungi.
2. The conversion of complex foods into simple foods is called fragmentation.
3. Oxygen gas is produced in the process of photosynthesis.

Q.4 Match the correct pair.

- | Column 'A' | Column 'B' |
|---------------|----------------------|
| 1. Autotrophs | a. Fungi |
| 2. Host | b. Cuscuta (Amarbel) |
| 3. Parasite | c. Green plants |
| 4. Dead body | d. Human |

Q.5. Very short answer type questions

1. In how many stages the whole process of digestion of food is completed in humans.

Q.6. Short Answer Type Questions

1. Why do living beings need food?
2. Explain the difference between parasite and saprophyte?
3. What is the action of ingestion?

Q.7. Long Answer Type Questions

1. Briefly describe the process of food synthesis in green plants.
2. Where is bile produced? It helps in digestion of which component of food?
3. Draw a labelled diagram of the human digestive system?

Project Work -

1. Prepare a chart of the digestive system and paste it in the class room.
2. Meet a doctor and collect information about the following -
 - (a) In which situation a patient needs to drip glucose?
 - (b) When is glucose given to the patient?
 - (c) What is the contribution of glucose in the improvement of the patient's condition?
3. List the functions of the organs of the digestive system.
4. Make a list of ruminants.



Chapter - 2

Temperature and Heat

We come in contact with many things every day, many of these things are hot and some are cold. The following table lists the commonly used items. Add some more names to this list. Mark these objects as hot or cold.



Item	Cold / Cool	Lukewarm / Hot
Icecream		
Ice		
Juice		
Tea		

We see that some objects are cold while some are hot. You also know that some objects are hotter than others while some objects are colder than others. How do we know that an object is hotter than another object? Usually we detect it by touching the objects. But is our sense of touch reliable? Let's find out.

Activity 1 - Take cold water mixed with ice in first vessel A, normal water in second vessel B and light warm water in third vessel C. Now put your left hand in vessel A and right hand in vessel C, now remove both the hands from these vessels and immediately put them in vessel B.

It is not reliable to detect whether an object is hot or cold by touch.

what do you feel is the water in vessel B cold or hot? The water in your left hand feels hot and the water in your right hand feels cold. Then you will not be able to determine whether the water in vessel B is cold or hot.

The property which shows the condition of an object being hot or cold in comparison to another object is called the temperature of the object. A thermometer is used to measure the temperature of an object.

Measurement of temperature -The instrument used to measure the temperature of objects is called a thermometer. There are many types of thermometers like-laboratory thermometer, gas thermometer, alcohol thermometer, digital thermometer.

1. Laboratory Thermometer - It is a glass long and thin tube of uniform internal diameter in which mercury is filled. One end of the tube is connected to a bulb and its other end is closed. A scale is made above the thermometer. Temperature values on the Celsius scale are expressed in $^{\circ}\text{C}$.

Laboratory thermometers are usually marked from -20°C to 110°C . This is called the range of the thermometer. Dip the bulb end of the thermometer alternately in the water filled in the three vessels A, B and C done in the previous activity, wait till the mercury level of the thermometer becomes stable and note the reading of the thermometer.

Here, keep in mind that the bulb of the thermometer should not touch the bottom or wall of the vessel. Also keep in mind that the thermometer should be vertical, not skewed. While taking the reading, keep the vision parallel to the plane of the mercury.

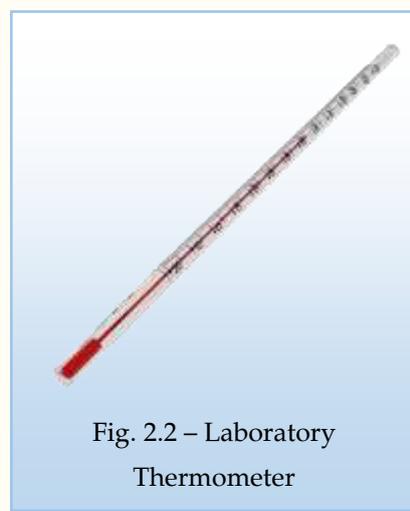


Fig. 2.2 – Laboratory Thermometer

2. Medical thermometer –

The thermometer which is used to find out the temperature of our body is called medical thermometer. It has markings on both the Celsius and Fahrenheit scales. Its tube is also filled with mercury. Look carefully at the clinical thermometer. A thin bright streak of mercury will be visible in the tube outside the bulb. If you cannot see this strip of mercury, then this strip will be visible after rotating it a little.

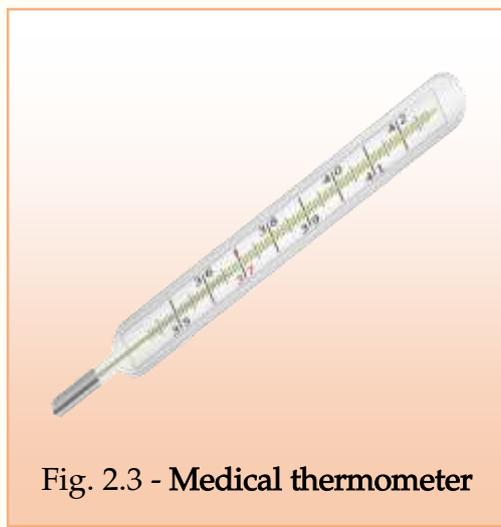


Fig. 2.3 - Medical thermometer

The range of this thermometer is between 35°C to 42°C .

To find out the temperature of the body with the medical thermometer, take out its bulb by keeping it under the tongue in your mouth for some time. Now find the temperature by looking at its mercury level.

Relation between degree Celsius and Fahrenheit -

$$C = \frac{5}{9} (F - 32)$$
$$F = \left(\frac{9}{5} \times C\right) + 32$$

Caution - The bulb of the thermometer should never be kept directly on or near the flame or in the sun for a long time, otherwise the thermometer may break.

- The flow of heat is from the object of higher temperature to the object of lower temperature.
- The temperature of an object that gives off heat decreases, and the temperature of an object that receives heat increases.
- The exchange of heat between the cold and hot objects continues till then, until the temperature of both the objects becomes the same.

Temperature of different substances –

S.No.	Name of the substance	Temperature
1	Melting ice	0°C
2	Freshly prepared tea	80°C
3	Boiling water	100°C
4	Ice cream	- 5°C
5	Liquid Nitrogen	~196°C
6	Liquid Nitrogen	~180°C
7	Sun's core	~15,000,000°C
8	Visible face of the Sun	~6000°C
9	Radiant side (visible part) of the Moon	~100°C
10	The dark side of the moon (the visible part)	~180°C
11	Filament of electric bulb	~2500°C
12	Gas flame	~150°C
13	Mixture of ice and salt	~20°C
14	Human body	~37°C

Methods of heat transfer -

The movement of heat from one place to another is called transmission of heat. Heat transfer takes place in three ways.

1. Transmission of heat by conduction - On heating one end of the wire, the heat is transferred to the cold end. This method of transmission of heat is called conduction. The transmission of heat in solid objects takes place by the method of conduction.

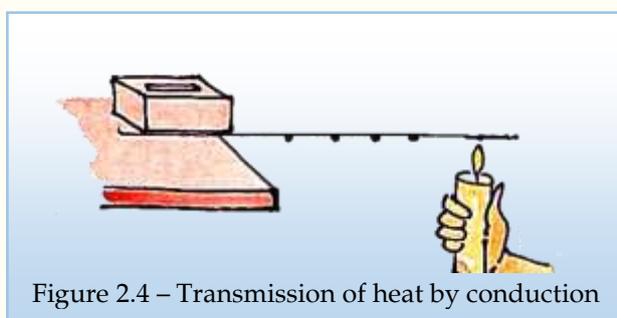


Figure 2.4 – Transmission of heat by conduction

अग्ने यत्ते दिवि वर्चः- पृथिव्यां यदोषधीष्वप्स्वा यजत्र ।
येनान्तरिक्षमुर्वाततन्थत्त्वेषः स भानुरर्णवो नृचक्षाः ॥

(यजुर्वेद - 12.48)

Fire has the ability to expand by heat.

अग्निर्मूर्धा दिवः ककुत्पतिः पृथिव्या अयम् ।
अपां रेतांसि जिन्वति ॥

(ऋग्वेद - 8.44.16)

It is fire, that sets the atoms of matter in motion.

Conductors of heat - The substances in which the conduction of heat takes place easily are called conductors of heat. Example - metals like aluminum, iron, copper etc.

Non-conductors of heat - Those substances in which the conduction of heat cannot be done easily, they are called non-conductors of heat or insulators. eg. - Wood, plastic, Ebonite, Woolen cloth.

Have you ever wondered how woolen clothes protect us from cold? Air is a bad conductor of heat. Air is filled in the small pores of woolen clothes. Due to the non-conductors of heat of wool and air, the heat of the body does not go out and we are protected from cold. Similarly, in winter, when two blankets are covered together, a layer of air is formed between the blankets, due to which the heat does not go out and we are protected from cold.

2. Transmission of heat by convection

– When water is heated, the water near the flame gets heated. Hot water rises up. The cold water around this hot water comes to take its place, then this water also gets heated up and the water from the surrounding again comes in its place.

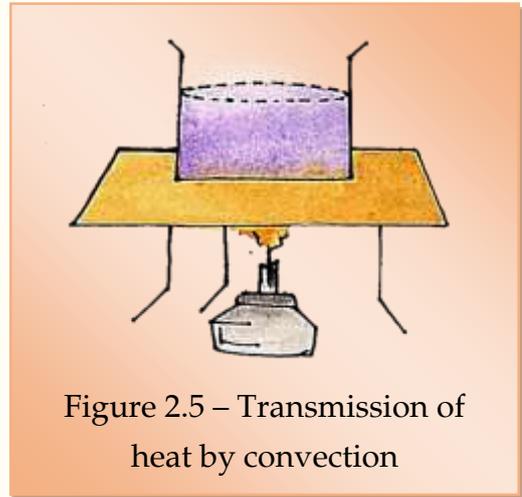


Figure 2.5 – Transmission of heat by convection



This process continues till all the water gets heated. This method of heat transfer is called convection.

Convection of heat also takes place in the air. Air molecules also become lighter (less dense) by taking heat. The cold molecules above the air come down to take the heat.

Uses of Convection – Wind movement – Air moves from low air pressure to high air pressure. When the temperature of a place is high, then the air of that place gets heated up and expands. Due to this the air pressure of that place decreases. Then the wind starts blowing from the colder place to the hotter place.

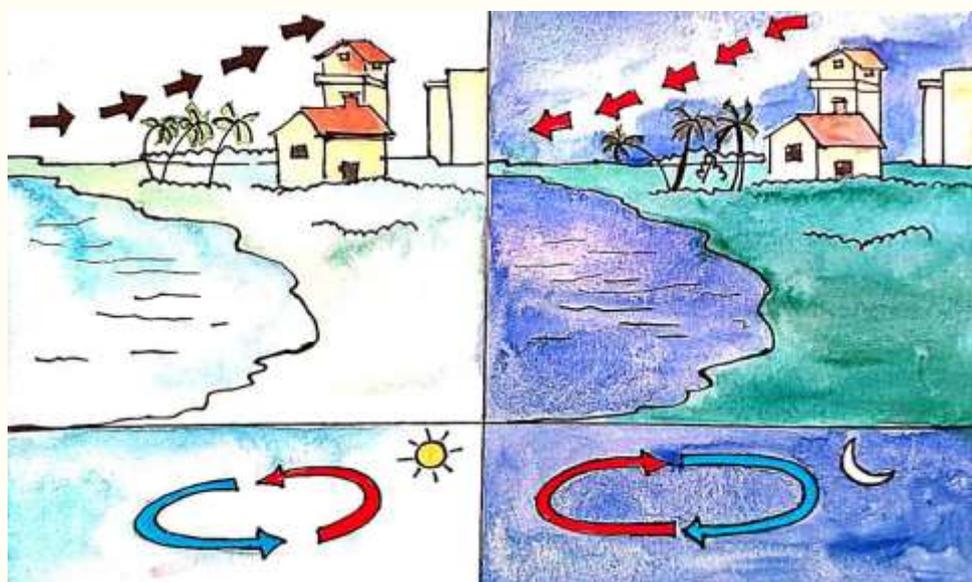


Fig. 2.6 – Sea breeze and land breeze

During the day, the land part is hotter than the sea water, so the air from the sea flows towards the land. This is called sea breeze. The terrestrial part gets cold quickly at night. Hence the wind blows from the land towards the sea. which is called Land breeze . In summer, monsoon winds from the sea also blow for this reason and it rains.

3. Transmission of heat by radiation – When we stand in the sun, we feel warm. Heat reaches us from the Sun by radiation. Most of the space between the Earth and the Sun is empty, that is, vacuum. Vacuum is the place where there is no air. Therefore, there are no molecules of any substance in the vacuum, the heat emerging from the Sun reaches the Earth by reaches in the vacuum in the form of light, in which method heat

is transmitted even in the vacuum without any medium. It is called radiation.

Activity 2 - Tabulate the different types of clothes worn by the students like kurta, northern, dhoti, sweater, shawl, stocking, light colored clothes, dark colored clothes, cap in winters and summers.

S.No.	Clothing name	Winter / Summer
1.	Kurta	
2.	Utari	
3.	Dhoti	
4.	Sweater	
5.	Shaal	
6.	Mooja	
7.	light colored clothing	
8.	dark clothes	
9.	Topi	

Types of clothes we wear in winter and summer -

- 1. Winter clothes** - It is more comfortable to wear dark colored clothes in winter because dark colored clothes absorb more heat. That's why dark colored clothes should be worn in winter.
- 2. Summer clothes** - It is comfortable to wear light and white colored clothes in summer because light colored clothes reflect most of the thermal radiations so that we do not feel hot.

Practice Work

Q.1. Select the correct option -

- Which of the following substances is used in laboratory thermometer?
(a) Sodium (b) Mercury
(c) Molten aluminum (d) Shinning water
- When the molecules of matter move by themselves and transfer heat from one place to another, then this method of heat transmission is called
(a) Conduction (b) Convection
(c) Radiation (d) Both conduction and radiation
- Which of the following is a heat conductor -
(a) Wood (b) Plastic
(c) Iron (d) Rubber

Q.2. Fill in the blanks -

- The measure of hotness or coldness of an object is called
- If you dip a metal spoon in a bowl of ice cream and keep it for a while, it will become
- A copper bottom is used in a steel pan, because copper is a good of heat.
- The flow of heat from a body at temperature towards the heated object.
- Temperature is measured in degree

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

- It is comfortable to wear light and white colored clothes in summer.
- Air moves from low air pressure to high air pressure.
- Barometer is used to measure the temperature of objects.

Q.4 Match the correctly

Column A	Column B
1. Time of flow of land breeze	a. Summer
2. Season of blowing sea breeze	b. Winters
3. Time to prefer light and white colored clothes	c. Day
4. Time to prefer dark colored clothes	d. Night

Q.5. Very short answer type questions

Write two examples each of Conductor of heat and Non conductor of heat .

Q.6. Short Answer Type Questions

1. What are the methods of heat transmission? Explain the difference between them.
2. Why are wooden or ebonite handles used for cooking utensils? Give reason.
3. Explain the process of conduction of heat with the help of necessary diagram.

Q.7. Long Answer Type Questions

1. Why does wearing woolen clothes in winter protect us from cold? Explain with reasons.
2. Why is it less painful to walk barefoot on the floor heated by the sun during summers?

Project Work -

1. Wrap a thin paper strip tightly around an iron rod. Try to burn the paper by keeping it over a burning candle while rotating the rod continuously. Can it burn? Explain your observation.

Chapter – 3

Acids, Bases and Salts

You must have used food items like lemon, tamarind, orange, apple, sapodilla, sugar and salt. Do all these substances taste the same? Let us tabulate the taste of all these food items in a table –

Table 3.1 - Food items on the basis of taste

No.	Food Taste	Food Taste (Sour/Sweet/Bitter)
1	Lemon juice	sour
2	Orange juice	sour
3	Indian Gooseberry (Amla)	
4	Tamarind	
5	Indian lilac (Neem)	
6	Sugar	
7	Salt	
8	Banana	
9	Butter	

You will find that some of these substances taste sour, some bitter, some sweet and some salty.

Acid- Curd, lemon juice, orange juice and vinegar are sour in taste. The taste of these substances is sour because they contain acids.

Natural sources of acid -



Fig. 3.1 - Natural sources of Acid

Table 3.2 - Acids present in various substances -

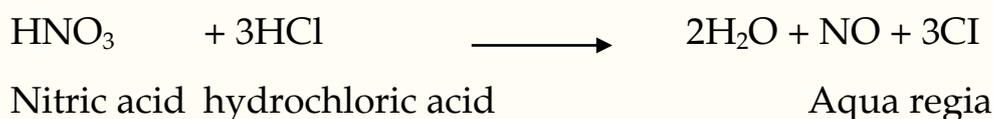
Sr. No.	Acid	Source
1	Grapes, Lemon	Citric Acid
2	Peanuts	Folic Acid
3	Milk, Curd	Lactic acid
4	Protein	Amino Acids
5	Tamarind	Tartaric Acid
6	Tomato	Oxalic Acid
7	Apple	Malic Acid
8	Vinegar	Acetic Acid
9	Cold Drink	Carbonic Acid
10	Tea	Tannic Acid

Mineral Acids - Some acids are made from minerals, hence they are called mineral acids. They are manufactured on a large scale in factories (laboratory). Some important mineral acids are as follows – Hydrochloric acid (HCl), Sulfuric acid (H₂SO₄), Nitric acid (HNO₃) etc.

There are two types of mineral acids –

1. **Concentrated acid** – In this type of acid, the amount of water is very less, so it is very active.
2. **Dilute acid** – This type of acid has more water content, so it is less active.

Aqua Regia – Aqua Regia is prepared by mixing concentrated nitric acid and concentrated hydrochloric acid in a ratio of 1:3. It has the ability to melt gold and platinum metals.



कद्वम्ललवणात्युष्णतीक्ष्णरूक्षविदाहिनः ।

आहारा राजसस्येष्टा दुःखशोकामयप्रदाः ॥

(श्रीमद्भगवद् गीता 17.9)

Sour substances and salty substances have been mentioned in this verse of Shrimad Bhagavad Gita . It is clear from this verse that our sages were fully familiar with acid, alkali and salt. It is described in Rigveda also that pungent, bitter, bland food is poisonous, so do not eat such food.

तृष्टमेतत् कटुकमेतदपाष्ठवद्विषवन्नैतदत्तवे ।

(ऋग्वेद 10.85.34)

Activity - Take some baking soda in a glass tumbler. Add lemon juice to it. You will see that foam starts forming in the glass and gas is released. When a burning match is brought near this gas, the match gets extinguished because acids react with baking soda (sodium bicarbonate) to generate carbon dioxide (CO₂) gas, which extinguishes the flame of the match.

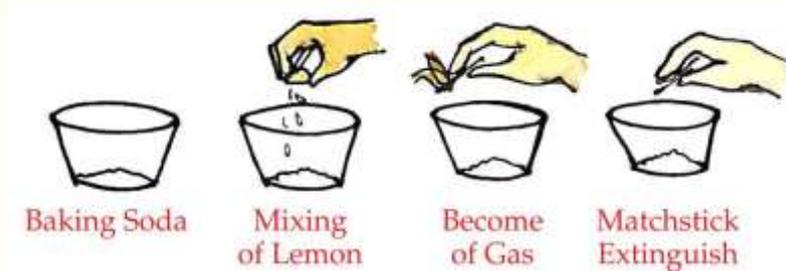


Fig. 3.2 – Reaction of acid with sodium bicarbonate

“Acids react with Sodium Bicarbonate (baking soda) to produce carbon dioxide gas.”

“We do not use metal utensils for keeping pickles, lemon juice, mango chutney at home, because the acids present in them react with metals to form toxic substances.”

“Hydrogen gas is produced by reacting with an acid metal. ”

Other properties of Acid -

Take a little acid in a test tube and put a petal of a blue flower in it. You will see that the color of the petal turns red from the bottom. “Acid turns the color of blue vegetation pigments to red.”

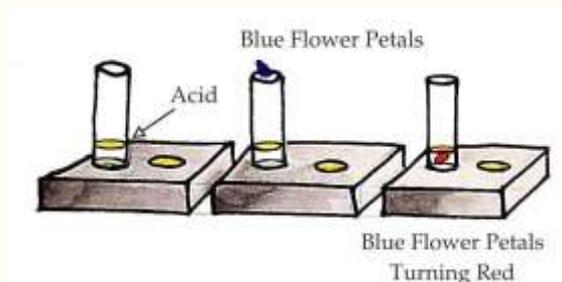


Fig. 3.3 – Acid test with vegetable dyes

Base -

Substances which have a bitter taste and feel soapy on touch are called bases.

S.No.	Name of the substance	Name of the base present	Chemical formula
1	Lime water	Calcium hydroxide	Ca(OH)_2
2	Soap	Sodium hydroxide	NaOH
3	Milky Magnesium	Magnesium Hydroxide	Mg(OH)_2

Table 3.3 - List of bases present in various substances

Let us learn the other properties of bases by experiment.

Activity - Take alkali (lime water) in a test tube and put red flower petals in it. You will see that the red color of the petal changes into blue. So we can say that the base turns the red vegetation pigments blue.

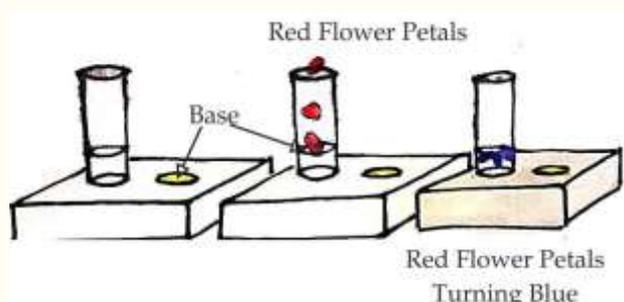


Fig. 3.4 – Testing of bases with vegetable dyes

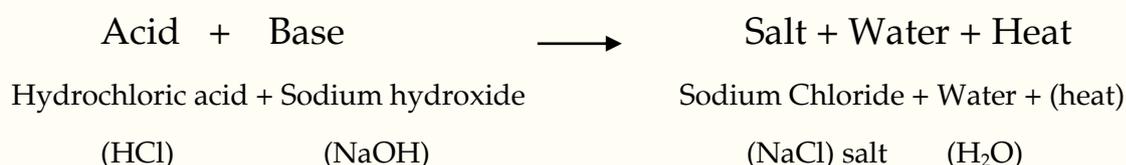
त्रिक्षारं टङ्कणक्षारो यवक्षारश्च सर्जिका ।

(रसाणव. 5.35.36)

There are three types of alkalis mentioned in Rasarnava. Tankan alkali (Suhaga), Yavakshar, Sarjika.

Salt (Neutral) - Substances which do not change red or blue litmus paper are called neutral. Such substances are neither acidic nor basic. For example, salt, sodium chloride, calcium chloride, sodium carbonate, sodium bicarbonate.

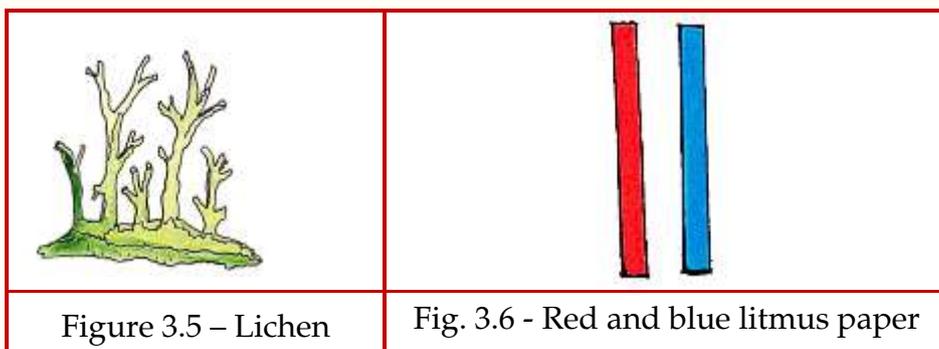
When a basic solution is added to an acidic solution, the two solutions neutralize each other's effect. This action is called neutralization reaction. As a result of this reaction, a new substance is formed, which is called salt and energy is released in this process.



Indicator - To test whether a substance is acidic or alkaline without tasting or touching it, some special types of substances are used, which are called indicators. Indicators tell about the nature of the substance by changing its colour. For example, turmeric, litmus, hibiscus petals etc. are some natural indicators and phenolphthalein and methyl orange are man-made indicators.

Natural Indicator-

1. **Litmus** - Litmus is obtained from lichen (algae). It is available in the form of solution and in the form of paper strips, these paper strips are called litmus paper. There are two types of litmus, blue litmus and red litmus. Acid turns blue litmus paper red. Alkali turns red litmus paper blue.



2. **Turmeric** - When drops of lime water are added to the turmeric paste, the color of the turmeric turns from yellow to red.

Activity - You can make a special greeting card for your Guruji on his birthday. Apply turmeric paste on a plain paper sheet and dry it. Make a beautiful flower with lime water on it with the help of cotton swab. You will get a beautiful congratulation letter.

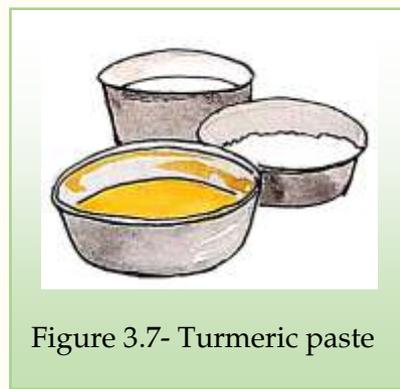


Figure 3.7- Turmeric paste

Now you must have understood that the turmeric stain on your white Cloth (dhoti) turns red when washed with soap. This happens because the soap solution is basic.

3. **Hibiscus leaves** - Take the petals of Hibiscus flower in a beaker and add some hot water to it. Now keep it for some time, till it turns light pink. This indicator made of Hibiscus flowers, turns acidic solutions dark pink and alkaline solutions green.

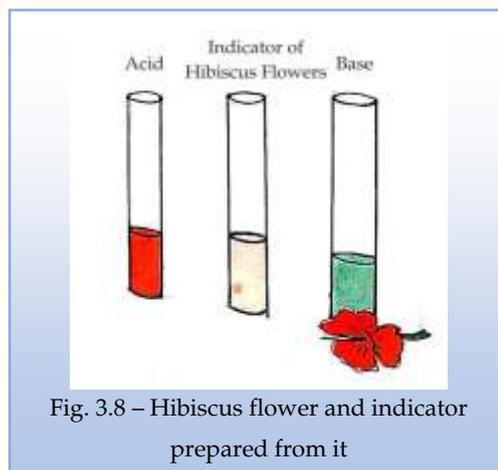


Fig. 3.8 – Hibiscus flower and indicator prepared from it

Synthetic Indicator (man-made)

1. **Phenolphthalein** – When the solution is basic, it gives pink colour. On the contrary, when the solution is non-acidic, it remains colourless.

2. **Methyl Orange** – When the solution is non-acidic, it gives red colour. On the contrary, when the solution is basic, it gives yellow colour.

PH scale

The pH scale is used to measure the concentration of acids and bases.

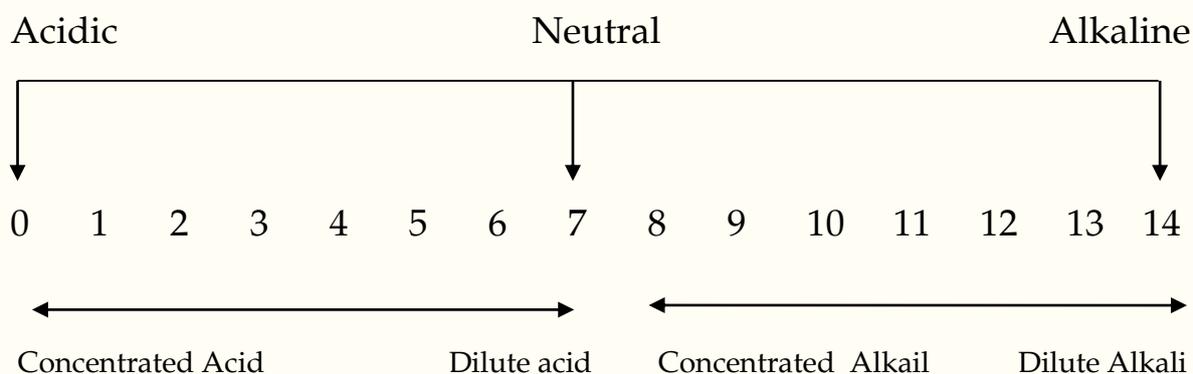


Figure - PH scale

- If the pH value of the solution is more than 7 then it is called alkaline solution.
- If the pH value of the solution is less than 7 then it is called acidic solution.
- If the pH value of a solution is 7, then it is called a neutral solution.

Table - pH values of some substances

Sr.	Name of substances	pH value
1	Lemon juice	2.2 – 2.4
2	Vinegar	2.5 – 3.4
3	Tomato juice	4.0 – 4.4
4	Coffee	4.5 – 5.5
5	Human urine (urea)	4.8 – 8.4
6	Human Saliva	6.5 – 7.5
7	Milk	6.4
8	Human Blood	7.4
9	Pure Water	7
10	Seawater	8.4
11	Tears	7.4

Acids, Bases and Salts in our daily life-

(A) Uses of Acid -

(1) **Acetic acid** - It is also often called vinegar. Its chemical formula is CH_3COOH . It is used for making pickles at home level.

(2) **Hydro-chloric acid** - It is also called acid of salt. Its chemical formula is HCl . It is used in cleaning toilets, refining salt, and digesting food.

(3) **Nitric acid** - It is also called salt acid. Its chemical formula is HNO_3 . It is used in the manufacture of fertilizers, in purifying gold and silver, in making firecrackers, explosives.

(4) **Oxalic acid** - used to remove rust stains from clothes.

(B) Uses of alkali - It is also called slaked lime.

(1) Calcium hydroxide [$\text{Ca}(\text{OH})_2$]

- (a) Lime plastering of houses
- (b) In making bleaching powder
- (c) To make water soft
- (d) To apply ointment on burns caused by acid.

(2) Caustic soda or sodium hydroxide [NaOH]

- (a) in making soap
- (b) In cleaning utensils at the household level

(3) Milk of magnesia or magnesium hydroxide [$\text{Mg}(\text{OH})_2$]

- (a) To remove acidity of the stomach.

(4) Calcium oxide [CaO]

- (a) It is also called quicklime.

It is used in home remedies and in the manufacture of ammonia on an industrial scale.

(C) Uses of salts

(1) Common salt or sodium chloride [NaCl]

It is used in the form of food and in the preservation of pickles.

- (2) Baking soda or sodium bicarbonate is used to remove acidity of the stomach and is used in fire extinguishers.
- (3) Washing soda or sodium carbonate $[\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}]$ is used for washing clothes.

Examples of neutralization in our daily life -

1. Indigestion - Hydrochloric acid is found in the stomach. It helps in the digestion of food, but excess amount of acid in the stomach leads to indigestion. To get rid of indigestion, milky magnesium hydroxide is taken which neutralizes the effect of excessive acid.

2. Ant sting - When an ant bites, it injects acidic liquid (formic acid) into the skin. The effects of the sting can be neutralized by rubbing moist baking soda (sodium hydrogen carbonate).

3. Soil treatment - Excessive use of chemical fertilizers in the fields makes the soil acidic. If the soil is highly acidic or highly alkaline, then the growth of plants is not good. When the soil is highly acidic, it is treated with bases such as quicklime (calcium oxide) or slaked lime (calcium hydroxide). If the soil is alkaline, organic matter is added to it. Organic matter releases acids into the soil which neutralize its alkaline nature.

4. Waste of factories - Acidic substances are mixed in the waste (waste) of many factories. If such waste materials are allowed to flow directly into water bodies, they can destroy fish and other aquatic organisms. Therefore, before immersing the factory waste in water bodies, it is neutralized by adding alkaline substances.



Practice Work

Q.1. Select the correct option -

- Which acid is found in milk -
(a) Lactic acid (b) Citric acid
(c) Tartaric acid (d) Acetic acid
- Which of the following compounds is a base -
(a) Salt (b) Slaked lime
(c) Tartaric acid (d) Malic acid
- Which gas is produced by reacting with an acid metal -
(a) Nitrogen (b) Hydrogen
(c) Carbon dioxide (d) Oxygen
- Shore's acid is -
(a) Nitric acid (b) Citric acid
(c) Tartaric acid (d) Malic acid

Q.2. Fill in the blanks -

- Acid turns original blue litmus paper in
- Acids and bases react and form
- Acids react with sodium bicarbonate to produce gas.
- Bases turn the red litmus paper in

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

- Hydrochloric acid turns blue litmus paper red.
- Indigestion occurs due to excess amount of acid in the stomach.
- Sodium chloride is used as table salt.



4. On adding lime water to turmeric paste, the color of turmeric changes from yellow to red.

Q.4. Match the following Column I and Column II .

Column - I	Column - II
1. Sodium chloride	CaO
2. Baking soda	CH ₃ COOH
3. Vinegar	NaHCO ₃
4. Quick lime	NaCl

Q.5. Very short answer type questions

1. Write the names of any two natural indicators.
2. Which reaction is the formation of salt and water by mutual reaction between an acid and a base?

Q.6. Short Answer Type Questions

1. What do you understand by hyperacidity? What is its treatment?
2. What will happen if the waste of factories is immersed in water bodies without treatment?
3. Why not use metal vessels to store lemon juice?

Q.7. Long Answer Type Questions

1. What is an indicator? Name any two indicators. What is their effect on acid and base please explain
2. Write domestic uses of the following
 - (a) Washing soda
 - (b) Sodium chloride
 - (c) Vinegar
 - (d) Calcium oxide



Project Work -

1. Using the knowledge of acids and bases, write a secret message with the help of baking soda and beetroot. Explain how it works.

(Hint - Use baking soda in water to write a message on a white paper sheet with a cotton swab. After the message dries, rub a piece of freshly cut beetroot on it.)

2. Testing of acids, bases, salts by natural indicators.
3. Prepare a list of citrus fruits.



Chapter - 4

Physical and Chemical Changes

In daily life, we see many changes around us. One or more substances may be involved in these changes. For example, we see many changes in life like burning of a candle, the formation of curd from milk, dissolution of lemon juice and sugar in water to form sherbet. On the basis of nature of changes, they are broadly divided into two types –

1. Physical Change -

Shape of matter is called the physical property of matter. Changes in which only the physical properties of matter change. are called physical changes. These changes are temporary and reversible. No new substance is formed in such a change.

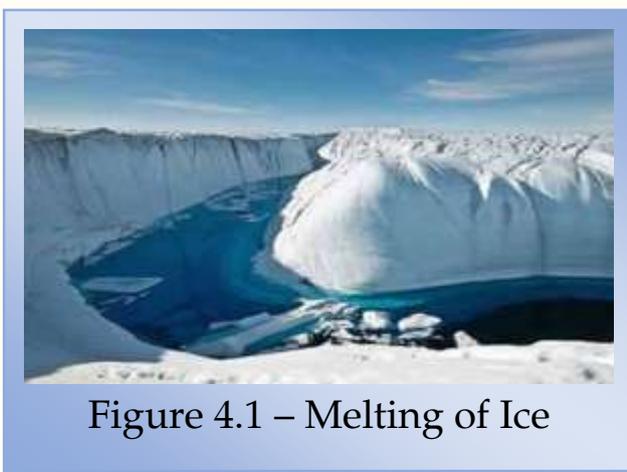


Figure 4.1 – Melting of Ice

Example: Dissolving of salt in water, melting of ice, illumination of bulb, heating of blade on flame, vaporization of water, conversion of steam into water, etc.

Crystallization - The process of obtaining pure and large size crystals of a substance from its solution is called crystallisation. No new substance is formed in this process. But crystals of the same substance are formed. So crystallization is also a change.

Let us understand this through activity.

Activity - 1

Take some wax in a bowl and heat it slowly. what do you see Remove the bowl of melted wax from the flame and let it cool. After some time you will see that on cooling the wax becomes solid again. So we can say that the melting of wax is a temporary change.

य एनमादिदेशति करम्भादिति पूषणम्

(ऋग्वेद - 6.56.1)

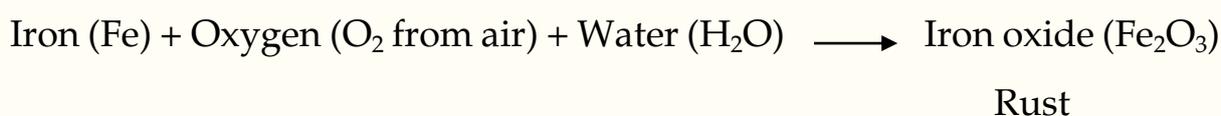
In the Rigveda, there is a mention of offering mixed grain which is curd mixed with sattu (karambh) to the god Pusha.

2. Chemical change -

Those changes, in which the chemical internal composition of the substance changes, that is, the substance is converted from its original form into a new substance, after the change, the substance cannot be brought back to its original or previous state. In this change, one or more new substances are formed.

Example – the burning of candle, digestion of food, rusting of iron, and burning of firecrackers and sparklers on festivals.

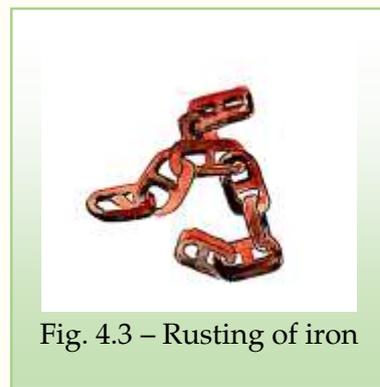
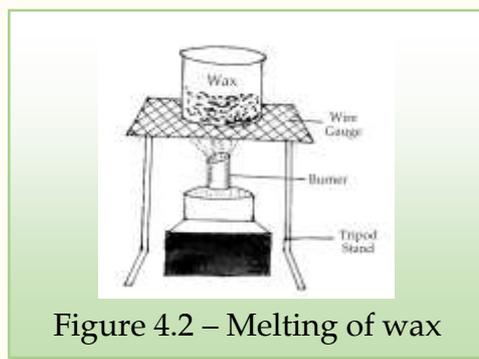
Rusting of iron - When a piece of iron is left in the open for a few days, a layer of brown colored material accumulates on it. This brown colored material is called rust and this process is called rusting. In this process iron is converted into a new substance called oxide (Fe_2O_3).



Oxygen and moisture (water vapour) are the essential components for rusting. Rust gradually destroys iron. Since iron is used to make the frame of vehicles like ships, cars, trucks, cycles etc. and to make bridges and big buildings. Therefore, it is necessary to protect iron from rusting.

Ways to protect iron from rusting -

To prevent rusting of iron, it has to be protected from contact with both oxygen and water. Iron can be protected from rust by applying a layer of paint, grease etc. To keep iron and steel safe from rust, the process of coating zinc (zinc) metal on iron is called galvanization.



सुवर्णं रजतं ताम्रं तीक्ष्णं वज्रभुजङ्गमाः ।
लोहकं षड्विधं तच्च यथपूर्वं तदक्षयम् ॥

(रसार्णव - 7.89.90)

Gold is the most renewable. Iron, steel (copper) and lead (lead) rust quickly. The order of activity of rusting of metals is given.

Also know about these chemical changes-

1. **Change of color on leaving the cut apple open in the air** - Apple contains iron, because of this after cutting it, keeping it in the air for a while, iron reacts with the oxygen of the air to form iron oxide. As a result, the color of its cut surface becomes reddish brown.

2. **How to make Mehndi**- Mehndi contains major chemical compounds such as kvinone, Naphthoquinones and lawsone. Lawsone itself is colourless, but when it comes in contact with air or sunlight, it forms a red colored compound.

3. **The Truth of the Magician** -

(i) **Setting fire to a glass filled with water** - In this magic, the magician puts a piece of sodium in the water while protecting your eyes. It reacts with water to form hydrogen gas. Heat is also produced in this reaction. The spark of fire is generated due to the burning of hydrogen gas from this heat. We think the magician started the fire with magic.



Sodium + water \longrightarrow Sodium hydroxide + Hydrogen gas + Heat

(ii) **White smoke coming out of magic** - In this, the magician has a solution of ammonium hydroxide in a glass and a solution of hydrochloric acid in another glass. When he mixes both the solutions, they react to form white smoke of ammonium chloride.



Ammonium hydroxide + hydrochloric acid \longrightarrow Ammonium chloride (white smoke) + Water



Practice Work

Q.1 Select the correct option -

- Which of the following is a physical change -
(a) Rusting (b) Curd formation of milk
(c) Ice melting (d) Turning brown on cutting the apple
- Which of the following is a chemical change -
(a) Light bulb
(b) Lime water turning milky
(c) Conversion of water into vapor
(d) Melting of ghee
- Why is paint applied on iron doors in homes -
(a) To protect from sun rays (b) To remain dust free
(c) To prevent rusting (d) To protect from birds
- The chemical formula of rust is -
(a) Fe_2O_3 (b) Fe (c) FeO (d) FeSO_4

Q.2 Fill in the blanks -

- Preparation of an aqueous solution of sugar is achange.
- Such changes are called physical changes, in which only properties of a substance change.
- Grinding of wheat grain into smaller size is achange.
- Melting of ice is a change.

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

- Rusting of iron is a chemical change.
- The dissolution of salt in water is a physical change.
- The process of coating iron with zinc is called galvanizing.

Q.4 Match the following Column I and Column II .

Column - I	Column - II
1. Burnout of the bulb.	Chemical changes
2. Rusting	Physical change
3. Getting crystals from alum.	Crystallization

Q.5 Very short answer type questions

1. Which components are responsible for rusting?
2. Tearing the paper is what change.

Q.6 Short Answer Type Questions

1. Explain the process of rusting and how it can be prevented?
2. Explain physical and chemical changes with examples.

Q.7 Long Answer Type Questions

1. Write any four examples of physical change associated with our daily life.

Project work

1. Mention two such changes which are harmful. Explain why you consider them harmful. How can you prevent them ?



Chapter - 5

Some Natural Phenomena

You must have seen that sometimes rain drops start falling with strong winds and lightning starts flashing with loud sound and you must have seen dust, dry leaves of plants etc flying in the air with strong winds . You must have experienced the vibrations generated in the earth at some point of time.

In this chapter we will study the reason behind all these incidents.

गणास्त्वोप गायन्तु मारुताः पर्जन्य घोषिणः पृथक् ।
सर्गा वर्षस्य वर्षतो वर्षन्तु पृथिवीमनु ॥

(अथर्ववेद - 4.15.4)

In this mantra of the Atharvaveda, there is mention of thunder clouds falling on the earth in the form of drops of water.

उदीरयत मरुतः समुद्रतस्त्वेषो अर्को नभ उत् पातयाथ ।
महऋषभस्य नदतो नभस्वतो वाश्रा आपः पृथिवीं तर्पयन्तु ॥

(अथर्ववेद - 4.15.5)

In this Atharvavedic mantra, it has been told that the water of the ocean rises up due to the process of evaporation and forms clouds. The clouds roar and fall on the earth in the form of drops of water.

Wind - The moving air is called wind. The speed of wind is almost parallel to the surface of the earth. The wind up to some height above the surface of the earth is known as surface wind and the wind of about 200 meters or more height is known as surface wind. In the observatory, the wind direction is detected by an instrument called wind compass. Its pointed end always remains in the direction from which the wind is coming. Wind speed in km Measured in meters per hour, or meters per second.

Wind always moves from a high-pressure area to low-pressure area. The strength of the wind depends on the difference in wind pressure. When the pressure difference is high then the wind blows strong and when the pressure difference is small then it blows in the form of weak wind.



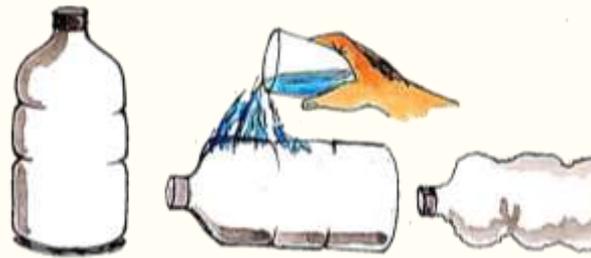
Figure 5.1 – Wind mill



Figure 5.2 – Ship

Uses of wind (air) –

1. Helps in drying of clothes and seeds.
2. Helps in separating the grain from the chaff.
3. Provides power to the vessel.
4. Electrical energy can be created with the help of wind energy.



Activity :- Air exerts pressure.

A plastic bottle filled half full with hot water and cold water poured on the bottle flattens it because the vapor formed from the hot water inside the bottle gets converted into water by pouring cold water on the bottle. Due to which the air pressure inside the bottle becomes less than the air pressure outside the bottle. Hence air exerts pressure.

Effect of velocity on air pressure -

Air pressure depends on the velocity of the air, as the velocity of the air increases, the pressure of the air decreases. As the velocity of the air decreases, the pressure of the air increases.

Uneven heating of the earth -

Earth and uneven heating of land and water is due to wind blowing.

When the warm air rises, the air pressure at that place decreases and the high pressure cold air of the surrounding area starts flowing towards that place.

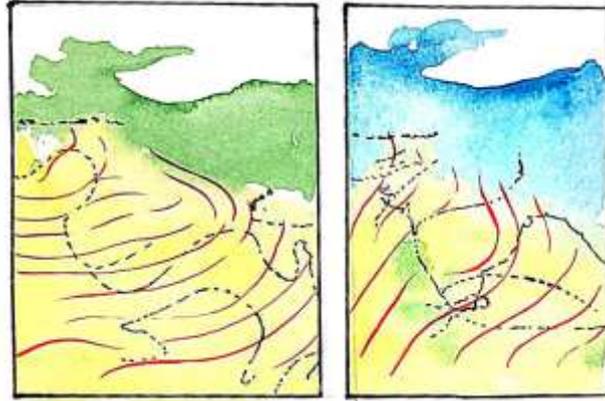


Fig. 5.4

Lightning-conductor -

तडित सौदामिनी विद्युत् चञ्चलाचपलाऽपि ।

(अमरकोष 1 खण्ड)

All these names (Thunder, Saudamini Vidyut, Chanchala, Chapla) are the names of electricity.

Lightning conductors are used to protect buildings during lightning. The lightning conductor is a thick copper metal rod. The upper end of the rod is pointed. This pointed end is placed on the top of the buildings and the other end is buried in the ground. When charged clouds pass over the building, the building can be protected by receiving their charge through the lightning conductor and transferring it to the ground.



Figure 5.5 – Lightning conductor

Hurricane -

The water in the reservoirs gets converted into water vapor by taking heat from the atmosphere. When this water vapor again falls on the earth in the form of raindrops, then the heat of water vapor is released in the atmosphere, due to which the surrounding air gets heated and this hot air rises upwards, due to which the air pressure decreases. For this, the high-velocity air starts moving in this direction. This cycle goes on continuously due to which cyclones are generated.

Thunderstorm

Due to the increase in the temperature of the atmosphere, the air gets heated and rises rapidly and this hot air takes the water vapor present in the atmosphere with it, due to the decrease in the temperature in the upper part of the atmosphere, the water vapor condenses into water. and starts falling down. The falling water drops rise up with more velocity and the air shines. Due to which sound is generated, this natural phenomenon is called thunderstorm.



Figure 5.6 - Thunderstorm

आशामाशां वि द्योततां वाता वान्तु दिशोदिशः ।

मरुद्भिः प्रच्युता मेघाः सं यन्तु पृथिवीमनु ॥

(अथर्ववेद - 4.15.8)

In this Atharvavedic mantra, there is mention of lightning in all directions and rain through clouds propelled by the wind.

नमस्ते अस्तु विद्युते नमस्ते स्तनयिन्ने ।

(अथर्ववेद - 1.13.1)

In this mantra of Atharvaveda, there is mention of thunder and lightning in the sky.

Measures to avoid lightning storm -

1. Stay away from such things, which are good conductors of electricity.
2. If you are at home, do not touch water tap, fridge, telephone etc.
3. Stay in your house, don't come out of the house.
4. If you are traveling then stay in your vehicle, do not get out of the vehicle.
5. Do not go under trees during a thunderstorm.

प्रवतो नपान्नम एवास्तु तुभ्यं नमस्ते हेतये तपुषे च कृणमः ।

(अथर्ववेद - 1.13.3)

Parjanya (lightning) falling down from a height has been mentioned.

Cloud Manufacturing –

दिवा यान्ति मरुतो भूम्याऽग्निरयं वातो अन्तरिक्षेण याति ।

अद्भिर्याति वरुणः समुद्रैर्युष्माँ इच्छन्तः शवसो नपातः ॥

(ऋग्वेद 1.161.14)

In this Rigvedic mantra, the process of formation of clouds has been explained. Due to the heat of the sun, the water of the ocean evaporates and with the help of wind, clouds are formed and due to Indra (electricity) and Maruts, rain comes from the clouds.

सप्तार्धगर्भा भुवनस्य रेतो विष्णोस्तिष्ठन्ति प्रदिशा विधर्मणि ।

(ऋग्वेद 1.164.36)

Due to the heat of the Sun, the water of the oceans evaporates, and clouds are formed. In this Rigvedic mantra, the time taken to change from vapor to clouds has been explained. It takes 195 days for the vapor to convert into clouds.

Lightning strike -

दिवि भुक्तशुभुफलानां पततां रूपाणि यानि तान्युल्काः ।



धिष्ण्योल्काशनिविद्युत्तारा इति पञ्चधा भिन्नाः ॥

(बृहत्संहिता 33.1)

In this verse of Brihatsamhita, five forms of lightning falling from the sky have been mentioned. For example – Ghishnya, Ulka, Ashni, Vidyut, Tara.

अशनिः स्वनेन महता नृगजाश्वमृगाश्मवेश्मतरुपशुषु ।
निपतति विदारयन्ती धरातलं चक्रसंस्थाना ॥

(बृहत्संहिता 33.4)

Ashni (lightning) falls on the earth with the loudest sound and rotates like a wheel.

विद्युत्सत्त्वत्रासं जनयन्ती तटतटस्वना सहसा ।
कुटिलविशाला निपतति जीवैन्धनराशिषु ज्वलिता ॥

(बृहत्संहिता 33.5)

Lightning (lightning) falls on the earth at a fast speed with a humming sound, crooked and huge shape.

धिष्ण्या कृशाल्पपुच्छा धनूषि दश दृश्यतेऽन्तराभ्यधिकम् ।
ज्वलिताङ्गारनिकाशा द्वौ हस्तौ सा प्रमाणेन ॥

(बृहत्संहिता 33.6)

Ghishnya looks like a fire with a thin and short tail and two cubits long.

तारा हस्तं दीर्घा शुक्ला ताम्राब्जतन्तुरूपा वा ।
तिर्यग्धश्चोर्ध्वं वा याति वियत्युह्यमानेव ॥

(बृहत्संहिता 33.7)

The star is one cubit long, white and the shape is very subtle and oblique, moving from bottom to top.

उल्का शिरसि विशाला निपतन्ती वर्धते प्रतनुपुच्छा ।
दीर्घा च भवति पुरुषं भेदा बहवो भवत्यस्याः ॥

(बृहत्संहिता 33.8)

The meteor is huge in shape and three and a half cubits long and appears to be falling.



Tornado -

Tornadoes are dark colored funnel-shaped clouds that come from the sky toward the earth's surface. Tornado is known as Hurricane in America and Typhoon in Japan. Tornadoes are formed due to differences in atmospheric pressure.



Figure 5.7 – Tornado

Earthquake -

Deep inside the Earth's crust, the plates are constantly in motion. When these plates collide with each other, a disturbance occurs in the earth's crust. This disturbance is called earthquake. The intensity of an earthquake is measured on the Richter scale. Earthquake waves are measured with the help of a seismograph instrument.

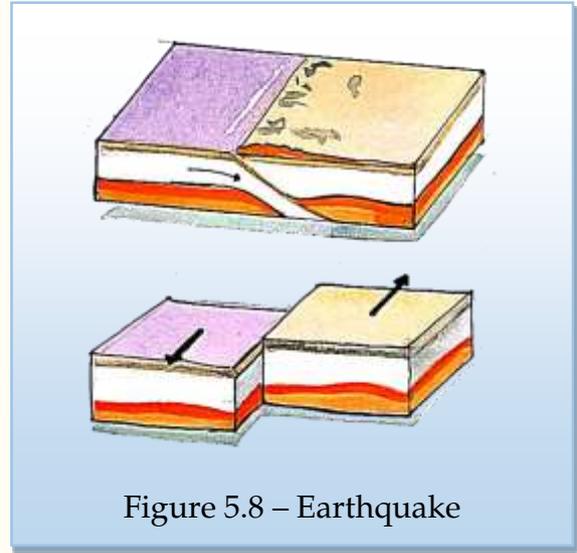


Figure 5.8 – Earthquake

याप सर्पं विजमाना विमृग्वरी यस्यामासन्नग्रयो ये अप्स्वन्तः ।

(अथर्ववेद - 12.1.37)

The vibrations of the earth have been mentioned in the mantras of the Atharvaveda.

Weather forecast -

Meteorologists forecast weather on the basis of temperature, air pressure, wind speed, wind direction, relative humidity, sky condition, nature and type of precipitation. The following are the modern methods of collecting meteorological data – weather balloons, weather-satellites, weather ships, radar etc.





Weather Balloons



Weather-Satellite



Radar

Fig. 5.9

Practice Work

Q.1 Choose the correct option

- The instrument used to measure the intensity of an earthquake is –
 - Anemometer
 - Odometer
 - Seismograph
 - None of these
- Which metal is used in making electric conductor?
 - Gold
 - Sodium
 - Iron
 - Copper
- Due to increase in the velocity of air, the pressure of air becomes -
 - Decreases
 - Becomes more
 - Remains unchanged
 - None of these

Q.2 Fill in the blanks

- Moving air is called
- Due to decrease in the velocity of air, the pressure of air becomes.....
- Dark colored funnel shaped clouds are called

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

- As the warm air rises, the air pressure of that place decreases.
- During a thunderstorm, one should take shelter under a tree.
- The water in the reservoirs gets converted into water vapor by taking heat from the atmosphere.

Q.4 Match the correct pair.

Column 'A'

- Earthquakes
- Uneven heating of the earth
- Movement of air from sky to earth

Column 'B'

- Due to wind blowing
- Due to the movement of the earth's plates
- Tornado

Q.5 Very short answer type questions

1. What is dynamic air called?
2. What are dark colored funnel shaped clouds called?

Q.6 Short Answer Type Questions

1. How is a cyclone formed?
2. What is a lightning conductor?

Q.7 Long Answer Type Questions

1. What is thunderstorm? What is the solution to avoid thunderstorm?

Project work

1. Make a chart and tell people around you how to avoid earthquakes.

Chapter - 6

Transportation in Animals and Plants

Dear students! You know that all animals and plants need air, water and food to survive. Air, water and food have to be transported to different parts of animals and plants. Along with this, the waste materials generated from these organs of animals need to be removed from the body. In this chapter, we will study about the transport of substances in animals and plants.

Circulatory System -

The circulatory System works to deliver food, water, and oxygen to the various parts of the body of living beings and helps in transporting the waste materials generated in those organs out of the body, is called the circulatory system.

Blood circulation system -

Blood is the liquid connective tissue or fluid that flows in the blood vessels. Two types of substances are found in the blood.

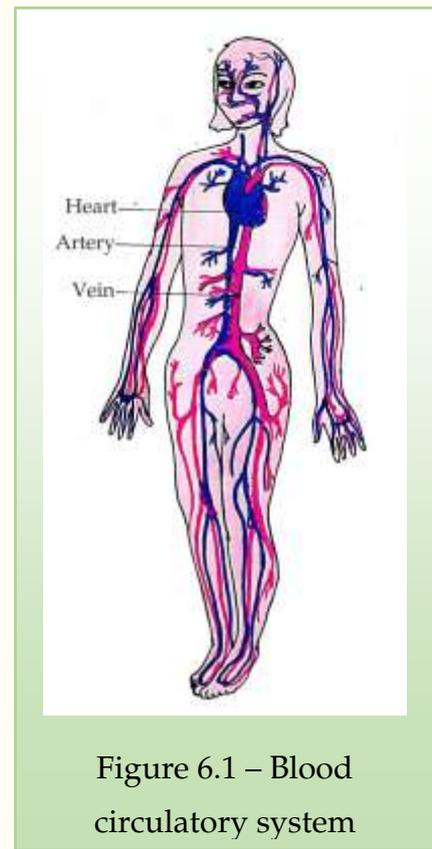
1. Plasma
2. Blood

1. **Plasma** – It transports the digested food to different parts of the body and removes waste materials from the body. Plasma is 60% of the blood.

2. **Hematopoietic** - It is the remaining 40% of the blood, it is divided into three parts -

- a) Red blood cells (RBC)
- b) White blood cells (WBC)
- c) Blood platelets

a) **Red Blood Corpuscles (RBC)** – Red pigment is present in it which is called Hemoglobin. It works to deliver oxygen to each and every cell of the body and to bring back carbon dioxide gas.



b) **White blood cells (WBC)** – Its main function is to protect the body from infection of diseases.

c) **Platelets** – It helps in clotting of blood at the time of injury.

Blood Vessels -

There are two types of blood vessels in the body, which carry blood from one place to another in the body, which are as follows – Artery and Vein.

शतस्य धमनीनां सहस्रस्य हिराणाम् ।

(अथर्ववेद - 1.17.3)

According to Atharvaveda, there are hundreds of arteries and thousands of veins in our body.

Arteries – It works to carry oxygenated blood from the heart to all the parts of the body. The walls of the arteries are thick and elastic because the blood flows through them rapidly and under high pressure.

Veins – They carry the blood containing carbon dioxide from different parts of the body back to the heart. Its walls are thin, valves in it help the blood to flow towards the heart.

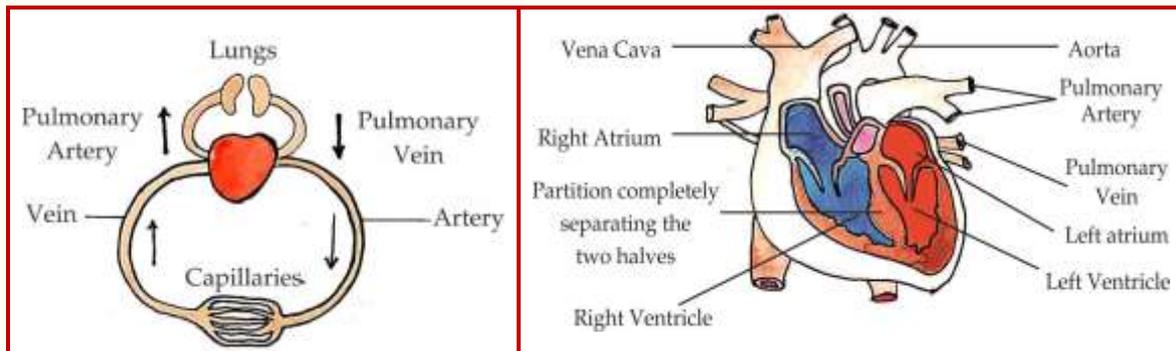


Fig. 6.2 – Structure and Function of Human Heart

Heart – The human heart is a triangular muscular structure of pink colour. Whose size is almost equal to the fist. It is located on the left side of the chest cavity. The human heart is made up of four chambers. In the front part there is a right atrium and left atrium and in the back part of the heart there is a right ventricle and a left ventricle.

Impure blood (blood containing carbon dioxide) resides in the right side of the heart and pure blood (oxygenated blood) remains in the left side. The heart is said to be the busiest organ of the body.

चत्वारि श्रृङ्गा त्रयो अस्य पादा द्वे शीर्षे सप्त हस्तासो अस्य ।
त्रिधा बद्धो वृषभो रोरवीति महो देवो मर्त्याँ आ विवेश ॥

(ऋग्वेद 4.58.3)

In this Rigvedic mantra, it is told that Taurus has four horns, three legs, two heads and seven hands. It is protected in three ways. This Vrishabha makes continuous sound. From the scientific point of view, it is a complete reference to the structure of the heart.

- 1) Shringa means the creator. There are four chambers in the human heart. These four chambers work to protect the heart.
- 2) The three legs of Taurus are the sign of the main artery of the heart, the medium vessels and the subtle vessels.
- 3) The two heads of Taurus means the two atria of the heart.
- 4) The seven hands of Vrishabha i.e. the seven arms of the heart, such as two carrying pure blood from the heart to the human brain, two carrying pure blood from the heart to both hands, two carrying pure blood to the stomach and two carrying pure blood to both the hands. There is a sign towards the vessels leading to the feet.
- 5) Tridha Baddha refers to the three functions of the heart, such as receiving impure blood, purifying impure blood, and distributing pure blood to different parts of the body.

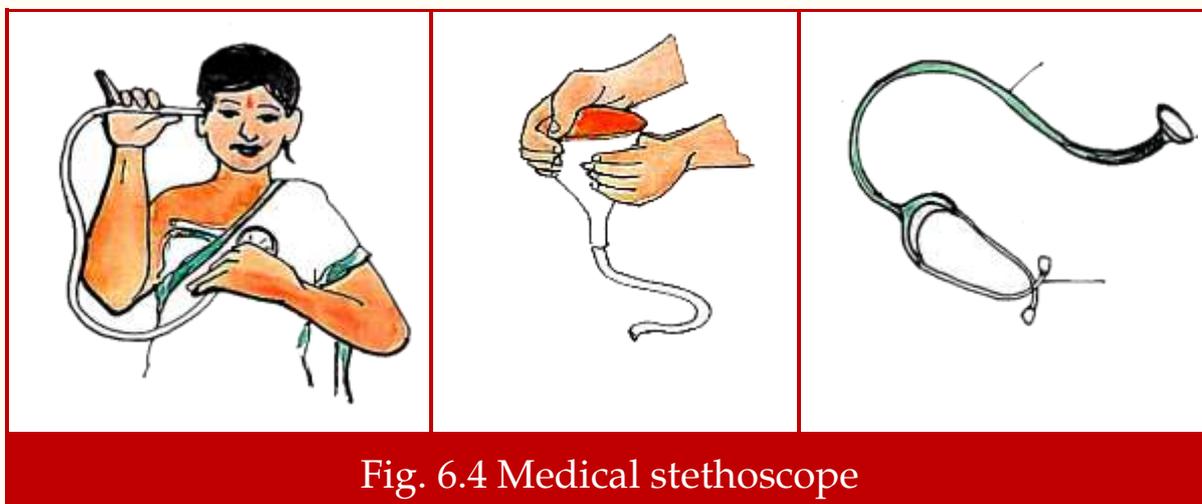
Activity 1 – In the presence of your Teacher, place the index finger and middle finger of your right hand (right hand) on the wrist of your left hand (left hand). What are you experiencing? Do you feel dizzy? Why is there rattling here? What's the hustle and bustle here? This pulsation is due to the blood flowing in the arteries of the hand and



Fig. 6.3 – Pulse Beat Rate

this pulsation is called pulse. You must have experienced that this pulse pulsation is continuous. Can you count the vibrations that occur in 1 minute? If yes, how many vibrations are there? The number of beats per minute is called the beat rate. In normal condition, the pulse rate of a healthy adult person is normally 72 to 80 per minute.

Heartbeat – The walls of the chambers of the heart are made of muscles. These muscles contract and relax rhythmically. The contraction and relaxation of the heart is collectively called the heartbeat. A stethoscope is an instrument used to measure the heartbeat (heartbeat). In normal condition, the human heart beats 72 times in 1 minute.

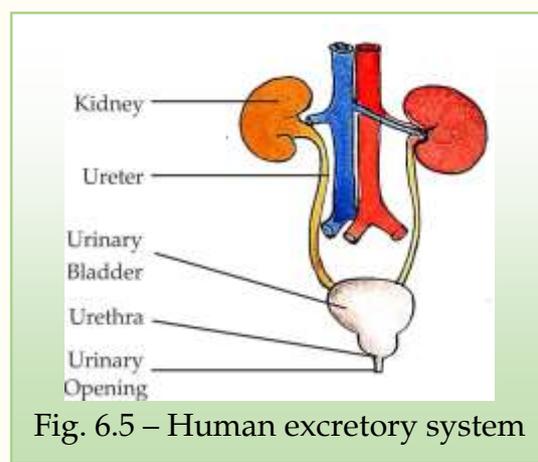


Excretion in animals -

The process of removal of toxic wastes produced in cells from the body of living beings is called excretion and the organs participating in excretion together form the excretory system.

Human excretory system – The main excretory organs in humans are as follows.

1. Kidney
2. Skin
3. Liver
4. Lungs



यदान्त्रेषु गवीन्योर्यद्वस्तावधि संश्रुतम् ।
एवा ते मूत्रं मुच्यतां बहिर्बालिति सर्वकम् ॥

(अथर्ववेद - 1.3.6)

Is stuck in the intestines, in the urinary tract and in the urinary bladder, all that urine is meant to come out quickly.

विद्वा शरस्य पितरं पर्जन्यं शतवृष्यम् ।
तेना ते तन्वे ३ शं करं पृथिव्यां ते निषेचनं बहिष्टे अस्तु बालिति ॥

(अथर्ववेद - 1.3.1)

Urine disease has been mentioned, by treating urine disease, it is mentioned to remove the urine that is stuck in the stomach out of the body.

प्र ते भिनद्धि मेहनं वर्त्रं वेशन्त्या इव ।
एवा ते मूत्रं मुच्यतां बहिर्बालिति सर्वकम् ॥

(अथर्ववेद 1.3.7)

This mantra of Atharvaveda mentions the treatment of a patient suffering from urine disease. It has been told in this mantra that just as the water of the reservoir is taken out through the drains (canals), in the same way the stagnant urine of the patient suffering from urinary disease can be taken out by piercing the urinary tract.

Kidney - The major excretory organ in humans is a pair of kidneys. The main function of the kidneys is to filter and purify the blood plasma, to remove unnecessary and unusable substances from it through the ureters through the ureters of some amount of water. In addition to kidney, skin, liver, lungs work to remove waste materials from the body.

Transport of substances in plants -

Transport of substances in plants takes place through the roots of the plants. Plants absorb water and mineral salts from the soil through roots to make their food and leaves make their food by the process of photosynthesis using water and carbon dioxide gas in the presence of sunlight.

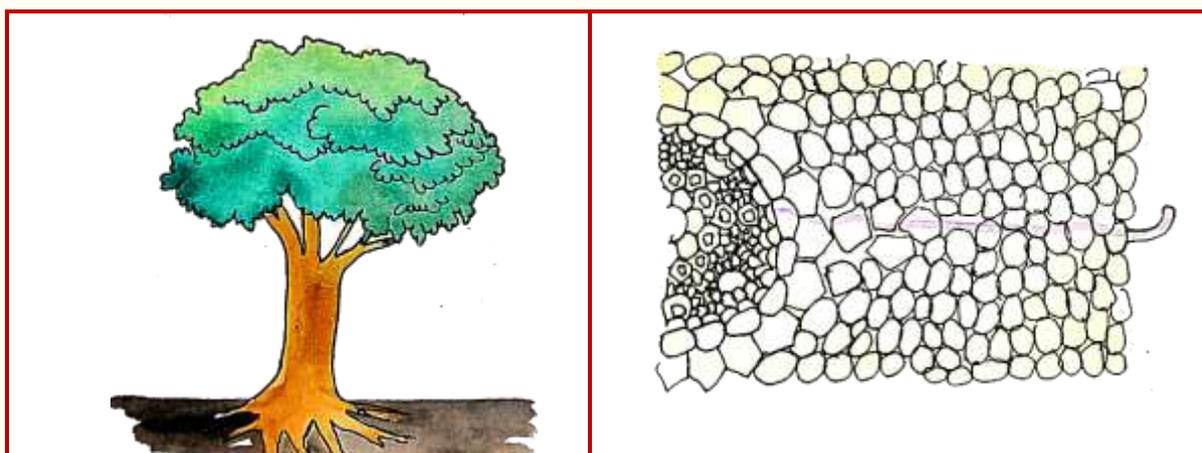


Figure 6.6 -Transport in plants

Transportation of water and minerals -

The following two tissues work for the absorption of water and mineral salts necessary for making food for plants and for digesting the prepared food to different parts of the plants.

- a) Xylem b) Phloem

a) **Xylem** – Xylem is a group of pipe-like tubes, it absorbs water and mineral salts from the soil and transports them to different parts of the plant. Xylem is the main water conducting tissue of plants. It forms a continuous chain that runs through the body of the plant. Along with water, dissolved minerals pass in a continuous stream from the roots to all parts of the plant through the upward-facing stem against gravity. When water reaches the leaves, it is used in the production of food and the excess water is released into the air through the stomata (pores on their lower sides) in the form of water vapour.

b) **Phloem** - Phloem serves to transport the food prepared by the leaves to all the parts of the plant. Phloem is the major food-conducting tissue in vascular plants. The cells of the phloem may be sieve cells with pores of approximately the same diameter or sieve tubes. In sieve tubes, phloem cells occur end-to-end forming a series of sieve tubes. Phloem cells lose their nucleus as they mature.

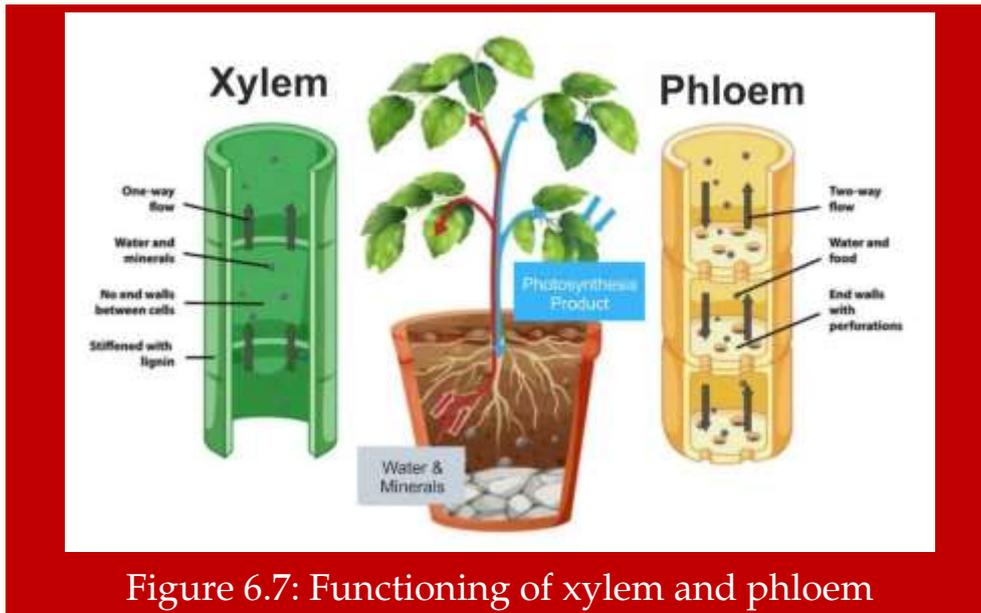


Figure 6.7: Functioning of xylem and phloem

Transpiration -

The loss of water in the form of vapor by the aerial parts of the plants is called transpiration, the action of transpiration is done through the stomata present on the surface of the leaves. The excess amount of water absorbed by the roots of the plants is lost in the form of vapors through the aerial parts of the plants.

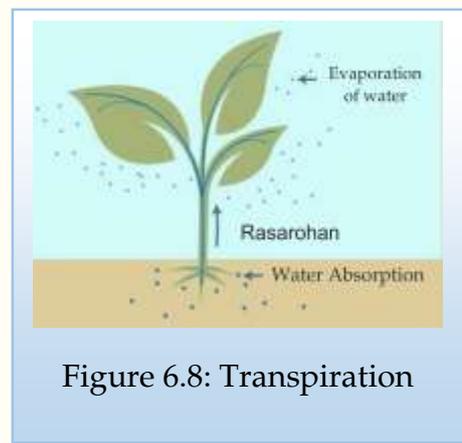


Figure 6.8: Transpiration

Practice Work

Q.1 Select the correct option –

- Which of the following is not a part of the blood circulation system of the human body?
(a) Kidney (b) Blood
(c) Blood vessels (d) Heart
- Which of the following instruments is used to measure heart rate?
(a) Stethoscope (b) Barometer
(c) Seismograph (d) Pacemaker
- Which of the following is not a part of the excretory system of the human body?
(a) Kidney (b) Skin (c) Lungs (d) Heart

Q.2 Fill in the blanks –

- The transport of food in plants is done by
- The main excretory organ in the human body is
- is called the busiest part of the body.

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

- Xylem absorbs water and mineral salts from the soil and transports them to different parts of the plant.
- Phloem serves to transport the food prepared by the leaves to different parts of the plant.
- White blood cells work to protect the body from infection by diseases.

Q.4 Match the correct pairs –

- | Column A | Column B |
|-----------------------|-----------------------------------|
| 1. of blood platelets | Transpiration |
| 2. White blood cell | Clotting |
| 3. Red blood cell | Protecting the body from diseases |

4. Stomata Hemoglobin

Q.5 Very short answer type questions

1. By whom is water transported in plants?
2. What is the loss of water in the form of vapor by the aerial parts of plants called?

Q.6 Short Answer Type Questions

1. What is the function of the arteries?
2. What is heartbeat?
3. Name the components of blood.
4. How is water and mineral salts transported in plants?

Q.7 Long Answer Type Questions

1. Explain the different parts of the human heart with a labeled diagram.
2. Draw a labeled diagram of the human excretory system and explain its working.

Project work

1. Plant a plant in a pot and keep it in a glass jar or polythene and observe the transpiration.

Chapter - 7

Respiration in Organisms

Dear students! Why does your breathing become faster when you exercise? Before knowing the answer to this question, it would be necessary to understand why do we breathe? In this chapter, we will understand the system of respiration in living organisms.

All living beings require energy to function, they get this energy from food. Energy stored in food is released through respiration. Therefore, all living beings need to do respiration to get energy from food. In the process of respiration, the oxygen present in the air taken inside the body by the breath does the work of breaking down the food. Energy is released as a result of decomposition of food, this energy is used by living beings to perform their functions. This process of respiration in the presence of oxygen is called aerobic respiration.

Glucose (Food) $\xrightarrow[\text{O}_2]{\text{(Oxygen Did Presence in)}}$ carbon dioxide + water + energy \uparrow

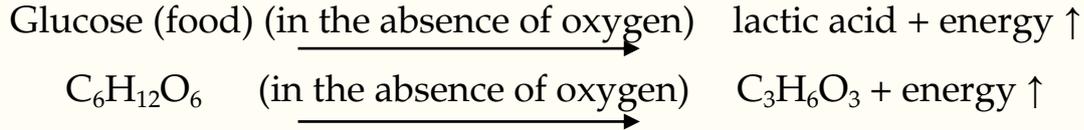


In this process of aerobic respiration, carbon dioxide gas and water are formed as the end products and energy is released. Aerobic respiration takes place in plants, humans, and animals like cows, deer, birds etc.

Some organisms such as yeast can survive in the absence of air (oxygen) as they undergo anaerobic respiration.

Glucose (food) $\xrightarrow{\text{(in the absence of oxygen)}}$ alcohol + carbon dioxide + water + energy \uparrow
 $\text{C}_6\text{H}_{12}\text{O}_6 \xrightarrow{\text{(in the absence of oxygen)}} \text{C}_2\text{H}_5\text{OH} + \text{CO}_2 + \text{H}_2\text{O} + \text{energy } \uparrow$

Carbon dioxide and energy are released as the end products. More energy is required to do heavy exercise, to run fast, to lift heavy objects. Our muscle cells supply energy for these functions by the process of anaerobic respiration. Muscle cells can perform anaerobic respiration for some time only.



In this process, lactic acid is formed as the end product and a lot of energy is released. Muscle cramps occur after lifting heavy objects due to excessive exercise. This is because anaerobic respiration results in formation of lactic acid which causes muscle cramps because the amount of oxygen decreases. By taking bath with hot water and massaging the muscles, the cramps go away and blood circulation increases in the muscles, due to which oxygen is supplied to the muscles.

Respiratory

When we inhale, oxygenated air enters the body through the nostrils, this process is called inhalation. This oxygen reaches the cells of the body and splits the food stored in the cells and converts it into water and carbon dioxide gas and energy. We exhale the changed carbon dioxide again which is called exhalation.

त्वं विश्वस्माद् भुवनात् पासि धर्मणाऽसुर्यात् पासि धर्मणा । (ऋग्वेद 1.134.5)

According to Rigveda, we can avoid many diseases only through air (breath).

प्राणायान्तरिक्षाय वयोभ्यो वायवेऽधिपतये स्वाहा । (अथर्ववेद 6.10.2)

In this Atharvavedic mantra, air is mentioned for prana (life).

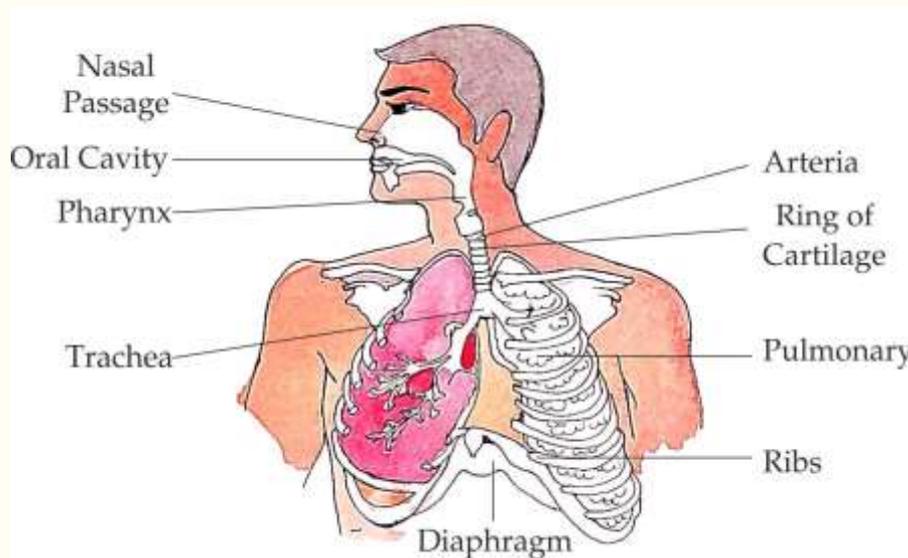


Fig 7.1 Human Respiratory System

Activity 7.1 - Consider the various activities performed by a student in a normal day, such as performing evening worship, exercise, chanting Veda mantras, riding a bicycle, doing self-study, playing etc. Can you tell in which activity the rate of respiration will be the lowest and in which the highest?

Respiration in humans

In the act of breathing, air enters the nostrils through the nostrils. From the nostrils, this air passes through the trachea to the lungs. Lungs are an important part of the respiratory system, they are located on either side of the middle line of the chest cavity. They are protected in the rib cage. A large muscular layer is found between it which is called the diaphragm. During inhalation, the ribs move outwards and the diaphragm moves downwards. Due to which the volume of the chest cavity increases and air fills in the lungs. At the time of exhalation, the ribs move inwards and the diaphragm comes back to its original position. This increases the volume of the thoracic cavity and allows air to move out of the lungs.

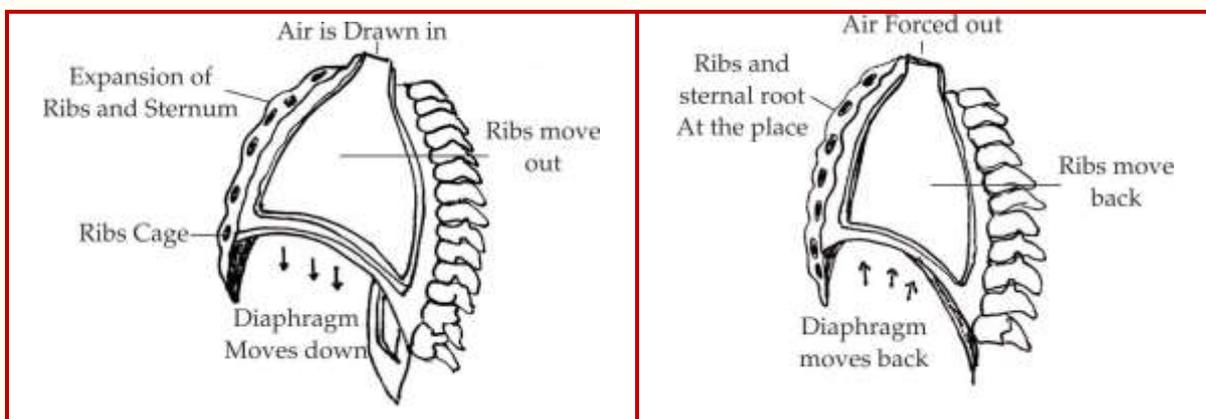


Fig. 7.2 - Mechanism of respiration in humans

Respiratory rate

The number of breaths taken by a healthy person in 1 minute is called the respiratory rate. The rate of respiration in normal condition is 15-18 per minute. The respiratory rate increases up to 25 times during strenuous work or exercise .

Respiration in insects - Cockroaches and other insects respire through small holes located in the lateral part of their body. These holes are called breathing holes. Insects have a respiratory system for the exchange of gases. Oxygen-rich air enters the respiratory system through the breathing holes, oxygen from the breathing system reaches the cell of the insect, and the carbon dioxide gas produced during respiration exits through the breathing holes.

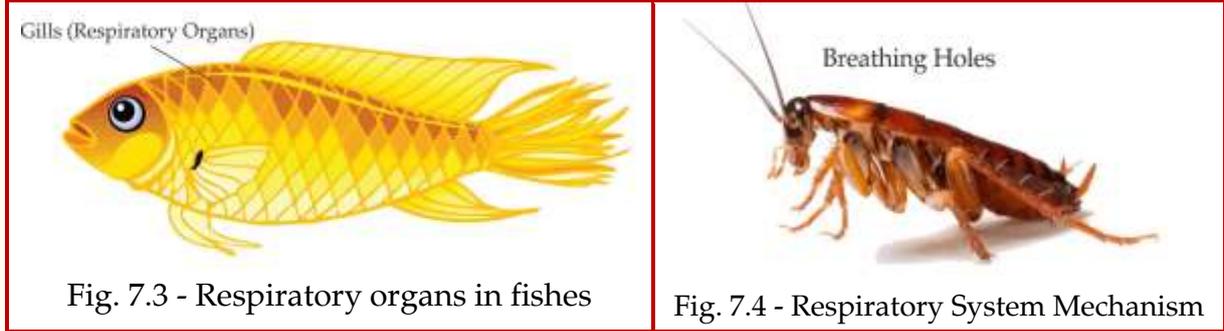


Fig. 7.3 - Respiratory organs in fishes

Fig. 7.4 - Respiratory System Mechanism

Respiration in Aquatic Organisms - In aquatic organisms such as fish, gills or gills are found, which are also called gills. Chloems help aquatic organisms in respiration by absorbing oxygen dissolved in water. The blood vessels located in the chyme exchange gases.

The earthworm respire through its skin, in which the exchange of gases takes place through the skin. Frogs breathe through lungs like humans and can also breathe through their skin.

Respiration in plants - Respiration takes place in plants like other living beings. Plants take oxygen gas from the atmosphere and release carbon dioxide gas. All living beings require respiration to survive.

आत्मा देवानां भुवनस्य गर्भो यथावशं चरति देव एषः ।

(ऋग्वेद - 10.168.4)

The flow of air is mentioned to be free.

Practice Work

Q.1 Select the correct option -

1. Respiratory organ in fish is -
(a) Chloem (b) Skin
(c) Lungs (d) Breathing holes
2. At the time of inhalation, ribs -
(a) Moves outwards. (b) Moves down.
(c) Moves upwards. (d) Does not move at all
3. Respires by breathing holes -
(a) Fish (b) Earthworm
(c) Man (d) Cockroach

Q.2 Fill in the blanks –

1. The process of respiration that takes place in the presence of oxygen is called respiration.
2. The process of respiration that takes place in the absence of oxygen is called respiration.
3. Spasms in the muscles of the body are caused by acids.

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

1. Plants also do respiration like other living beings.
2. Earthworm respires through its skin.
3. In normal condition, the rate of respiration is 15-18 per minute.

Q.4 Match the correct pair.

- | Column 'A' | Column 'B' |
|--------------------------|------------|
| 1. Aerobic respiration | a. Yeast |
| 2. Anaerobic Respiration | b. Deer |

3. Cockroach
4. Fish
- c. Clome
- d. Trachea

Q.5 very short answer type questions -

1. Name the animal that breathes through skin and lungs?
2. In which direction do the ribs move during exhalation?
3. Oxygen dissolved in water is used by which animal in respiration?

Q.6 Short Answer Type Questions

1. Explain the process of respiration in insects.
2. Define respiratory rate.
3. Explain respiration in aquatic animals.

Q.7 Long answer type questions -

1. Explain the mechanism of respiration in humans with labeled diagram.
2. Draw a labeled diagram of the human respiratory system.

Project work

1. Prepare a model of the respiratory system.
2. Try the breathing process.

Chapter - 8

Reproduction in Plants

The process by which living beings produce offspring similar to themselves is called reproduction. By reproduction, an organism (plant or animal) increases its species by giving birth to another organism similar to itself. The following are the methods of reproduction in plants-

(1) Asexual reproduction -

In this type of reproduction new plants are produced without the use of seeds. Asexual reproduction takes place by the following methods.

(a) Vegetative Propagation - Root, stem and leaves in plants are called vegetative parts of the plant. In this, new plant is formed by vegetative parts or buds of the plant. The process under which a part of the plant body separates and develops into a new plant is called vegetative propagation .

Activity-1

Take a potato. You will see scars on the potato, these scars are called eyes. Cut the potatoes into pieces in such a way that eyes are present in each potato piece. Bury the cut pieces in the soil at some depth and add water regularly. After a few days, dig out the potato pieces.

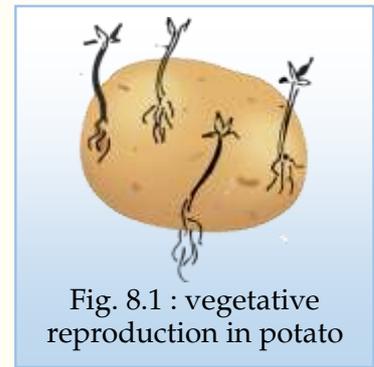


Fig. 8.1 : vegetative reproduction in potato

Overview - We see that new plants are seen sprouting from the eyes of the potato. Similarly, we can also grow ginger or turmeric.

Activity – 2 -

Cut a branch of the hibiscus plant obliquely from its junction and bury it in the soil and pour water regularly. The part of the stem or branch from where the leaf emerges is called the node and the cut branch is called the pen.

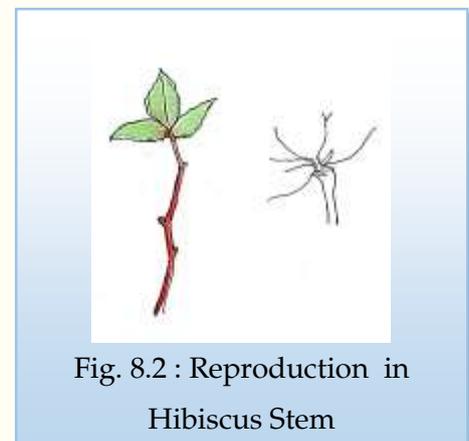


Fig. 8.2 : Reproduction in Hibiscus Stem

Observation - The cutting planted in the ground gradually turns into a plant.

देवानां पूर्व्ये युगेऽसतः सदजायत ।

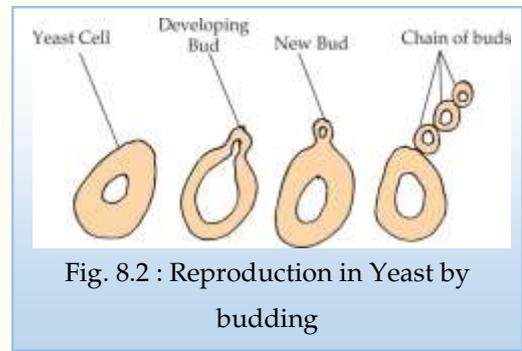
(ऋग्वेद 10/72/2)

In the stage of creation, there was first an unmanifest (Nirguna) object. Again, from the same unmanifest the manifested (Saguna) was born.

(b) Budding - In this process a small sprout develops on the body of the parent organism and after some time separates from the parent organism and forms a new organism. In hydra and yeast, reproduction takes place by budding process.

Activity - 3

Buy yeast cake or yeast powder from a bakery. Take half a spoonful of yeast and one spoonful of sugar in a vessel filled with water and stir the water and keep this vessel in a warm place.



Observation - After one hour, placing a drop of this liquid on a glass slide and observing it under a microscope, you will see new yeast cells or buds as shown in the picture.

(c) Fission - In this type of asexual reproduction, unicellular organisms divide to form new organisms. Example – Spirogyra

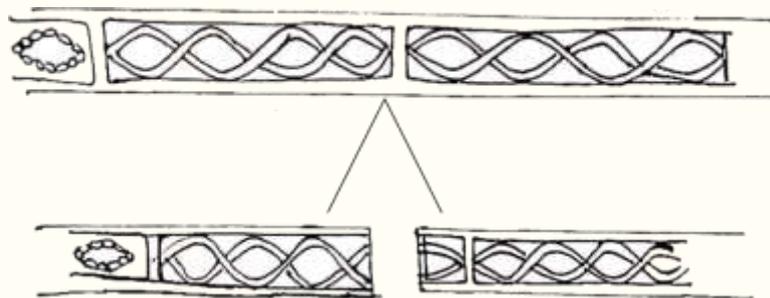


Fig. 8.4 - Fragmentation

You must have seen green colored slippery moss floating in water in stagnant water reservoirs or ponds, this slippery moss is called algae. Algae reproduce by fission method; it divides to form new algae.

(d) **Spore formation** - It occurs in both unicellular and multicellular organisms. In this method, the parent plant produces hundreds of reproductive units in its spore sac. Which are called spores. When the spore box of plants bursts, these spores are scattered on air, land, food items, or soil and they grow and give birth to new plants. This type of reproduction occurs in plants like mosses and ferns and in fungi.

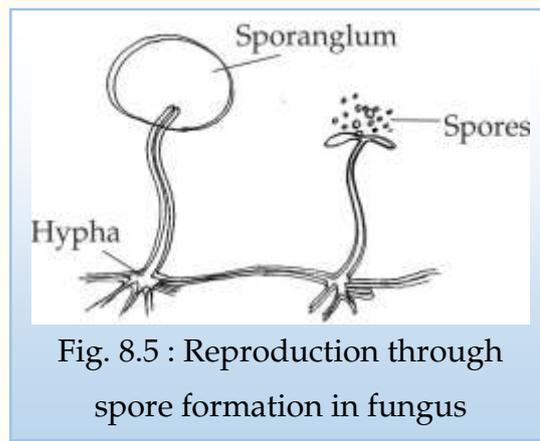


Fig. 8.5 : Reproduction through spore formation in fungus

2. Sexual Reproduction -

The process by which parent plants use their gametes to produce new plants is called sexual reproduction. Flowers are the reproductive organs of the plant. Plants also have male and female reproductive organs. Stamens are male reproductive organs and pistils are female reproductive organs.

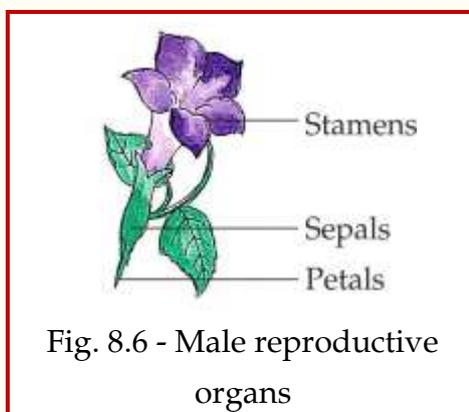


Fig. 8.6 - Male reproductive organs

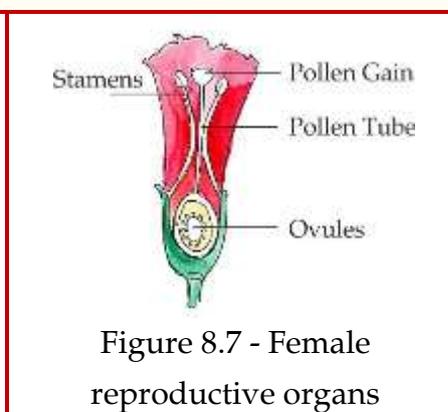


Figure 8.7 - Female reproductive organs

The reproductive organs of the flower are found inside the pistil.

Reproductive organs present in stamens or pistils are called unisexual flowers. Example - Maize, Papaya, Cucumber or Cucumber etc.

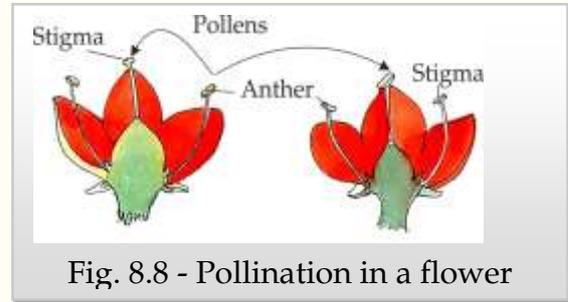
Bisexual flowers - In such flowers both stamens and pistils are present, they are called bisexual flowers. Example - Mustard, Rose, Dhatura, Pitunia etc. plants have bisexual flowers.

Anthers are present in the stamen, which contain innumerable number of pollen grains, which form new centers when germinated. Pollen grains make up the male gametes.

The pistil consists of the stigma, style, and ovary. One or more ovules are present in the ovary. The female gamete or egg is formed in the ovule. In this type of reproduction, the zygote is formed by the fusion of male and female gametes.

Pollination - When the pollen grain of a flower reaches the stigma of the flower of the same flower or any other plant through water, air, insects or animals from the anther, then this action is called pollination. Pollination takes place by two methods.

1. **Self-pollination** - When the pollen grain comes out of the anther of a flower and reaches the stigma of the same flower through some medium, it is called self-pollination.



2. **Cross-pollination** - When the pollen grain comes out of the anther of a flower and reaches the stigma of another flower of the same plant through some medium, it is called cross-pollination.

Fertilization - The process of fusion of male and female gametes is called fertilization and the cell formed by fusion is called zygote. The development of the zygote takes place in the embryo.

तमिद्भर्भं प्रथमं दध्न आपो यत्र देवाः समणच्छन्त विश्वे ।

(ऋग्वेद - 10.82.6)

According to Rigveda, the first basic form in the creation of the universe is assumed to be the water element.

Development of Fruits and Seeds-

After fertilization, the fruit is formed from the ovary and the seed from the ovule. The seed contains an embryo, which after germination produces a new plant.

Practice Work

Q.1 Select the correct option -

1. After fertilization the fruit is formed from –
(a) Ovary (b) Ovule
(c) Dalpunj (d) None of these
2. By which process does reproduction take place in yeast?
(a) Vegetative reproduction (b) Budding
(c) Fission (d) None of these
3. Male reproductive organ in plants is -
(a) Stamen (b) Pistil
(c) Both (d) None of these

Q.2 Fill in the blanks -

1. The combination of male and female gametes is called
2. Reproduction in ginger takes place by the method.
3. Root, stem and leaves are called parts of the plant.

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

1. Such flowers in which either the stamen or the pistil have one reproductive organ are called unisexual flowers.
2. Such flowers in which either the stamens or the pistils have only one reproductive organ are called unisexual flowers.
3. In asexual reproduction, new plants are produced without the use of seeds.

Q.4 Match the correct pair.

- | Column 'A' | Column 'B' |
|---------------------|------------|
| 1. Unisexual flower | a. Mustard |
| 2. Bisexual flower | b. Maize |

3. Budding
 4. Fission
- c. Spirogyra
 - d. Yeast

Q.5 Very short answer type questions -

1. What is the process of producing living beings similar to themselves called?
2. By which method do ferns and mosses reproduce?
3. Name the unisexual flower?

Q.6 Short Answer Type Questions-

1. What are bisexual flowers called? Explain with example.
2. What is self-pollination?
3. Explain the method of fertilization with diagram.

Q.7 Long answer type questions-

1. Explain the modes of reproduction in plants.

Project work

1. Experiment on sprouting a plant from the eye of a potato.

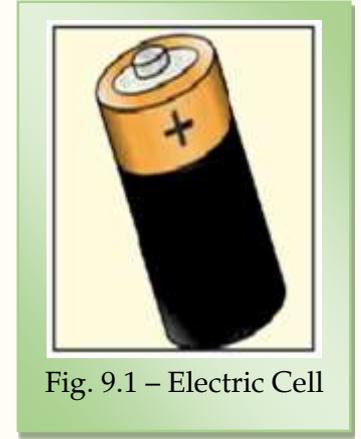
Chapter - 9

Electric Circuit

Electricity is very important in our life. Electricity is used today in factories, washing machines, means of entertainment such as television and radio, etc. Electricity is also used in the field of medicine. Irrigation work is done in the fields only with the help of electricity. Light is obtained in our homes only through electricity. In case of power failure, we get electricity from torch, generator or inverter.

Electric cell-

An electric cell is a device that converts chemical energy into electrical energy. We get electricity from the interaction of chemical substances present inside the cell, when the chemical substances are exhausted, the electric current stops. Then we use the new cell. There are 2 ends (terminals) in an electric cell, the upper end of the cell is positive and the circular end at the bottom is negative.



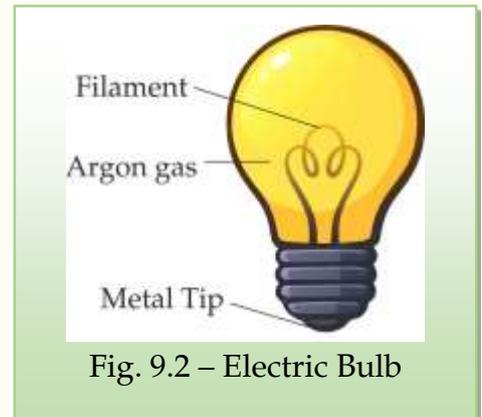
अविन्दन्नु दर्शतमप्स्वश्रुन्तःर्देवासो अग्निमपसि स्वसृणाम् ।

(ऋग्वेद 3/1/3)

The presence of electricity or the flow of electricity (fire) is mainly through water (liquidity). In this way, Rigveda tells that means electricity flows in moisture. Not in dry.

Electric light bulb -

An electric bulb is a hollow cover of glass. In this, there is a thin wire inside the glass cover, which is called a filament. The filament is made of tungsten metal. This filament is fitted between two thick wires. In the center of the bulb there is a glass tube which is used to fill the mixture of inert gas



(argon) and nitrogen gas in the bulb. There is a metal tip at the base of the bulb with pins on either side that hold the bulb securely in the holder. There is a metal frame over the base of the bulb. To which the two terminals of the bulb are connected as shown in the figure. When electric current is passed through it, the bulb gets heated and starts glowing.

Making a Simple Electric Circuit -

Activity-1 - Take a torch bulb, an electric cell, and two wires of different colors of fixed length. After removing the plastic cover from both ends of the wire, connect the ends of the wire with the help of electrical tape as shown in the picture. So that a simple circuit is formed.

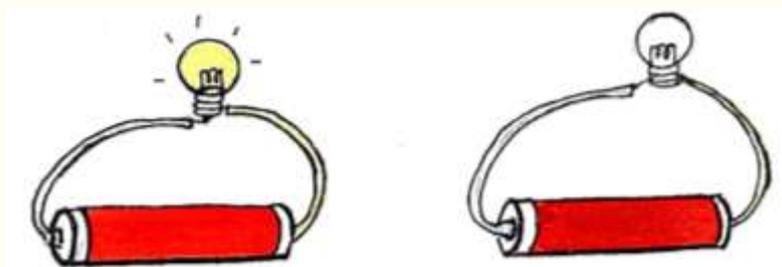


Fig. 9.3 - Making a simple circuit

Case (A), current flows in the circuit. Due to which the bulb starts burning.

Case (B) the bulb does not light up. The reason for this may be that the wire in the circuit is not connected properly or the bulb may also be defective.

Electrical switch -

Electrical switch works of turning on and off electrical appliances like electric bulb, refrigerators, television, fan etc.

Mode of action of a switch -

Activity 2 -

Take an electric bulb, an electric cell, some wires of different lengths, a safety pin, a drawing board.

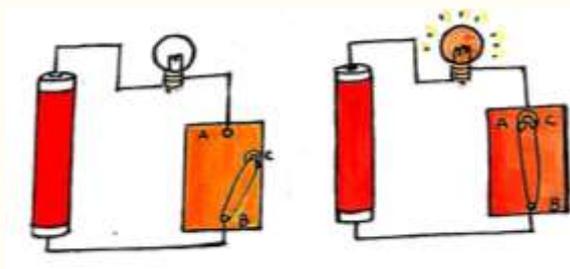


Fig. 9.4 - Mode of action of a switch

Place the drawing pin on the drawing board at point B by inserting a drawing pin in the round end of the safety pin. Fix another pin at point A of the same length as the safety pin. With the help of wire, connect the drawing pin A to one end of the electric bulb and the other end of the electric bulb to one end of the electric cell and the other end of the electric cell to the drawing pin B with the help of wire. Touch the free end C of the safety pin to the drawing pin A. This will cause the bulb to light up, this type of circuit is called a closed circuit. But when we do not touch the free end C of the safety pin with the drawing pin, then the electric current does not flow in the circuit due to which the bulb does not light up, this type of circuit is called an open circuit.

Conductor and Non-Conductor material -

Activity 3 - Take objects like an electric bulb, electric cell, drawing board, drawing pin wire, rubber, plastic, iron nail, wood, glass etc.

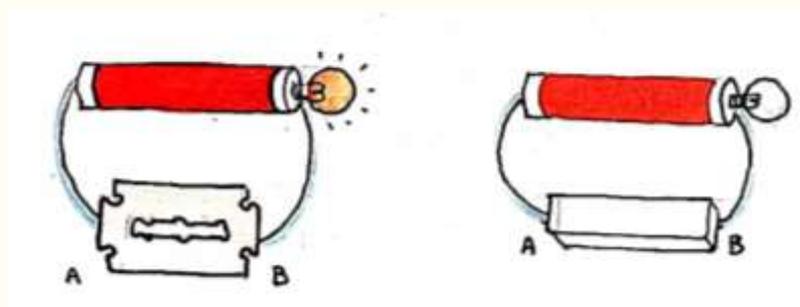


Fig. 9.5 - Conductor and dielectric material

The drawing pins should be placed on the drawing board about 2 cm from each other. Place them at points A and B at a distance of 10 cm and connect the ends of the electric bulb with the help of wire at points A and B as per the picture. Put different objects in the blank space between A and B and complete the table by observing.

Table 9.1

S.No	The substance placed between A and B	The substance of which it is made of	The bulb glows, yes or no.
1	Sharpener	Plastic	Not
2	Panchapatra	Metals	Yes

3	Eraser	Rubber	
4	Scale	Metals	
5	Match Box	Paper	
6	Candle	Wax	
7	Coin	Metals	

After observing the table, you will know that when some substances are placed between A and B, the bulb glows and some substances do not.

Good Conductor (Driver) -

Such substances which when placed between A and B cause the bulb to glow and through which electric current starts flowing are called Good conductors. Example- Iron, copper, silver, pencil, coin etc. Copper metal is used in making electric wire.

Bad conductor (Dielectric) -

Such substances which when placed between A and B, the bulb does not light up, that is, electric current does not flow through these substances. Such substances are called non-conductors or insulators. Example-rubber, glass, plastic, paper etc.

Insulating substances are used in making the top cover of electric wires, making switches, plugs etc.

Practice Work

Q.1 Select the correct option.

1. which of the metal is the filament in the electric bulb made?
(a) Silver (b) Copper
(c) Tungsten (d) Gold
2. What type of energy does an electric cell convert chemical energy into?
(a) Light energy (b) Sound energy
(c) Electrical energy (d) None of these
3. In which of the following does electric current flow?
(a) Paper (b) Wood
(d) Glass (d) Metals

Q.2 Fill in the blanks.

1. An electric cell has terminals.
2. The substances in which electric current does not flow are called
3. The substances in which electric current flows are called.....

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

1. Metals are good conductors of electricity.
2. Plastic is a good conductor of electricity.
3. With the help of electrical switch, we can turn on (on) or off (off) the electrical equipment.

Q.4 Match the correct pair.

- | Column 'A' | Column 'B' |
|------------------------------|------------|
| 1. Conductive material | a. Wood |
| 2. Non-conducting substances | b. copper |

-
3. Electrically Operated Device c. electric cell
 4. Electrical energy to chemical energy conversion device d. refrigerator

Q.5 Very short answer type questions

1. Name any one conducting substance.
2. Name the devices that run on electricity.

Q.6 Short Answer Type Questions

1. What is called a conductor? Explain with examples.
2. What is an electric cell?
3. What is the function of electric switch?

Q.7 Long Answer Type Questions

1. Explain the working of electric bulb with a diagram.

Project work

1. Use to differentiate between conductor and insulator of heat.



Chapter - 10

Air, Water and Soil

Dear students! You know that the environment is made up of air, water and soil around us. In this chapter, we will study about the components of environment, air, water and soil.

Air - Air is present all around us. We cannot see the air present around us. But when we see the leaves of trees and plants moving and the paper flying here and there, we feel the wind.

Importance of air

- Living beings need air for respiration.
- Air is necessary for the combustion of substances.
- Air is necessary for birds to fly.

Air is important for the living beings living on the earth.

Composition of air

Air is a mixture of many gases, water vapor and dust particles, these are called components or components of air. The components of air are as follows-

1. Nitrogen (N_2) -

About 78% of the air is nitrogen. Nitrogen gas is helpful in the growth of plants.

2. Oxygen (O_2) -

It is the second major component of air. About 21% of the air is oxygen. Oxygen gas is necessary for respiration of living beings and combustion of substances.

Activity - Cover a burning candle with a glass tumbler. After some time, the candle gets extinguished.

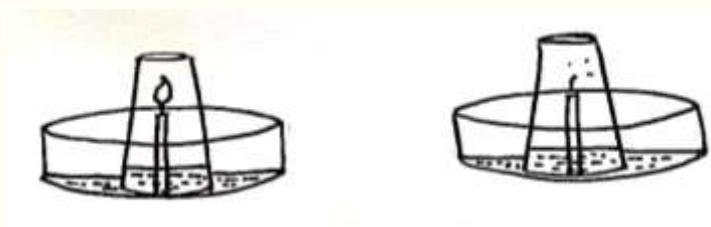


Fig. 10.1 – Presence of oxygen in air



समुत्ये महतीरपः सं क्षोणी समु सूर्यम्

(ऋग्वेद 8/7/22)

According to the Rigveda, Marut (air) holds water, and the whole earth is being sustained by water.

3. Carbon dioxide gas (CO₂) -

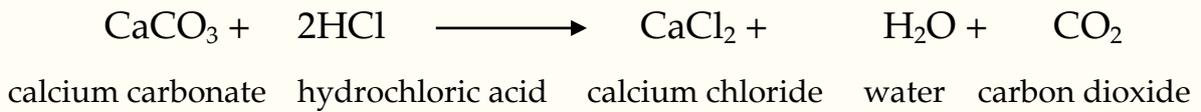
All living beings release carbon dioxide gas into the atmosphere after respiration and after combustion of substances, carbon dioxide gas is released into the atmosphere. Carbon dioxide gas is present in 0.03% of the total amount of air.

Uses of carbon dioxide gas –

1. In making soft drinks
2. As a fire extinguisher
3. In the form of dry ice
4. In the process of making food of plants

Formation of carbon dioxide gas –

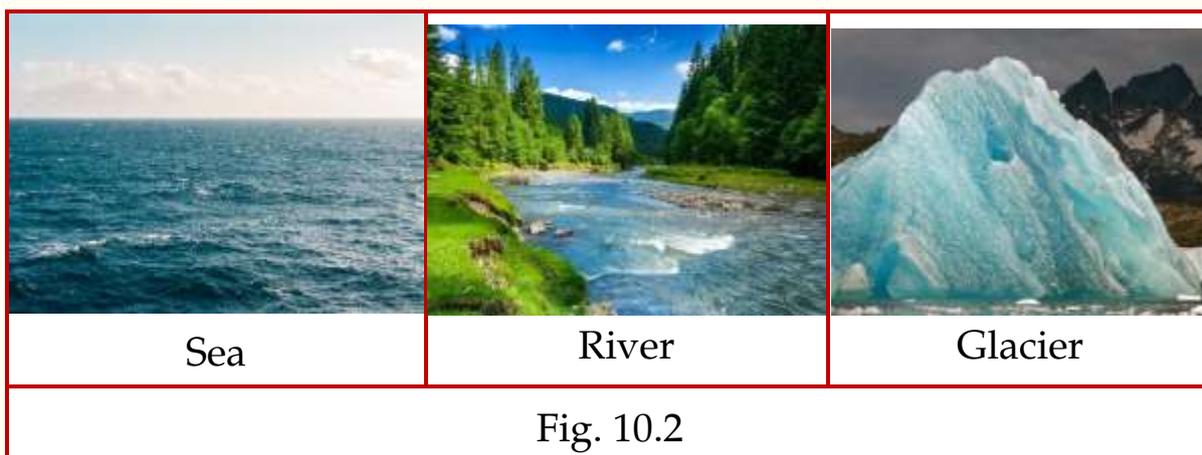
Carbon dioxide can be prepared by the action of dilute hydrochloric acid with calcium carbonate (marble). This reaction occurs at room temperature.



4. Water vapor -

Water vapor is formed from water by evaporation and water vapor is converted back into water by condensation method. Water vapor is present in the atmosphere.

Water vapor is obtained from the following sources – oceans, lakes, rivers, wet soil, plants, snow rivers, snow etc. The energy received from the sun continuously converts water into water vapour.



5. Dust and smoke -

Smoke is generated after the combustion of substances; some gases and fine particles are present in the smoke. Dust particles hit your face when strong wind blows. Hence dust particles are present in the air. In addition to the above-mentioned components of air (nitrogen, oxygen, carbon dioxide, water vapor etc.) other gases (about 0.97%) such as carbon monoxide, sulfur dioxide etc. are also present in our atmosphere.

Properties of air -

Air is colourless, odorless and tasteless. It occupies space, carries weight and exerts pressure.

Uses of air -

- It is necessary for the respiration of living beings.
- Helps in combustion of substances.
- Wind helps in causing rain.
- Wind mill converts wind energy into electrical energy with the help of wind.
- Wind helps in pollination of flowers.
- Air helps birds to fly.

Water -

71% of our earth (about $\frac{3}{4}$ part) is covered with water. Out of the water available on the surface of the earth, 97% of the water is in the seas and oceans, which is not potable. Only 3% of the water is potable.

Components of water

Water is formed when two atoms of hydrogen and one atom of oxygen combine. Its formula is H₂O .

शं नो देवीरभिष्टय आपो भवन्तु पीतये । शं योरभि स्रवन्तु नः ॥

(अथर्ववेद 1.6.1)

In this mantra of Atharvaveda, water has been described as having divine qualities and drinking water is mentioned.

अप्सु मे सोमो अब्रवीदन्तर्विश्वानि भेषजा ।

अग्निं च विश्वशंभुवम् ॥

(अथर्ववेद 1.6.2)

In this Atharvavedic mantra, it has been told that medicines and fire (energy) reside in water.

शं न आपो धन्वन्याः शमु सन्त्वनूप्याः ।

शं नः खनित्रिमा आपः शमु याः कुम्भ आभृताः

शिवा नः सन्तु वार्षिकीः ॥

(अथर्ववेद 1.6.4)

In this mantra of Atharvaveda, water obtained from desert land, water obtained by digging a well, water filled in a pitcher, water obtained from rain is mentioned to be beneficial for us.

Sources of water -

Rivers, lakes, springs, stepwells, ponds, wells, handpumps (tube wells) are the main sources of drinking water.

Physical and chemical properties of water -

Odorless, colorless, and transparent liquid at normal temperature and pressure. The freezing point of water is 0⁰C and the boiling point is 100⁰C. Water is a great solvent, it dissolves other substances in itself.

Activity - 2

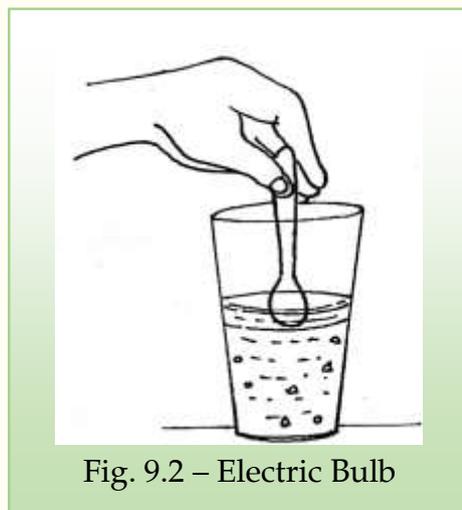
Take water in a glass and mix one spoon of salt in it and stir. After some time we see that all the particles of salt get dissolved in the water.



Hence salt is completely soluble in water. Hence water is a universal solvent.

Uses of water

- Water is used in irrigation work.
- Water is used in our daily activities like taking bath, evening prayer, cleaning, washing clothes, cooking food, drinking water etc.
- Water helps in digestion of food in our body.
- Water is used in the operation of industrial factories.



The water cycle -

The Water of oceans, rivers, ponds etc. gets heated by the rays of the sun and rises up in the form of vapor. This water vapor cools down and forms clouds and through rain this water comes back to the water sources. This cycle is called water cycle.

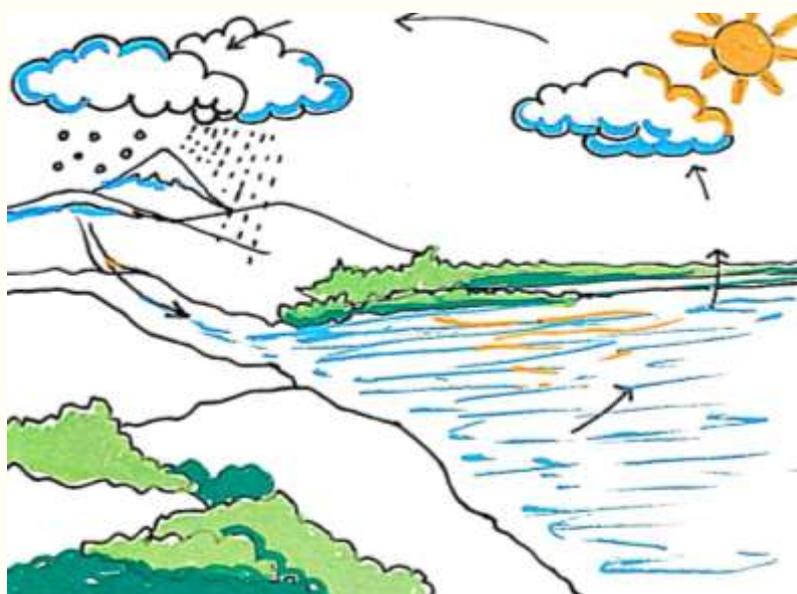


Fig. 10.4 - Water cycle

Water harvesting

The process of collecting and storing rainwater is called water harvesting.

Methods of water harvesting -

1. To make the rainwater collected on the roof of the house leak into the ground by digging it in the ground with the help of pipes.
2. Storing rainwater in wells, rivers and ponds.
3. Construction of dams on rivers.

Soil -

The upper layer of the earth, called soil, is formed by a mixture of different substances formed by the disintegration of rocks and minerals and by the decomposition of vegetation and animals. Soil is made up of many different layers. In the uppermost layer rotten materials are present, they are called humus. Different types of particles are found in soil. Soil can be classified based on particles as follows-

1. Sandy soil -

It contains 20-50% sand particles and 50-80% clay particles. The particles of this type of soil are large and light in size.

2. Clayey soil -

This type of soil is formed by the combination of fine particles.

3. Loamy soil -

This type of soil is made up of a mixture of clayey silt and sand particles.

Soil erosion -

It is a naturally occurring physical process, in which the top soil particles of the land are carried away by wind and water, is called soil erosion.

Soil Conservation -

Soil conservation is necessary to prevent the occurrence of soil erosion. The following are the measures for soil conservation-

1. Through tree plantation
2. By making terraced fields

3. By conservation of natural forests

Formation of clouds

Clouds are formed in the sky due to the following reasons –

1. When the hot air rises up and spreads all around.
2. When the quantity (volume) of air increases.
3. When the air is cooled below the freezing point
4. When water vapor in the air condenses on the microscopic salt particles present in the air.

Occurrence of rain – When the drops of condensed water become very heavy, they fall on the earth in the form of rainwater. The water vapor mixed in the air reaches the freezing point due to condensation when it comes in contact with cold substances. When the temperature of the air falls below the dew point, then water vapor starts falling on the ground in the form of water drops or hail. This is called rain.

चतुष्टय्य आपो गृह्णाति । चत्वारि वा अपा रूपाणि । मेघो विद्युत् । स्तनयित्नुर्वृष्टिः ।
तान्येवावरुन्धे । आतपति वर्ष्या गृह्णाति । ताः पुरस्तादुपदधाति ।
एता वै ब्रह्मवर्चस्या आपः ।

(तैत्तिरीय आरण्यक 1.24.99)

In Tetriay Aranyak Mantra four forms of water are mentioned: Clouds, Lighting, Thunder and Rain.

Practice Work

Q.1 Select the correct option -

- Which gas is required for the combustion of substances?
(a) Nitrogen (b) Carbon dioxide
(c) oxygen (d) Chlorine
- Which gas do plants take during photosynthesis?
(a) Oxygen (b) Nitrogen
(c) Carbon dioxide (d) Helium
- What is the percentage of Nitrogen gas in our atmosphere?
(a) 21% (b) 60%
(c) 78% (d) 52%

Q.2 Fill in the blanks -

- The part of the earth is covered with water.
- The upper layer of land is called
- Living beings take in gas during respiration.

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

- Water can be stored by making dams on the rivers.
- Soil erosion can be stopped by planting trees.
- Air is necessary for the combustion of substances.

Q.4 Match the correct pair.

- | Column 'A' | Column 'B' |
|--|-------------|
| 1. Helpful in the growth of plants | a. Oxygen |
| 2. Necessary in the respiration of living beings | b. Nitrogen |
| 3. Freezing point of water | c. 100°C |
| 4. Boiling point of water | d. 0°C |

Q5 Very short answer type questions-

1. Write the names of the components of air present in the atmosphere?
2. Tell the components of water?

Q.6 Short Answer Type Questions -

1. What is soil erosion?
2. Write the measures to prevent soil erosion ?
3. Write the uses of water.
4. Write the uses of air.

Q.7 Long answer type questions-

1. What is water harvesting? Write the methods of water harvesting.

Project work -

1. Prepare a model for water conservation in your school.



आदर्श प्रश्नपत्र / Model Que. Paper : II/23-24/विज्ञान/

वेदभूषण द्वितीय-वर्ष / Vedabhusan Second Year/

कक्षा 7वीं/ प्रथमा - II / Class 7th / Prathama - II

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.

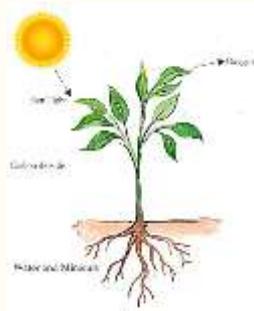
सही विकल्प का चयन कीजिए / Choose the correct option - $10 \times 2 = 20$

नोट – दिए गए प्रश्नों में 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 प्रकाश संश्लेषण की क्रिया के लिए आवश्यक है -

Which of the following is essential for the process of photosynthesis?



(i) क्लोरोफिल

Chlorophyll

(iii) कार्बन डाइऑक्साइड

Carbon dioxide

(ii) ऑक्सीजन

Oxygen

(iv) जल एवं खनिज लवण

Water and Minerals



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

2. निम्न में से मानव पाचन तन्त्र के/का अङ्ग है -

Which of the following is/are part of the human digestive system?

- (i) क्षुद्रांत्र (ii) मुख (iii) आमाशय (iv) वृक्क
 Small intestine Mouth Stomach Kidney

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

3. निम्न में से ऊष्मा चालक पदार्थ है -

Which of the following is the heat conducting material?

- (i) लकड़ी (ii) लोहा (iii) प्लास्टिक (iv) ताँबा
 Wood Iron Plastic Copper

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

4. सुवर्णं रजतं ताम्रं तीक्ष्णं वज्रभुजङ्गमाः ।

लोहकं षड्विधं तच्च यथपूर्वं तदक्षयम् ॥ (रसार्णव - 7.89.90)

उपर्युक्त श्लोक में किस धातु को सबसे अधिक अक्षय बताया गया है -

Which metal has been described as the most renewable in the above shloka -

- (i) ताँबा (ii) लोहा (iii) सीसा (iv) सोना
 Copper Iron Lead 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. निम्न में से नाइट्रिक अम्ल का उपयोग किन कार्यों में किया जाता है -
In which of the following works Nitric acid is used -

- | |
|---|
| (i) उर्वरक निर्माण में
In the manufacture of fertilizers |
| (ii) चाँदी को शुद्ध करने में
In the purification of silver |
| (iii) नमक के शोधन में
Refining salt |
| (iv) विस्फोटक बनाने में
Making explosives |

- | | |
|---|---|
| (अ) (i), (ii) और (iv)
(i), (ii) and (iv) | (ब) केवल (iii)
Only (iii) |
| (स) केवल (ii)
Only (ii) | (द) (i), (ii) और (iii)
(i), (ii) and (iii) |

6. निम्न में से रासायनिक परिवर्तन है -
Which of the following is a chemical change -

- | | |
|--|---|
| (i) बर्फ का पिघलना
Melting of ice | (ii) कागज को मोड़ना
Folding of paper |
| (iii) दूध का दही बनाना
Curdling of milk | (iv) लोहे पर जङ्ग लगना
Rusting of iron |
| (अ) केवल (iii)
Only (iii) | (ब) केवल (iv)
Only (iv) |
| (स) (i), (ii), (iii) तीनों | (द) (iii) और (iv) |

(i), (ii), (iii) all the three (iii) and (iv)

7. तडित चालक बनाने में किस धातु का उपयोग किया जाता है -

Which metal is used in making lightning conductor -

(i) सोना (ii) सोडियम (iii) लोहा (iv) ताँबा
Gold Sodium Iron Copper

(अ) केवल (i) (ब) केवल (iv)
Only (i) Only (iv)

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

8. प्र ते भिनद्धि मेहनं वत्रं वेशन्त्या इव ।

एवा ते मूत्रं मुच्यतां बहिर्बालिति सर्वकम् ॥ (अथर्ववेद 1.3.7)

उपर्युक्त वेद मन्त्र में किस चिकित्सा के बारे में उल्लेख है -

Which treatment is mentioned in the above Veda Mantra?

(i) दन्तचिकित्सा (ii) नेत्रचिकित्सा
Dentistry Ophthalmology

(iii) मूत्ररोग चिकित्सा (iv) मुखरोग चिकित्सा
Urology Oral medicine

(अ) केवल (i) (ब) केवल (ii)
Only (i) Only (ii)

(स) केवल (iv) (द) केवल (iii)
Only (iv) Only (iii)

9. कथन (A) – वृक्कों का प्रमुख कार्य रक्त के प्लाज्मा को छानकर रक्त को शुद्ध बनाना है -

Assertion (A) – The main function of the kidneys is to purify the blood pure by filtering the blood plasma.

कथन (R) – मनुष्यों में एक जोड़ी वृक्क होता है ।

Reason (R) – There is a pair of kidneys in humans.

(अ) A एवं R दोनों सही हैं । 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 नहीं 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) - ताँबा धातु का उपयोग विद्युत तार बनाने में किया जाता है ।

Assertion (A) - Copper metal is used for making electric wire.

कथन (R) - ताँबा धातु, विद्युत का अच्छा सुचालक है ।

Reason (R) - Copper metal is a good conductor of electricity.

(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 नहीं 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× 1= 5

11. क्योंकि हरे पादप अपना खाद्य स्वयं बनाते हैं, इसलिए उन्हें पादप कहते हैं।

Because green plants make their own food, they are called plants.

12. स्टील की कड़ाही में ताँबे की तली लगाई जाती है, क्योंकि ताँबा ऊष्मा का अच्छा है।

A copper bottom is used in a steel pan, because copper is a good of heat.

13. क्षार लाल लिटमस पत्र को कर देते हैं।



Alkalis turn red litmus paper to

14. लोहें को जंग से बचाने के लिए की परत चढ़ाते हैं ।

To protect iron from rust, a layer of is applied.

15. गतिशील वायु कहलाती है।

Moving air is called

16 सही जोड़ी का मिलान कीजिए /Match the correct Column – 5 x 0.5 = 2.5

स्तम्भ क /Column A	स्तम्भ ख/Column B
(i) स्वपोषी Autotrophs	(अ) कवक Fungi
(ii) परपोषी Host	(ब) अमरबेल Dodder
(iii) परजीवी Parasite	(स) गर्मियाँ Summer
(iv) मृतजीवी Saprophyte	(द) मानव Human
(v) गहरे रङ्ग के कपड़े पहनने का समय Time to wear dark colored clothes	(य) हरे पौधे Green plants
	(र) सर्दियाँ Winters

.17 सही जोड़ी का मिलान कीजिए /Match the correct Column – 5 x 0.5 = 2.5

स्तम्भ क /Column A	स्तम्भ ख/Column B
(i) सोडियम क्लोराइड Sodium chloride	(अ) CaO CaO
(ii) खाने का सोडा Baking soda	(ब) NaCl NaCl
(iii) बिना बुझा चुना	(स) NaHCO ₃



	Slaked lime		NaHCO ₃
(iv)	विद्युत से चलने वाली युक्ति Electrically operated device	(द)	लकड़ी Wood
(v)	कुचालक पदार्थ Non-conducting material	(य)	रेफ्रिजरेटर Refrigerator
		(र)	पवन चक्की Wind mill

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

Consider the following statements –

- (i) प्रकाश संश्लेषण के प्रक्रम में आक्सीजन गैस निर्मुक्त होती है ।
Oxygen gas is released in the process of photosynthesis.
- (ii) भूकंप की तीव्रता को रिक्टर स्केल पर मापा जाता है।
The intensity of an earthquake is measured on the Richter scale.
- (iii) पौधों में भोजन का परिवहन जाइलम के द्वारा होता है।
Food is transported through xylem in plants.
- (iv) धातुएँ विद्युत की कुचालक होती है।
Metals are poor conductors of electricity.
- (v) शुद्ध जल का पी.एच. मान 7 होता है।
The PH value of pure water is 7.

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

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

- | | | | |
|----|-----------------------|----|--------------------------|
| अ. | i और iii
i and iii | ब. | i, ii, v
i, ii, v |
| स. | i और v
i and v | द. | iii, iv, v
iii, iv, v |

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



Consider the following statements –

- (i) शैवाल एवं कवक में सहजीवी सम्बन्ध है।
There is a symbiotic relationship between algae and fungi.
- (ii) तड़ित झंझावात से बचने के लिए अपने घर से बाहर निकलना चाहिए।
One should come out of his house to avoid a thunderstorm.
- (iii) पौधे जड़ों के माध्यम से अपना श्वसन पूर्ण करते हैं।
Plants carry out their respiration through roots.
- (iv) कुत्ता एक सर्वाहारी प्राणी है।
Dog is an omnivorous animal.
- (v) लोहे का उपयोग विद्युत तार बनाने में किया जाता है।
Iron is used for making electric wire.

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

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

- | | |
|--------------------------|-----------------------------|
| अ. i और iv
i and iv | ब. i, ii, v
i, ii, v |
| स. ii और iv
ii and iv | द. 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. किन्हीं दो प्राकृतिक सूचकों के नाम लिखिए।

Write the names of any two natural indicators.

21. जल के अवयव बताइए।

Write the components of water.



22. किसी एक चालक पदार्थ का नाम बताइए।

Write the name of any one conducting substance.

23. विद्युत बल्ब में कौन-सी गैस भरी जाती है।

Which gas is filled in electric bulb?

24. RBC का पूरा नाम क्या है ?

What is the full form of RBC?

लघूत्तरीय प्रश्न

5 x 3 = 15

Short Answer Type Questions

25. अम्ल एवं क्षारक में अन्तर स्पष्ट किजिए । सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

Explain the difference between acid and base. Write the related Veda mantra or shlok.



मन्त्र या श्लोक/ Mantra or Shloka

26. चक्रवात का निर्माण कैसे होता है? चक्रवात से सम्बद्ध वेद मन्त्र या श्लोक लिखिए ।

How is cyclone formed? Write the Veda mantra or shloka related to cyclone.

मन्त्र या श्लोक/ Mantra or Shloka

27. हृदय स्पन्दन क्या है?

What is heart beat?

28. कीटों में श्वसन प्रक्रिया को समझाइए ।

Explain the process of respiration in insects.



29. धमनियाँ क्या कार्य करती हैं ?

What are the function of arteries?

विवरणात्मक प्रश्न

5 x 4 = 20

Descriptive Questions

30. जल संग्रहण किसे कहते हैं ? जल संग्रहण की विधियाँ लिखिए ।

What is water harvesting? Write the methods of water harvesting.

31. मृदा का संरक्षण किस प्रकार किया जा सकता है। मृदा (भूमि) से सम्बद्ध वेद मन्त्र या श्लोक लिखिए।



37. कार्बन डाइआक्साइड गैस के निर्माण की विधि तथा इसके उपयोग लिखिए।

Write the method of manufacture of carbon dioxide gas and its uses.

38. जल चक्र को सचित्र समझाइए।

Explain the water cycle with diagram.

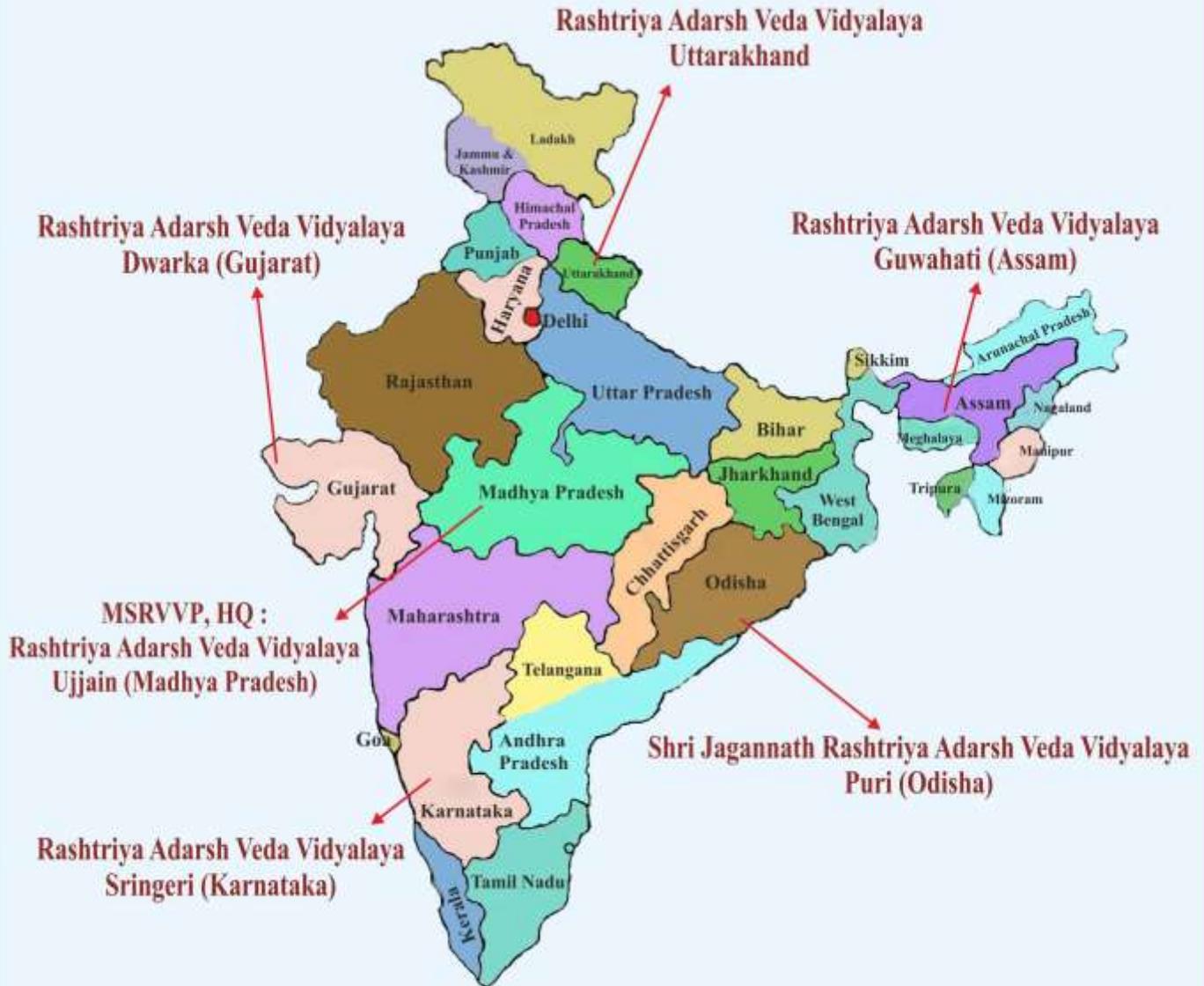
चित्र/Diagram



व्याख्या/Explanation

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