

HIGHLY RECOMMENDED

2023

 **OSWAAL BOOKS®**
LEARNING MADE SIMPLE



NCERT

ONE FOR ALL

for **UPSC & State PSC's**

[Relevant for other competitive exams also]

GENERAL SCIENCE

CLASSES 6-12

(Old & New NCERT edition)



With this book, get free access to

- 10+ hours of NCERT Video Course
- Online assessments on www.Oswaal360.com

The **ONLY** Hybrid book to ace NCERT

1

100% Useful

For UPSC, State PSCs and other Competitive Exams

2

Extensive Practice

With 1500+ MCQs

3

Crisp Revision

With NCERT Chapter-wise Summary covering all Important Concepts

4

Concept Clarity

With 100% Solved Questions with Detailed Explanations

5

100% Exam Readiness

With 3 levels of MCQs Moderate, Advanced & Previous Years' Qs



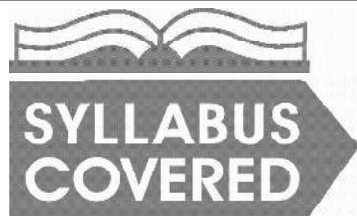
1st EDITION

YEAR 2023



ISBN

“9789356347656”



UPSC

(UNION PUBLIC SERVICE COMMISSION)



COPYRIGHT
RESERVED
BY THE PUBLISHERS

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without written permission from the publishers. The author and publisher will gladly receive information enabling them to rectify any error or omission in subsequent editions.



PUBLISHED BY

OSWAAL BOOKS &
LEARNING PVT. LTD.



1/11, Sahitya Kunj, M.G. Road,
Agra - 282002, (UP) India



1010, Cambourne Business Centre
Cambridge, Cambridgeshire
CB 236DP, United kingdom



0562-2857671



contact@oswaalbooks.com



www.OswaalBooks.com

DISCLAIMER

This book is published by Oswaal Books and Learning Pvt Ltd (“Publisher”) and is intended solely for educational use, to enable students to practice for examinations/tests and reference. Any practice questions and/or notes included by the Publisher are formulated by placing reliance on previous question papers and are in keeping with the format/pattern/guidelines applicable to such papers.

The Publisher expressly disclaims any liability for the use of, or references to, any terms or terminology in the book, which may not be considered appropriate or may be considered offensive, in light of societal changes. Further, the contents of this book, including references to any persons, corporations, brands, political parties, incidents, historical events and/or terminology within the book, if any, are not intended to be offensive, and/or to hurt, insult or defame any person (whether living or dead), entity, gender, caste, religion, race, etc. and any interpretation to this effect is unintended and purely incidental. While we try to keep our publications as updated and accurate as possible, human error may creep in. We expressly disclaim liability for errors and/or omissions in the content, if any, and further disclaim any liability for any loss or damages in connection with the use of the book and reference to its contents”.

CONTENTS

■ Preface	5 - 5
■ Importance of NCERT books for UPSC and other government exams	6 - 6
■ Approach to read NCERT Books for UPSC and other government exams	7 - 7

Class-VI

1. Physics	1 - 6
● Motion and Measurement of Distances	
● Light, Shadows and Reflections	
● Electricity and Circuits	
● Fun with Magnets	
2. Chemistry	7 - 12
● Fibre to Fabric	
● Sorting Materials into Groups	
● Separation of Substances	
● Changes Around Us	
● Air Around Us	
3. Biology	13 - 24
● Food: Where Does it Come From?	
● Components of Food	
● Getting to Know Plants	
● Body Movements	
● The Living Organisms and their Surroundings	
● Water	
● Garbage in, Garbage out	

Class-VII

1. Physics	25 - 36
● Winds, Storms and Cyclones	
● Motion and time	
● Electric Current and its Effects	
● Light	
● Heat	
2. Chemistry	37 - 45
● Fibres to Fabric	
● Acids Bases and Salts	
● Physical and Chemical Changes	
3. Biology	46 - 72
● Nutrition in Plants	
● Nutrition in Animals	
● Weather, Climate and Adaptations of Animals of Climate	
● Soil	
● Respiration in Organisms	
● Transportation in Animals and Plants	
● Reproduction in Plants	

- Water: A Precious Resource
- Forests – Our Lifeline
- Wastewater Story

Class-VIII

1. Physics	73 - 98
● Force and Pressure	
● Friction	
● Sound	
● Chemical Effects of Current	
● Some Natural Phenomena	
● Light	
● Stars and the Solar System	
2. Chemistry	99 - 114
● Synthetic Fibres and Plastics	
● Materials: Metals and Non-Metals	
● Coal and Petroleum	
● Combustion and Flame	
● Pollution of Air and Water	
3. Biology	115 - 138
● Crop Production and Management	
● Microorganisms - Friend and Foe	
● Conservation of Plants and Animals	
● Cell - Structure and Functions	
● Reproduction in Animals	
● Reaching The Age of Adolescence	

Class-IX

1. Physics	139 - 161
● Motion	
● Force and Laws of Motion	
● Gravitation	
● Work and Energy	
● Sound	
2. Chemistry	162 - 180
● Matter in our Surroundings	
● Is Matter Around us Pure	
● Atoms and Molecules	
● Structure of the Atom	
3. Biology	181 - 211
● Tissues	

- Diversity in Living Organisms
- Why do we Fall Ill?
- Natural Resources
- Improvements in Food Resources

Class-X

1. Physics 212 - 245
 - Light-Reflection and Refraction
 - The Human eye and the Colourful World
 - Electricity
 - Magnetic Effects of Electric Current
 - Sources of Energy
2. Chemistry 246 - 286
 - Chemical Reactions and Equations
 - Acids, Bases and Salts
 - Metals and Non-Metals

- Carbon and Its Compounds
 - Periodic Classification of Elements
3. Biology 287 - 324
 - Life Processes
 - Control and Coordination
 - How Do Organisms Reproduce?
 - Heredity and Evolution
 - Our Environment
 - Sustainable Management of Natural Resources

Important Topics of Class XI & XII Science

1. Biotechnology: Principles and Processes 325 - 337
2. Chemistry in Everyday Life 338 - 345
3. Human Health and Disease 346 - 360

□□

We can't let you miss out on this!

Keep yourself updated!
For the latest UPSC updates
throughout the Academic year
2022-23 Scan the QR code below

PREFACE

The will to win, the desire to succeed, the urge to reach your full potential, these are the keys that will unlock the door to personal excellence - Confucius

Introduction

More than 10 lakh candidates appear for competitive examinations like the Civil Services Examination (CSE), State Public Service Commission Examinations (PSCs), and other government examinations. These examinations call for rigorous and robust preparation, meticulous practice, and discipline. Often candidates ignore comprehensive resources like NCERT books in favour of more well known and popular resources, thus missing out an important element that can provide them the extra edge in preparation.

The *One for All NCERT Question Bank* is an objective question bank for competitive examinations at the national and state level, covering Economics, History, Geography, Polity and General Science. It is one of the most important books any candidate can add to his/her examination preparation portfolio.

How will this book benefit students?

The *One for All NCERT Question Bank* has been developed with competitive examinations in mind, like UPSC, State PSCs and other competitive examinations. It has complete coverage of the NCERT syllabus, with chapter wise summary to cover all important points. Questions are structured exactly as per the exam pattern, and also feature 100% detailed solutions, aiding students to understand their preparation gaps. It features chapter wise MCQs in level, with the moderate level featuring questions from state PSCs and other government examinations, and the advance level featuring questions from the UPSC examinations. Previous years question papers of all relevant exams (UPSC, State PSC, amongst others) have been included to equip students with previous question paper pattern. This book also includes comprehensive video course of 10+ hours which makes it one of its own kind of a book.

This book has been developed with the highest editorial standards, keeping in mind the rigor and the meticulousness of resources catering to competitive examinations. The features of the book make it a must-have for anyone preparing for any competitive examination.

We also wish to thank **Ms. Anshu Pandey** who made this book a valuable addition to the Oswaal Knowledge family. Their expert knowledge, advice and recommendations will help our readers gain valuable insights and knowledge and secure a high rank in these competitive examinations.

We wish the readers great success ahead!

All the best!
Team Oswaal

Importance of NCERT Books for UPSC and other government exams

Introduction

Books published by the National Council of Educational Research and Training (NCERT) are usually not considered to be top of mind when it comes to preparing for competitive examinations like Civil Services Examinations (CSE), Combined Defence Services (CDS), exams conducted by National Defence Academy (NDA) and Central Armed Police Forces (CAPF). However, this is a fallacy that can cost any student dearly, not just in terms of ranks secured in the examination, but even qualifications. NCERT books are by far the most comprehensive and reliable source of information that can elevate the level of preparation a candidate has for any of the above competitive examinations.

Here are five reasons why NCERT books should be among the go-to resources for preparing for competitive examinations.

1. Credibility

NCERT books are an authentic source of information as the books are authored by reputed, credible experts, and the information published is sourced from credentialed government reports, ministries agencies, and institutions. If a candidate prepares using any NCERT textbook, then s/he can be rest assured that the content is factually correct, updated, and accurate. In competitive examinations, where a single mark difference can be crucial, factual accuracy is a huge differentiator and determinant of qualification and rank.

2. Comprehensive

NCERT books are comprehensive and reliable. The language in NCERT books is lucid and easily understandable. The books provide a basic idea of all the concepts, provide detailed explanations where necessary, and aid in the understanding of complex topics. Most examinations rely on NCERT topics for question selection and topic coverage and missing out on NCERT books can cost candidates dearly.

3. Research-driven

NCERT books are authored by subject matter experts and specialists who have decades of experience in their chosen fields. The content in NCERT books is authored after extensive research done by authors, co-authors, editors, and support staff. Usually, the authors are eminent experts, professors of reputed academic universities, and research institutions.

5. Authentic

NCERT books are almost error-free. The content is checked times before it is published. There is an extensive editorial team that supports the publication of all books and hence the content and editorial quality are of the highest standard.

Conclusion

Candidates preparing for competitive examinations cannot afford to give NCERT books a miss. Authored by experts and backed by research, these books aid in bridging the learning curve as they are quite lucid and easy to understand. Having a good grasp and understanding of the basics can improve the confidence level of the candidates during preparation and spur them to secure better marks and rank.

Aashirvad Kumar

UPSC Consultant-Oswaal Books

Faculty SPM IAS Academy, Guwahati, 6 years of Teaching experience,

3 UPSC Interviews

Mentored Multiple Single digit Ranks in UPSC

Approach to read NCERT Books for UPSC and other government exams

Introduction

The Civil Services Examination (CSE) conducted by the Union Public Service Commission (UPSC) for appointments into the elite branches of civil services of the Government of India is considered one of the most rigorous and demanding examinations in India.

The intake applications rate for UPSC is quite high – every year around 900,000 to 1,000,000 candidates apply every year. Candidates feel daunted, and sometimes are unsure of getting the right rank even if they have the right preparation, because of the sheer number of candidates appearing in the examination. Often in an attempt to read more current resources, candidates miss out on reading the most comprehensive resources already at their disposal, books published by the National Council of Educational Research and Training (NCERT).

Here are a few strategies for how NCERT books can be leveraged for CSE preparation.

1. Coverage strategy

It is advised to cover the NCERT books subject-wise from Class VI to XII. For example, for history, you may want to start with the textbook for Class VI, moving on to VII, VIII, and so on. This will give you subject continuity and help you build your understanding chronologically. It is also recommended to build interlinks between your knowledge of the subject from a previous class while reading the textbook of the next class. To further consolidate your preparation, solve MCQs from another book to help cement your understanding of the subject further.

2. Visual assets

For subjects like geography and biology, visual assets are very important. Diagrams provided in NCERT textbooks are very important for these subjects. Some of the representations are relevant for the main of various state public service examinations.

3. Subject-specific strategies

It is imperative to give special attention to some subjects such as geography, and science (environment science sections). Questions from these topics are frequently asked in the examination and preparing from NCERT ensures that your subject knowledge is current, authentic, and up to date.

Conclusion

Candidates preparing for UPSC need to leverage every resource for strategic competitive advantage. Preparation with NCERT books can give candidates the necessary edge. To help candidates improve their confidence while attempting UPSC, Oswaal Books is launching NCERT summaries from Class VI-XII. This power-packed resource will help save time by highlighting the necessary sections for UPSC preparation as well as give candidates confidence that they have covered everything. This best-in-class resource will give candidates a tremendous advantage as they are a derivative of the research-backed NCERT books but are condensed for UPSC preparation.

Aashirvad Kumar

UPSC Consultant-Oswaal Books

Faculty SPM IAS Academy, Guwahati, 6 years of Teaching experience,

3 UPSC Interviews

Mentored Multiple Single digit Ranks in UPSC

EXCLUSIVE SCHOOL BOOKS SUPPLIERS

VJAYAWADA	ANDHRA PRADESH Sri Vikas Book Centre, 9848571114, 9440715700, Sri Kanka Durga Book Stall, 9603491009 ASSAM Dutta Book Stall, 8729948473	PUNE Pravin Sales, 9890683475, Sai Shubham, 9975687678	DHULE Navjeevan Book Stall, 9422296434
WEST KAMENG	JHARKHAND Bharti International, 06432359136, 9431132051	JALNA Anil Paper Mart, 9422722522, (02482) 230733	UTTAR PRADESH Maheshwari Pustak Bhandar, 9760602503
DEOGHAR	KARNATAKA Palasandra Promoters, 9448214377, (0816) 2273220 Sree byraveshawara book Depot, 9880561081,	AGRA TAMIL NADU Bookmark-IT, 7305151653	TELANGANA Sri Balaji Book Depot , 9676996199, (040) 27613300, Shri Sharada Store & Stationers, 9000400069
TUMKUR	MADHYA PRADESH Adithi Distributor, 9229171880	CHENNAI WEST BENGAL United Book House, 9831344622	KOLKATA Schoolwale & Company, 9731715655
BANGLORE	MAHARASHTRA Ashish Book Depot, 7798420420	WEST KEVVERY	

OUR DISTRIBUTORS

VISAKHAPATHAM	ANDHRA PRADESH JBD Educational, 9246632691, 9246633693	LATUR Yash Book House, 9637936999	KOLHAPUR Granth the Book World, 9922295522
PORTBLAIR	ANDAMAN & NICOBAR ISLAND Krishna Book Centre, 9474205570	NASHIK New India book House, 9623123458, 7448123456	NAGPUR Laxmi Pustakalay and Stationers, (0712) 2727354, Vijay Book Depot, 9860122094, (0712) 2534217, Renuka Book distributor, 9765406133, Novelty Book Depot, 9657690220
GUWAHATI	ASSAM Book Emporium, 9675972993, 6000763186, Ashok Publication, 7896141127 Kayan Enterprises, (0361) 2630443, Central Book Agency, 99547107165, Orchid Book house, 9864624209	DHULE Shri Ganesh Pustakalaya, 9423131275	YAVATMAL ODISHA A. K. Mishra Agencies, 9437025991, 9437081319
PATNA	BIHAR Bokaro Student Friends, (0612) 2300600, 2618400, Gyan Ganga Ltd., 9304826651	CUTTACK M/s Pragnya, 684788616, 9437943777, Padmalaya, 9437026922	BHUBANESHWAR Bidyashree, 9937017070
	Nova Publisher & Distributors, (0612) 2666404, Shri Durga Pustak Mandir, 9334477386, Vikas Book Depot, 9504780402 Sharda Pustak Bhandar, 9334259293	BARIPADA Students corner, 7008435418	KEONJHAR Sindhu book Depot, 9425275763, 9981935763
MADHUBANI	Krishna Book Agency, 9801019292	RAIGARH Sibani Book Store, 8763340822	BRAHMAPUR PUNJAB Adarsh Enterprises, 9814347613
PURNEA	Chaurasia book centre, 7004456102	PATIALA Cheap Book Store, 987223458, 9878258592, City Book Shop, 9417440753	JALANDHAR Gaurav Book World, 9478821183, Subhash Book Depot, 9876453625
RAIPUR	CHATTISGARH Shri Ramdev Traders, 9981761797	LUDHIANA Mahindra Book Depot, 9814920226	CHANDIGARH RAJASTHAN Perfect Stationers & Gen. Shoppe, 9829863904
RAIGARH	Sindhu Book Depot, 9425275763, 9981935763	KOTA Vardhman Book Depot, 9571365020, Bhandari Stationers, 9001094271	NAKODI Nakoda Book Depot, (01482) 243653, 9214983594
DELHI	Mittal Books, (011) 23288887, 9899037390, Shyam Brother, 9313619935 Bokaro.Student Friends Pvt Ltd., 7004074900, R. D. Chawla & Sons, 9899445522	BHILWARA J K Enterprises, 9460983939, 9414782130, Ravi Enterprises, 9829060694	JAIPUR Saraswati Book House, (0141) 2610823, 9829811155
GOA	GOA Golden Heart Emporium, (0832) 2725208, 9370273479	TRIPURA Book Corner, 8794894165, 8984657146	AGARTALA TAMIL NADU Majestic Book House, (0422) 2384333
AHMEDABAD	GUJARAT Patel Book, 9898184248, 9824386112, 9825900335	COIMBATORE Arraba Book Traders, (044) 25387868, 9841459105, M.R. Book Store (044) 25364596, Indian Book House, (044) 24327784, 9094129595,	CHENNAI Kalaimagal Store, (044) 5544072, 9940619404, Vijaya Stores, 9381037417
VAPI	Shalibhadra Stationers, 9904477855, Zaveri Agency, 9979897312, 9979890330	CHENNAI Sasta Sahitya Sadan, 9450029674, Shree Pustak Vatika, 6392555866	CHENNAI Bookmark It-Books & Stat. Store, 7305151653, M.K. Store, 9840030099
VALSAD	Goutam Book Sellers, 9081790813	CHENNAI Tiger Books Pvt. Ltd., 9710447000	CHENNAI Sri Saraswathi Book Stall, (04132) 222283, 9092626287
NAVSARI	Mahavir Stationers, 9429474177	PUDUCHERRY Pattu book centre, 9894816280	SALEM Rasi Publication, 9894816280
SURAT	College Store, 8141913750, 9825099121 Kazi Brothers, 7984880995, Shopping Point, 0261-2230097	TRICHY Maya Book Centre, 9443929274	THENI TELANGANA
ROHTAK	HARYANA Swami Kitab Ghar, 9255121948	HYDERABAD Sri Balaji Book Depot, (040) 27613300, 9866355473, Central Book Shop, 9121152053, Shah Book House, 9849564564	SECUNDERABAD UTTAR PRADESH
BALLABGARH	Kashi Ram Kishan Lal, 9289504004, 8920567245	AGRA Sparsh Book Agency, 9412257817, Manav Book world, 9358429663	AGRA Om Pustak Mandir, (0562) 2464014, 9319117771, Panchsheel Books, 9412257961, 9412257962, Mehrotra Book Agency, (0532) 2266865, 9415636890
FARIDABAD	Agarwal Book House, 9810657456	ALLAHABAD Sasta Sahitya Sadan, 9450029674, Shree Pustak Vatika, 6392555866	AZAMGARH K.B.C.L. Agarwal, 9897124960
BOKARO	JHARKHAND Bokaro Student Friends, (0654) 2233094, 7360021503	ALIGARH Deepak Book store, 9837027416, Bunty Stationers, 9412048717	BAREILLY Radhika Competition, 8923681800 Central Book House, 9935454590
DHANBAD	Bokaro Student Friends, (0326) 3590527	ETAWAH Bhanu Book Depot, 9415031340	GORAKHPUR Raj Book Dist., 9235616506
RANCHI	Bokaro Student Friends, 9234628152, Gyan Ganga Ltd., 9117889900, Crown Book Distributor & Publishers, (0651) 2213735, 9431173904 Pustak Mandir, 9431115138, Jaysree Book House, 9431350775 Vidyanthi Pustak Bhandar, 9431310228	JHANSI Vyapar Sadan, 7607102462, Om Book Depot, 7705871398	KANPUR Vidyanthi kendra Publisher & Distributor, 9554967415
DUMKA	KARNATAKA Asad Book Centre, (0484) 2370431, 9447314548, Academic Book House, (0484) 2376613	LUCKNOW Azad Book Depot Pvt. Ltd., 7317000250, Book Sadan, 9839487327, Universal Books, 8881093333, 7652043110	MEERUT Ideal Book Depot, (0121) 4059252, 9837066307
DEOGHAR	Surya Book Centre, 9847238314, H & C Store, 9864196344, Surya Book House, 9847124217, 9847238314	RENUKOOT Goyal Book Center, 9458766132, Prozo (Global Edu4 Share Pvt. Ltd), 9318395520	MATHURA Goyal Books Overseas, (0120) 4655555, 9873387003
HUBLI	Book Centre, (0481) 2566992	VARANASI Bokaro Student Friends, (0542) 2401250, 8299344607	NOIDA Om Stationers, 9838186991
BANGLORE	Academic Book House, (0471) 2333349, 9447063349, T.B.S. Publisher Distributors, (0471) 2570504	UTTARAKHAND Bookman & Company, 9935194495, Gupta Books, 9918155500	DEHRADUN Brother Pustak Bhandar, 9897833882
BELLARY	T.B.S. Publisher Distributors, 755982223	KOLKATA Oriental Publishers & Distributor (033) 40628367, Katha 'O' Kahini, (033) 22196313, 22419071, Saha Book House, (033), 22193671, 9333416484, United Book House, 9831344622, Bijay Pustak Bhandar, 8961260603, Krishna Book House, 8420431083	COOCH BEHAR S.B. Book Distributor, Cooch behar, 9002670771
KARWAR	Aman Book Stall, (0495) 2721282, Vasantha Book Stall, 9895072023		
ERNAKULAM	Adithya book house, 8606005600		
KOTTAYAM	MADHYA PRADESH Agarwal Book Depot, 9425116210, Bharti Publishers and Distributors, 7000989901		
TRIVANDRUM	Sushil Prakashan,(0731) 2503333, 2535892, 9425322330, Bhaiya Store, 9425318103 Vinay Pustak.Sadan, 8962362667, New Radhika Book Palace, 9425411533-66 Vidya Sagar Stationery Mart, 9425451565		
KOZHIKODE	MAHARASHTRA		
CALICUT			
KOLLAM			
PERUMBAVOOR			
GWALIOR			
INDORE			
JABALPUR			
SAGAR			
PUNE	Natraj Book Depot, (020) 24485054, 9890054092, Vikas Book House, 9921331187, Sai Shubham, 9975687687, 9890043496, Pravin Sales, 9890683475, New Saraswati Granth Bhandar, 9422323859, Akshar Books & Stationery, 7385089789, Vandhaman Educational, 9860574354 The Wisdom Store, 9822588775, 02025433344 Hira Stationers, 9423755472		
AHMED NAGAR			
MUMBAI	Vidyanthi Sales Agencies, 9819776110, New Student Agencies, 7045065799, Shivam Books & Stationery, (022) 28230897, 9892935799		

1

MOTION AND MEASUREMENT OF DISTANCES

Means of Transport

- From ancient times, people used different means of transport to travel from one place to another. Earlier, they used to move on foot, later on they used animals for transportation.
- Later, they designed boats of streamlined shapes imitating the shapes of the animals living in the water. They invented the wheels and animals were used to pull carts that moved on wheels.
- Beginning of the 19th century, the invention of the steam engine led to the development of new means of transport. Later automobiles, motorized boats, airplanes, and trains came.
- Measurement means the comparison of an unknown quantity with some known quantity. This known fixed quantity is called a Unit.

Standard Units of Measurements

- People also used the "foot" as a unit of length in different parts of the world
- People measured a "yard" of cloth by the distance between the end of the outstretched arm and their chin.
- In ancient India, small length measurements used were an angul (finger) or a mutthi (fist).
- In 1790, the French created a standard unit of measurement called the **metric system**. For uniformity scientists from all over the world have accepted a set of standard units of measurement called the International System of Units (SI units). The International System of Units (SI units) was set up as the convention for measurement. The SI unit of length is a metre (m).

1. $1 \text{ m} = 100 \text{ cm}$ (centimetres)

2. $1 \text{ cm} = 10 \text{ mm}$ (millimetres)

3. $1 \text{ km} = 1000 \text{ m}$ (kilometre is used to measure larger distance)

Correct Measurement of Length

- The scale must be in contact with the object along its length.
- If scales are broken or a zero mark is not visible, use another full mark of the scale. Next you must subtract the reading of this mark from the reading at the other end.
- To avoid error, the eye must exactly be in front of the point where the measurement is to be taken.

Measuring the Length of Curved Line

- Curved lines can't be measured using a meter scale. A thread can be used to measure curved lines by creating a knot on one end and keeping that at the beginning. Then the length can be stretched out and measured by meter scale.

Motion and Its Types

- Motion is a change in the position of an object with time.
 1. **Rectilinear motion:** A type of motion where the object moves along a straight line, e.g., vehicle on a straight road, march-past of soldiers in a parade, the falling of a stone, or sprinters in a 100-metre race.
 2. **Circular motion:** Object moves along a circular path e.g., blade of an electric fan or the hands of a clock.
 3. **Periodic motion:** Object repeats its motion after some time or moves to and fro e.g., a pendulum, the motion of a child on a swing, strings of a guitar.

2

LIGHT, SHADOWS AND REFLECTIONS

How do we see objects?

- Light help us see objects. Without light, we cannot see objects. We see objects like a chair, of a table when light from a luminous object falls on these and then travels towards our eye.
- Objects that give out or emit light of their own are called luminous objects e.g., sun, star, torch bulb, etc.
- Objects that do not give out or emit light of their own are called non luminous objects. For e.g. table, chair, book, moon, etc.

Transparent, Opaque and Translucent Objects

- **Opaque object:** We cannot see through an object e.g., pencil, wood, notebook, stone, etc.
- **Transparent object:** We can see through an object e.g., glass, water, air etc.
- **Translucent object:** Can see partially through an object e.g., tracing paper, tissue paper, etc.

What Exactly are Shadows?

- A shadow is a dark area where light from a light source is blocked by an opaque object.
- A shadow is formed when an opaque object comes in the path of light.
- Shadow needs a screen where it is formed, e.g., ground, walls of a room, a building, or other such surfaces act as a screen for the shadows.
- Shadows give us an idea about the shapes of objects. Sometimes, shadows can also mislead us about the shape of the object.

A Pinhole Camera

- It is a simple camera that consists of a light-proof box, a thin film for a screen, and a small aperture or hole to allow the passage of light rays. The light from outside enters through the small hole and forms an image on the screen that is inverted.
- When sunlight passes through the leaves of a tree, the gaps between the leaves act as a **natural pinhole camera**.
- The pinhole camera works on the principle that light travels in a straight line. The property of light travelling in a straight line is called Rectilinear propagation of light.

Mirrors and Reflection

- A mirror is a polished or smooth surface that forms images by reflection.
- When light falls on a surface, it gets reflected or bounces back. The phenomenon of light bouncing off surfaces is called reflection.

3

ELECTRICITY AND CIRCUITS**Electricity**

- Electricity is the flow of charges (electrons). The source of electric currents can be through invertors, a battery, generators and so on. Electricity can be used for lighting, heating, cooling etc. to make our tasks easier.

Electric Cell

- Electric Cell is a device that contains chemicals inside it and converts them into electrical energy. Electric cells have two terminals namely positive and negative. These are used in a torch, alarm clocks, wristwatches, transistor radios, cameras and so on.

Battery

- Battery is a combination of two or more cells combined together in series connection.
- A conducting thin wire that gives off light is called the filament of the bulb.

An Electric Circuit

- A circuit is the complete path for electricity to pass (current to flow), from one terminal of the electric cell through the bulb and back to the other terminal of the electric cell. The bulb glows only when current flows through the circuit.

- If the filament of the bulb is broken, the path of the current between the terminals of the electric cell is not completed and hence the current cannot flow. The bulb with a broken filament is called a fused bulb. The fused bulb does not light up.

Electric Switch

- Electric Switch is a simple device that either breaks the circuit or completes it to stop or start the flow of electricity.
 1. Closed switch completes the circuit and allows the flow of current.
 2. Open switch breaks the circuit and does not allow the flow of current.

Electric Conductors and Insulators

- Materials that allow an electric current to pass through them are conductors. Objects made of metals or metal alloys are conductors e.g., iron, steel, gold, mercury, brass etc. Our body is also a conductor of electricity.
- Materials that do not allow an electric current to pass through them are insulators. Some examples of insulators include rubber, wood, plastics, glass and air.

4

FUN WITH MAGNETS**Natural Magnet**

- Natural magnet is a magnet that occurs naturally. Magnetite is called a natural magnet. People believed that it was first discovered at place called magnesia.
- Nowadays artificial magnets are prepared in different shapes, e.g., bar magnets, horseshoe magnets, cylindrical or ball-ended magnets.

Magnetic and Non Magnetic Material

- The magnet attracts certain materials whereas some do not get attracted towards the magnet. Materials that get attracted towards a magnet are magnetic materials, e.g., iron, nickel or cobalt. The materials which are not attracted towards a magnet are non-magnetic materials, e.g., plastic, cloth, paper and so on.

- Poles of a magnet are said to be near the ends of a magnet.

Finding Directions

- Freely suspended bar magnet always comes to rest in the North-South direction. For centuries, travellers have been making use of this property of magnets to find directions.
- The end of the magnet that points towards the North is called its North seeking end or the North Pole of the magnet. The other end that points towards the South is called the South seeking end of the South Pole of the magnet.

Compass

- Compass is usually a small box with a glass cover on it and a magnetised needle is pivoted inside the box, which can rotate freely. The compass also has a dial

with directions marked on it. When it comes to rest its needle indicates the N-S direction.

- Attraction and Repulsion between two poles of magnets: Opposite poles of two magnets attract each other whereas similar poles repel each other.
- Magnets lose their properties if they are heated, hammered or dropped from some height.
- Magnets become weak if they are not stored properly.
- To keep them safe, bar magnets should be kept in pairs with their unlike poles on the same side. They must be separated by a piece of wood while two pieces of soft iron should be placed across their ends. For horse-shoe magnet, one should keep a piece of iron across the poles. Also, Keep magnets away from cassettes, mobiles, television, music system, compact disks (CDs) and the computer.

QUESTIONS

LEVEL-1 : MODERATE

- One of the early measures of length was
 - Metre
 - Centimetre
 - Foot
 - Km
- Motion of moon around the earth shows
 - Rectilinear motion
 - Circular motion
 - Periodic motion
 - Both (b) and (c)
- Cubit is a measure of length between
 - End of arm and the chin
 - Two hands
 - Elbow to the fingertips
 - Width of a finger
- The SI unit of length is
 - Km
 - cm
 - mm
 - m
- Choose one which is not luminous.
 - Sun
 - Moon
 - Star
 - Bulb
- Which one is an example of translucent?
 - Wax paper
 - Wood
 - Pencil
 - Glass
- Propagation of Light ray is
 - Projectile
 - Rectilinear
 - Sinusoidal
 - Projectile
- In a completely dark room you are holding a mirror, can you see your reflection on the mirror?
 - Yes
 - No
 - Partially
 - Can't say
- Shadow gives information about
 - Colour of object
 - Dimension of object
 - Shape of object
 - Composition of object
- Earliest mode of transport on the water was
 - Boat
 - Logs tied together
 - Ship
 - Bullock cart
- Electric cell is a device which
 - Converts electrical energy into light energy
 - Converts chemical energy into electrical energy
 - Converts chemical energy into light energy
 - None
- Filament is made up of
 - Aluminium
 - Chromium
 - Tungsten
 - Nickel
- Which is an example of an insulator?
 - Diamond
 - Graphite
 - Silver
 - All of these
- To prevent electric shocks, the metallic electrical wires are covered with
 - Insulator
 - Semiconductor
 - Conductor
 - Superconductor
- Which of the following is an example of natural magnet?
 - Bar magnet
 - Sunstone
 - Lodestone
 - Emerald
- Magnets lose their magnetism when _____
 - Buried inside the earth
 - Hammered
 - Dropped into water
 - Electric field is applied to it
- A freely suspended magnet always aligns in which direction?
 - North-south
 - East-west
 - South-east
 - North-east

LEVEL-2 : ADVANCED

- Distance from Riya's house to her office is 80 paces. If 1 pace is equal to 20 cm, find the distance in the SI unit.
 - 1600 km
 - 160 m
 - 1600 cm
 - 16 m
- The term parallax means
 - A parabolic motion

- (b) A unit of length
(c) Apparent shift in the position
(d) 1 parallax = 3.26 light-years
3. Consider the following statements
1. To reduce friction
2. To increase the surface area
3. To decrease the density of boat
Which of the above is/are the reasons behind the streamlined shape of boats?
(a) 1 only (b) 1 and 3 only
(c) 2 only (d) 3 only
4. Consider the following statement about units of measurement.
(a) A single undivided entity or whole
(b) Any standard used for making comparisons in measurements
(c) The rightmost position in a number or the one's place
(d) None of these
5. Consider the following example of periodic motion.
1. Motion of earth round the sun
2. Motion of pendulum
3. Giant wheel
4. Falling fruits from trees
Which of the following is/ are examples of periodic motion?
(a) 1 only (b) 2 and 4 only
(c) 1 and 2 only (d) 3 only
6. With reference to the Pinhole camera, consider the following statement.
1. The image obtained by it is real.
2. The image is inverted.
3. Size of the image is the same as the object.
4. The image used in the analysis of the propagation of light.
Which option is/are correct?
(a) 1, 2 and 3 only (b) 1 and 2 only
(c) 1, 3 and 4 only (d) 1, 2 and 4 only
7. Condition for the formation of shadow is
1. Source of light 2. A screen
3. An opaque object
Which of the following option is/are correct?
(a) 1 only (b) 2 only
(c) 1 and 2 only (d) 1, 2 and 3
8. Which one is true for Reflection of Light?
(a) The phenomenon of bouncing back of the light
(b) The phenomenon of bending of light
(c) The phenomenon of splitting of light
(d) The phenomenon of interference of light
9. Light is a form of
(a) Heat (b) Radiation
(c) Power (d) Energy
10. Which is not true for a plane mirror?
(a) Image formed by a plane mirror is always virtual.
(b) Image formed by a plane mirror is smaller than the object in size.
(c) Image is always upright.
(d) Distance of object from the mirror is equal to a distance of image formed from the mirror.
11. Consider the following statements.
1. Metals are good conductors of electricity.
2. Nichrome has the higher resistivity than silver.
3. Allotrope of carbon can conduct electricity.
Which of the above is/are correct?
(a) 1 only (b) 1 and 3 only
(c) 1, 2 and 3 (d) 1 and 2 only
12. To which device is the two ends of a conductor are connected to get a continuous flow of electrons?
(a) CFL (b) Bulb
(c) Tube light (d) Cell
13. Consider the following statements.
1. Direction of magnetic fields outside the magnet is from south to north.
2. Direction of magnetic fields inside the magnet is from north to south.
Which of the above is/are correct?
(a) 1 only (b) 2 only
(c) 1 and 2 both (d) None
14. Consider the following statements.
1. At the centre of a bar magnet, magnetism is maximum.
2. Magnetic field lines form a closed loop.
3. Magnets are used to find directions.
Which of the above is/are correct?
(a) 3 only (b) 1, 2 and 3
(c) 1 and 3 only (d) 2 and 3 only

LEVEL-3 : PREVIOUS YEARS

1. If 1 litre of water weighs 1 kg, then how many cubic millimetre of water will weigh 0.1 gm? [UPSC]
(a) 1 (b) 10
(c) 100 (d) 1000
2. Tungsten is used for the construction of filament in an electric bulb because of its [CDS]
(a) High specific resistance
(b) Low specific resistance
(c) High light-emitting power
(d) High melting point
3. Electricity is produced through the dry cell from [CDS]
(a) Chemical energy (b) Thermal energy
(c) Mechanical energy (d) Nuclear energy
4. The important property of magnet which was exploited by navigators and travellers from ancient times is _____. [MP Police Constable]
(a) Repulsive property (b) Induction property
(c) Directional property (d) Attractive property

ANSWERS WITH EXPLANATION

LEVEL-1 : MODERATE

- Option (c) is correct.**
Explanation: In ancient times, people used an angul (finger), a mutthi (fist) length of a foot, distance of a step or different parts of body for measurement of length.
- Option (d) is correct.**
Explanation: Motion of moon around the earth shows both circular and periodic motion. Moon completes a circle around earth called circular motion and it repeats itself after a regular interval of time called periodic motion.
- Option (c) is correct.**
Explanation: Cubit was an ancient unit of length based on the distance from the elbow to the middle finger. It was used in ancient Egypt.
- Option (d) is correct.**
Explanation: SI unit of length is meter, symbol, m. It is as the distance travelled by light in vacuum in $1/299,792,458$ of a second.
- Option (b) is correct.**
Explanation: Moon does not emit its own light. It is visible only when it reflects light from the sun. Therefore, it is a non luminous objects. Luminous objects are those which emit their own light independently, e.g., Sun, Star, Bulb
- Option (a) is correct.**
Explanation: Translucent objects are those which allow only partial transmission of light through them. Wax paper is an example of a translucent object. Wood and pencil are examples of an opaque object. Glass is an example of a transparent object.
- Option (b) is correct.**
Explanation: Rectilinear propagation of Light describes that light travels in a straight line.
- Option (b) is correct.**
Explanation: In a completely dark room we will not see our reflection in a mirror because an image is formed only when the light gets reflected by the mirror and enters our eye.
- Option (b) is correct.**
Explanation: Shadows give information about the shape of objects. Sometimes, shadows can also mislead us about the shape of an object.
- Option (b) is correct.**
Explanation: Two logs tied together was the earliest mode of transportation. They were designed as boats of streamlined shapes.
- Option (b) is correct.**
Explanation: Electric cell converts chemical energy into electrical energy.
- Option (c) is correct.**
Explanation: Filament is made up of tungsten.

- Option (a) is correct.**
Explanation: Diamond does not conduct electricity while graphite and silver conduct electricity.
- Option (a) is correct.**
Explanation: To prevent electric shocks, the metallic electrical wires are covered with Insulator.
- Option (c) is correct.**
Explanation: Lodestone is a special type of magnetite which is a natural magnet.
- Option (b) is correct.**
Explanation: Magnets lose its property when hammered.
- Option (a) is correct.**
Explanation: A freely suspended magnet always aligns in a north-south direction.

LEVEL-2 : ADVANCED

- Option (d) is correct.**
Explanation: Given:
Distance from Riya's house to her office = 80 paces
1 pace = 20 cm
Then 80 paces = 80×20
= 1600 cm
100 cm = 1 m
Hence 1600 cm = 16 m
Therefore, the distance from Riya's house to her office in SI unit is 16m.
- Option (c) is correct.**
Explanation: Parallax is the observed displacement of an object caused by the change in observer's point of view.
To measure large distances, such as the distance of a planet or a star from the earth, astronomers use the principle of parallax. Parallax also affects instruments such as binoculars, microscopes, twin-lens cameras. The parsec (or parallax of one second) is a unit of length used to measure the large distances to astronomical objects outside the solar system.
1 parsec = 3.26 light years
- Option (a) is correct.**
Explanation: A streamline shape helps in reducing the drag force between fluid and the object traversing through it. A Streamlined shape of boat reduces friction and helps the boat go quickly.
- Option (b) is correct.**
Explanation: A unit of measurement is a definite magnitude of a quantity, defined and adopted by convention or by law, i.e., used as a standard for making comparisons in measurement.
- Option (c) is correct.**
Explanation: When object repeats its motion after some time or moves to and fro, the motion is called periodic motion. E.g., a rocking chair, a bouncing ball

a swing in motion, the earth in its orbit around the sun, a pendulum and so on. The fixed time interval after which the motion repeats itself is called as period of motion.

6. Option (d) is correct.

Explanation: Characteristics of the image formed by Pinhole camera are:

- The image obtained by it is real i.e. image is obtained on the screen.
- The image is inverted.
- Size of the image obtained is comparatively smaller than the actual object.
- The image used in the analysis of the rectilinear propagation of light.

7. Option (d) is correct.

Explanation: Conditions for the formation of shadows are:

- Source of light
- An opaque screen where shadow is formed.
- An opaque object must obstruct the path of the light. Shadows are formed only when an opaque object obstructs the light from a source.

8. Option (a) is correct.

Explanation: Reflection of light is the phenomenon of bouncing back of the light.

The phenomenon of bending of light is called the refraction of light.

The phenomenon of splitting of light is called dispersion of light.

The phenomenon of interference of light is the superposition of two waves to form a resultant wave of the greater, lower or same amplitude.

9. Option (d) is correct.

Explanation: Light is a form of energy that enables us to see things. More precisely, light is an electromagnetic wave energy. Light starts from a source and bounces off the objects which are perceived by our eyes and our brain processes this signal, which eventually enables us to see.

10. Option (b) is correct.

Explanation: Characteristics of image formed by a plane mirror

- Image formed by a plane mirror is always virtual.
- Image formed by a plane mirror is erect and of a same size as the object.
- Image is always upright.
- Distance of object from the mirror is equal to distance of image formed from the mirror.

11. Option (c) is correct.

Explanation: All the statements are true.

- Metals are good conductor of electricity due to presence of free electrons. Free electrons allow current to flow through them. Therefore statement 1 is correct.

- Nichrome has high resistivity, when electric current is passed through it, heat gets generated. It is for this reason that Nichrome is used in toasters, electric stoves.

- Due to de-localisation of electrons in carbon allotrope they conduct electricity, hence have a wide variety of application in electronics industry.

12. Option (d) is correct.

Explanation: Cell has two ends to which two ends of the conductor are connected to get continuous flow of electrons.

13. Option (d) is correct.

Explanation: Direction of magnetic fields outside the magnet is from north to south. The direction of magnetic fields inside the magnet is from south to north.

14. Option (d) is correct.

Explanation: At the centre of a bar magnet, magnetism is zero, as the magnetic field from both the ends get cancelled out.

LEVEL-3 : PREVIOUS YEARS

1. Option (c) is correct.

Explanation: As we know, 1 litre = 1 kg
1 litre = 0.001 m³ = 1000000 mm³

Calculation:

$$\Rightarrow 1 \text{ litre} = 1 \text{ kg}$$

$$\Rightarrow 1 \text{ kg} = 1000000 \text{ mm}^3$$

$$\Rightarrow 1000 \text{ g} = 1000000 \text{ mm}^3$$

$$\Rightarrow 0.1 \text{ g} = \left(\frac{1000000}{10000} \right) \text{ mm}^3$$

$$\Rightarrow 0.1 \text{ g} = 100 \text{ mm}^3$$

∴ 0.1 gram is equal to 100 cubic millimetres

2. Option (d) is correct.

Explanation: Tungsten has the highest melting point and lowest vapour pressure of all metals. It does not melt even when large amount of heat is passed through it, hence it is used as filament in electric bulbs.

3. Option (a) is correct.

Explanation: Electricity is produced through the dry cell from chemical energy. Working Principle: A dry cell is a device that generates electricity based solely on chemical reactions. When the two electrodes of the cell are connected, the cell then forces the electrons to flow from one end to the other. This flow of electrons causes the current to flow in the closed circuit.

4. Option (c) is correct.

Explanation: Direction property: Ancient travellers used to find directions by suspending magnets with a thread fixed at one end. When suspended freely, the magnet will point in North-South direction.

Introduction

- In ancient times, people used the bark and big leaves of trees or animal skins and furs to cover themselves. When people began to settle in agricultural communities, they learnt to weave twigs and grass into mats and baskets. Vines, animal fleece or hair were twisted together into long strands and were woven into fabrics.
- The early Indians wore fabrics made out of cotton that grew in the regions near the river Ganga. Flax is also a plant that gives natural fibres. In ancient Egypt, cotton as well as flax were cultivated near the river Nile and were used for making fabrics.
- In those days, people were not aware of stitching so they simply draped the fabric.

Variety of Fabrics

- Fabrics are cloth materials made up of yarns. Cotton, silk, wool or synthetics are some examples of fibre used to make fabric.
- Loose thread from fabric is called Yarn.

Fibre

- The thin strands of thread that are made up of still thinner strands called fibres.
 1. **Natural fibre:** These fibres are naturally obtained from plants and animals. Cotton, jute, silk and wool are natural fibres. Cotton and jute are obtained from plants. Wool is obtained from the fleece of sheep, goats, hair of rabbits, yak and camels. Silk fibre is drawn from the cocoon of the silkworm.
 2. **Synthetic fibre:** These fibres are artificially synthesized by humans using chemical substances. Polyester, Nylon, Rayon, Acrylic are a few examples of synthetic fibre.

Some Plant Fibres**Cotton**

- Cotton plants are usually grown at places having black soil and warm climate. Cotton is usually picked up by hand from fruit of cotton plants called cotton bolls.
- Ginning is a process through which fibres are separated from the seeds by combing. Ginning is done by hand as well as by machines.

Jute

- Jute fibre is obtained from the stem of the jute plant which is cultivated during the rainy season. Jute is mainly grown in West Bengal, Bihar and Assam. It is harvested at the flowering stage. After this, the stems of the harvested plants are immersed in water for a few days. Then stems rot and fibres are separated by hand.

Spinning Cotton Yarn

- **Spinning:** It is the process of making yarn from fibres. Hand spindle (takli) or Charkha are used for spinning. Spinning is used for making yarn in to fibre.

Yarn to Fabric

- The two main processes of making fabric from yarn are weaving and knitting.
- **Weaving:** It is the process of arranging two sets of yarns together to make a fabric. Weaving is done on looms. The looms are either hand operated or power operated.
- **Knitting:** It is a process of making a piece of fabric using single yarn. Knitting is done by hand as well as on machines.

Cotton rolls $\xrightarrow{\text{ginning}}$ Fibre $\xrightarrow{\text{spinning}}$ Yarn $\xrightarrow{\text{knitting/weaving}}$ Fabric

Properties of Material

- Materials can be differentiated into their respective groups based on different properties.

Appearance

- On the basis of appearance materials can be sorted. The appearance of materials varies in colour, texture, lustre etc.

Hardness

- Materials which can be compressed or scratched easily are called soft while some other materials which are difficult to compress are called hard, e.g., cotton or sponge is soft while the iron is hard.

Soluble or Insoluble?

- On the basis of solubility, materials can be sorted into soluble or insoluble. Materials which are completely disappeared or dissolved in water are called soluble (sugar, salt) while those that do not mix in water are called insoluble (chalk, coal). Some gases are soluble in water whereas others are not. Oxygen can dissolve in water.

Float or Sink

- Light materials float on water while heavy materials sink in water.

Transparency

- On the basis of transmission of light through objects, materials can be sorted into opaque, translucent and transparent.
- **Opaque:** Materials through which you are not able to see, e.g., wooden box, cardboard carton, metal container etc.
- **Translucent:** Materials through which objects can be seen, but not clearly, e.g., oily paper, tissue, some plastics etc.
- **Transparent:** Substances or materials, through which things can be seen, e.g., glass, water, air etc.

Why do we need to Group Materials?

- To locate them easily.
- To study their properties and also observe any patterns in these properties.

3**SEPARATION OF SUBSTANCES****Separation**

- Separation is the removal of substances from mixture materials, e.g., separation of stones from rice, ginning of cotton to separate seeds etc.
- The substances to be separated may be particles of different sizes or materials. These may be in any three states of matter i.e., solid, liquid or gas. For separation, we use different methods:
 - To separate two different, but useful components.
 - To remove non-useful components.
 - To remove impurities or harmful components.

Methods of Separation

- **Handpicking:** Handpicking can be used for separating slightly larger-sized impurities like pieces of dirt, stone, and husk from wheat, rice or pulses.
- **Threshing:** In this process, the stalks are beaten to free the grain seeds. Machines are used to thresh large quantities of grain.
- **Winnowing:** Winnowing is used to separate heavier and lighter components of a mixture by wind or by blowing air.

- **Sieving:** Sieving allows the fine particles to pass through the holes of the sieve while the bigger impurities remain on the sieve.
- **Sedimentation:** In sedimentation, the heavier component in a mixture settles when water is added to it.
- **Decantation:** Decantation is the process in which water along with dust is removed.
- **Filtration:** Filtration is a process of separating solids from a liquid by passing through a filter or pores of filter paper.
- **Evaporation:** The process of conversion of water into its vapour is called evaporation.
- **Condensation:** The process of conversion of water vapour into its liquid form is called condensation.
- **Saturated solution:** A solution that cannot dissolve more of that substance is a saturated solution. On heating, we can dissolve more of a substance in a solution.

4**CHANGES AROUND US****Ways to bring change in a substance**

- **Heating:** When an object is heated, it gets affected in the following ways:
 1. Some objects expand.
 2. Some objects get hot and change their state.
 3. Some objects burn.
 4. Metals expand on heating and contract on cooling.
- **Pressure:** When pressure is applied to an object then
 1. The object can change its shape and size.
 2. Metals can be hammered into thin sheets.
 3. Air can be compressed.

- We can also bring a change in any substance by mixing it with some other substance, e.g., mixing water-soluble substances in water.

Types of Changes

- Changes are of two types:
 1. **Reversible changes:** Changes in objects that can be reversed are reversible changes, e.g., a toy aeroplane made by folding papers, a rolled-out roti, stretching of rubber etc.
 2. **Irreversible changes:** Change in an object that cannot be brought back to its original state, e.g., burning of a candle, an aeroplane cut out of paper, milk to paneer etc.

5

AIR AROUND US

Air

- It is a mixture of gases and dust particles. Moving air is called wind.
- The atmosphere is a thin layer of air surrounding the Earth's surface. The air gets rare, as we move higher in the atmosphere.

Properties of Air

- It occupies space.
- It is present everywhere around us.
- It has no colour.
- It is transparent.

What is Air Made Up Of?

- The gases in the air are mainly nitrogen, oxygen, a small amount of carbon dioxide, and many other gases. Air contains mostly nitrogen and oxygen. These two gases together make up 99% of the air and the remaining 1% is constituted by carbon dioxide and a few other gases and water vapour.
- **Water vapour:** Air contains water vapour. We have seen that when air comes in contact with a cool surface, it condenses and drops of water appear on the cooled surfaces. The presence of water vapour in the air is important for the water cycle in nature.
- **Oxygen:** Oxygen is one component of air that supports burning. Plants and animals consume oxygen for respiration and produce carbon dioxide.
- **Nitrogen:** Nitrogen is a major part of the air. It does not support burning but helps in the growth of the plant.
- **Carbon dioxide:** Carbon dioxide makes up a small component of the air around us. Plant and animal matter consumes oxygen on burning and produces mainly carbon dioxide and a few other gases.
- **Dust and Smoke:** The burning of fuel produces smoke. Smoke contains a few gases and fine dust particles. It is harmful. Air also contains dust particles. The presence of dust particles in the air varies from time to time, and from place to place.

- The presence of fine hair and mucus inside the nose prevents dust particles from getting into the respiratory system.

How does oxygen become available to Animals and Plants living in water and soil?

- Animals living in water use the dissolved oxygen in the water. When the water is poured on the lump of soil, it displaces the air which is seen in the form of bubbles.
- The organisms that live inside the soil and the plant roots respire in this air. A lot of burrows and holes are formed in deep soil by the animals living in the soil. These burrows also make spaces available for air to move in and out of the soil. That is how animals and plants living in soil use oxygen.

How is the Oxygen in the Atmosphere Replaced?

- Animals cannot live without plants, they are interdependent. Plants make their own food and oxygen is produced along with it. Plants also consume oxygen for respiration, but they produce more of it than they consume. That is why we say plants produce oxygen. The balance of oxygen and carbon dioxide in the atmosphere is maintained through respiration in plants and animals and by photosynthesis in plants.

Uses of Air

- **Windmill:** The wind makes the windmill rotate. The windmill is used to draw water from tube wells and to run flour mills. Windmills are also used to generate electricity.
- Air helps in the movements of sailing yachts, gliders, parachutes and aeroplanes.
- Birds, bats and insects can fly due to the presence of air.
- Air also helps in the dispersal of seeds and pollen of flowers of several plants.
- Air plays an important role in the water cycle.

QUESTIONS

LEVEL-1 : MODERATE

1. Separation of fibres of cotton from its seed is known as _____.
 (a) Weaving (b) Knitting
 (c) Spinning (d) Ginning
2. Jute fibres are obtained from _____.
 (a) Fruits of jute plants (b) Stem of jute plants
 (c) Seeds of jute plants (d) Flowers of jute plants
3. Making a piece of fabric using a single yarn is called _____.
 (a) Weaving (b) Knitting
 (c) Ginning (d) Spinning
4. Which types of soil are suitable for growing cotton?
 (a) Alluvial soil (b) Yellow soil
 (c) Red soil (d) Black soil
5. What makes the basis of sorting materials into groups?
 (a) Differences in their properties
 (b) Similarities in their properties
 (c) Both similarities and differences in their properties
 (d) None
6. Which of the following is not soluble in water?
 (a) Turmeric powder (b) NaCl
 (c) Alum (d) All

7. Which of the following floats on water?
 (a) Eraser (b) Key
 (c) Marble (d) Wax
8. Anything which has a mass and occupies space is called _____.
 (a) Volume (b) Matter
 (c) Area (d) Perimeter
9. The process of conversion of water vapour into its liquid form is called _____.
 (a) Decantation (b) Condensation
 (c) Evaporation (d) Filtration
10. The process of removing dirt by wind is called _____.
 (a) Winnowing (b) Threshing
 (c) Sieving (d) Decantation
11. Farmer beats the stalk to free the grain seeds. The process is called _____.
 (a) Sedimentation (b) Winnowing
 (c) Threshing (d) Handpicking
12. Change of water into vapour is called _____.
 (a) Natural (b) Reversible
 (c) Irreversible (d) Organic
13. Which is not an example of irreversible change?
 (a) Rusting of iron
 (b) Candle burning
 (c) Making curd from milk
 (d) Ironing of clothes
14. Which of the following changes can be reversed?
 (a) Milk to curd
 (b) Dough to chapati
 (c) Wet clothes to dry clothes
 (d) Bud to flower
15. Which of the following gas helps in burning?
 (a) Argon (b) Carbon dioxide
 (c) Nitrogen (d) Oxygen
16. Wind is _____.
 (a) Air in motion (b) Rising air
 (c) Air around us (d) None
17. Envelop of air that surrounds the earth is known as _____.
 (a) Environment (b) Atmosphere
 (c) Ecosystem (d) Biosphere
3. An object is placed in a room in such a way that it is allowing the light to pass through it, the object is
 (a) Light medium (b) Opaque
 (c) Translucent (d) Transparent
4. What is called for the method of removing dust and other particles from water using filters?
 (a) Filtration (b) Sublimation
 (c) Rainwater harvesting (d) Evaporation
5. Consider the following match.
 Which of the above is/are correctly matched?

	Process	Definition
1.	Condensation	The process of conversion of water vapour into its liquid form.
2.	Evaporation	The process of conversion of water into its vapour.
3.	Decantation	Component in a mixture settles when water is added.

- (a) 1 only (b) 2 only
 (c) None of these (d) 1 and 2 only
6. Consider the following statement regarding saturation.
 1. When solvent cannot dissolve more of a solute to it, is called saturation.
 2. On heating more of a substance can be added to the solution
 Which of the above is are correct?
 (a) 1 and 2 (b) 1 only
 (c) 2 only (d) None
7. A process in which objects become smaller or shrink is called _____.
 (a) Expansion (b) Contraction
 (c) Reversible change (d) Irreversible change
8. Which of the following is/are the ways to bring changes in a substance?
 (a) By mixing (b) Heating
 (c) Pressure (d) All
9. Consider the following statements.
 1. Air is present in the soil
 2. Air has a colour
 3. Air occupies space
 4. Air is transparent
 Which of the following is/are correct?
 (a) 1, 2 and 4 (b) 1, 3 and 4
 (c) 2, 3 and 4 (d) 1, 2, 3 and 4
10. Air consists of _____.
 1. Dust 2. Water vapour
 3. Oxygen 4. Argon
 5. Carbon dioxide
 Choose the correct option.
 (a) 1, 2, 3 and 5 (b) 1, 2, 4 and 5
 (c) 2, 3, 4 and 5 (d) All
11. Which of the following is not the use of air?
 (a) In pollination
 (b) In making biogas
 (c) Generation of electricity
 (d) Water cycle

LEVEL-2 : ADVANCED

1. Which of the above is are correctly match?

	Source	Fibre
1.	Goat	Cotton
2.	Cocoon	Silk
3.	Rabbit	Rayon

- (a) 2 only (b) 1 and 3 only
 (c) 1 and 2 only (d) 1, 2 and 3
2. Which is correct order?
 (a) Cotton rolls - fibre - yarn - fabric
 (b) Cotton rolls - yarn - fibre - fabric
 (c) Cotton rolls - yarn - fabric - fibre
 (d) Cotton rolls - fabric - yarn - fibre

LEVEL-3 : PREVIOUS YEARS

- Which one of the following is an important crop of Barak valley? [UPSC]
 - Jute
 - Tea
 - Sugarcane
 - Cotton
 - Which of the following pairs of states and their important crops are correctly matched? [UPSC]
 - Kerala – Tapioca
 - Maharashtra – Cotton
 - West Bengal – Jute
 - Gujarat – Groundnut
- Choose correct option:
- 1, 2 and 3
 - 1, 2 and 4
 - 1, 3 and 4
 - 1, 2, 3 and 4
- A metal screw top on a glass bottle that appears to be stuck could be opened by using the fact that _____ [CDS]
 - The metal expands more than the glass when both are heated
 - The metal and glass expand identically when heated
 - The metal shrinks when heated
 - Both metal and glass shrink when cooled

ANSWERS WITH EXPLANATION

LEVEL-1 : MODERATE

- Option (d) is correct.**
Explanation: The separation of fibres of cotton from its seed is known as ginning.
- Option (b) is correct.**
Explanation: Jute fibres are obtained from the stem of the jute plant
- Option (b) is correct.**
Explanation: Knitting
- Option (d) is correct.**
Explanation: Black soil is a type of mineral soil which have a black surface horizon, enriched with organic carbon that is at least 25 cm deep.
- Option (c) is correct.**
Explanation: Both similarities and differences in their properties
- Option (a) is correct.**
Explanation: Turmeric powder is not soluble in water.
- Option (d) is correct.**
Explanation: Out of the given options, wax is the one thing that floats on the water.
- Option (b) is correct.**
Explanation: Anything which has a mass and occupies space is called matter.
- Option (b) is correct.**
Explanation: Condensation is a process of converting water vapour into liquid form.
- Option (a) is correct.**
Explanation: The process of removing dirt by wind is called winnowing. Winnowing is a process by which a chaff is separated from grain. Winnowing can also be used to remove pests from stored grain.
- Option (c) is correct.**
Explanation: In threshing, the stalks are beaten to free the grain seeds.
- Option (b) is correct.**
Explanation: Conversion of water into vapour is a reversible change. A reversible change does not create any new material.

13. Option (d) is correct.

Explanation: Ironing of cloth is an example of reversible change. A reversible change is a change that can be undone or reversed. These changes are observed in state, size and shape of the substance. A reversible change does not create any new material. For example - A blacksmith changes a piece of iron into different tools. For that, a piece of iron is heated to red hot.

14. Option (c) is correct.

Explanation: Wet cloth to dry cloth is an example of reversible change.

15. Option (d) is correct.

Explanation: Oxygen helps in burning.

16. Option (a) is correct.

Explanation: Wind is air in motion.

17. Option (b) is correct.

Explanation: Atmosphere is an envelope of air that surrounds the earth.

LEVEL-2 : ADVANCED

1. Option (c) is correct.

Explanation: Rayon is a synthetic fibre. It is an artificial textile material composed of regenerated and purified cellulose derived from plant sources. It was developed in the late 19th century as a substitute for silk. Rayon was also the first man-made fibre.

2. Option (a) is correct.

Explanation: Cotton rolls – fibre – yarn – fabric

3. Option (d) is correct.

Explanation: Transparent objects allow light to travel through them.

4. Option (a) is correct.

Explanation: Filtration is the process in which solid particles in a liquid or gaseous fluid are removed by the use of a filter medium that permits the fluid to pass through but retains the solid particles.

5. Option (d) is correct.

Explanation: Decantation is the process in which water along with dust is removed. Decantation is the

process of separation of liquid from solid and other immiscible liquids, by removing the liquid layer at the top from layer of solid or liquid below.

6. **Option (a) is correct.**

Explanation: Both the given statements are true.

7. **Option (b) is correct.**

Explanation: Contraction is a process in which an object becomes smaller or shrinks.

8. **Option (d) is correct.**

Explanation: We can change the state of any substance by heating, mixing and by applying pressure on it.

9. **Option (b) is correct.**

Explanation: It occupies space.

It is present everywhere around us.

It has no colour.

It is transparent

10. **Option (d) is correct.**

Explanation: Air consists of mainly nitrogen, oxygen, a small amount of carbon dioxide and many other gases. Air contains mostly nitrogen and oxygen. These two gases together make up 99% of the air and the remaining 1% is constituted by carbon dioxide and a few other gases and water vapour.

11. **Option (b) is correct.**

Explanation: Making of biogas is an anaerobic process i.e. absence of air. Biogas is an environmentally-friendly, renewable source of energy. It's produced when organic matter, such as food or animal waste, is

broken by microorganisms in the absence of oxygen, in a process called anaerobic digestion.

LEVEL-3 : PREVIOUS YEARS

1. **Option (a) is correct.**

Explanation: Barak valley is situated in Assam and jute is grown in Assam. Jute is an important crop of Barak valley, because Barak valley is situated in Assam. The temperature of the valley varies from 25° to 30°C and rainfall varies from 100 to 200 cm, which is ideal for jute cultivation.

2. **Option (d) is correct.**

Explanation: Tapioca is a crop of all these states. Cassava or tapioca is a shrub cultivated for its starchy root worldwide. It is a rich source of carbohydrates and is one of the most widely used foods next only to rice and maize. Tapioca is cultivated in the tropics and is a staple food for people in the developing countries. Nigeria is the largest cassava producer while Thailand is the largest exporter of dried cassava. Owing to its high amount of carbohydrates, it is a popular basic diet for millions across the globe. It is also used as a food thickening agent in food manufacturing industry.

3. **Option (a) is correct.**

Explanation: Both metal and glass expand when heated. Here glass is a non-metal. Metal expands more than non-metal due to temperature change.



1

FOOD: WHERE DOES IT COME FROM?

Food Variety

- The component that we consume, which provides nourishment to the body, is called food, e.g., rice, chapati, curry, bread, milk, curd, and so on.
- Materials that are needed to prepare a dish are called ingredients.

Food Materials and Sources

- Fruits and vegetables come from plants. Paddy or wheat also comes from plants, which give us these grains.
- Food items like milk, eggs, and meat, come from animals. Cows, goats, and buffaloes are some common animals that give us milk. Some milk and milk products are butter, cream, cheese, and curd.

Plant Parts and Animal Products as Food

- All parts of the plant are edible (eatable). We can eat leaves, flowers, fruits, stems, and even roots.
- Some of the animal products as food are Milk, Butter, Meat, Honey (Bees collect nectar i.e. Sweet juices from flowers and convert them into honey).

What do Animals Eat?

- Based on food habits animals can be divided into:
 1. **Herbivores:** Animals that eat only plants or plant products are called herbivores (herbi - plant; vores - eater), e.g., cow, deer, goat, squirrel etc.
 2. **Carnivores:** Animals that eat other animals are called carnivores (carni - meat; vores - eater), e.g., lion, tiger, owl, vulture, snake, etc.
 3. **Omnivores:** Animals which eat both plants and animals are called omnivores (omni - all; vores - eater), e.g., human, bear, crow etc.

2

COMPONENTS OF FOOD

Introduction

- A meal consists of a variety of food items, e.g., A meal could consist of chapati, dal and vegetable curry.
- Each dish which we eat is made up of one or two ingredients, which we get from plants or animals.
- Nutrients are the ingredients that contain some components that are needed by our body. These components are called nutrients. The major nutrients in our food are carbohydrates, proteins, fats, vitamins and minerals. In addition, dietary fibres and water are also needed by our body.

Test for the Presence of Nutrients in Food**Test for Starch**

- There are many types of carbohydrates. The main carbohydrates found in our food are in the form of starch and sugars. By putting 2-3 drops of dilute iodine solution on a food item, the food item changes its colour. A blue-black colour indicates the presence of starch.

Test for Protein

- A violet colour indicates the presence of proteins by adding 2 drops of a solution of copper sulphate and 10 drops of a solution of caustic soda to the food item.

Test for Fats

- Wrapped food items in a piece of paper show an oily patch on the paper. It indicates the presence of fat.

What do Various Nutrients do for our Body?

- Carbohydrates mainly provide energy to our bodies. Sources of carbohydrates are maize, papaya, bajra, wheat, rice, potato etc.
- Fats also give us energy. In fact, fats give much more energy as compared to the same amount of carbohydrates. Foods containing fats and carbohydrates are called 'energy-giving foods'.
 1. Plant sources of fats are nuts, til, groundnuts, coconut oil, soybean oil etc.
 2. Animal sources of fats are milk, cream, ghee, eggs, meat, fish etc.
- Proteins are needed for the growth and repair of our body. Foods proteins are called 'body building foods'.
 1. Sources of plant protein are soybeans, peas, moong, beans, dal, gram etc.
 2. Sources of animal proteins are milk, eggs, fish, meat, paneer etc.
- Vitamins help in protecting our bodies against diseases. Vitamins also help in keeping our eyes, bones, teeth, and gums healthy. Vitamins are of

different kinds. Some of these are Vitamin A, Vitamin C, Vitamin D, Vitamin E and K. There is also a group of vitamins called Vitamin B-complex. Our body needs all types of vitamins in small quantities. Vitamin A keeps our skin and eyes healthy. Vitamin C helps the body to fight against many diseases. Vitamin C gets easily destroyed by heat during cooking. Vitamin D helps our body to use calcium for bones and teeth. Our body also prepares Vitamin D in the presence of sunlight.

1. Sources of vitamin A are papaya, fish oil, milk and milk products, carrots, mangoes and so on.
 2. Sources of vitamin B are liver, wheat, rice, milk and so on.
 3. Sources of vitamin C are amla, guava, orange, tomato and so on.
 4. Sources of vitamin D are fish, eggs, liver, butter, milk and so on.
- *Minerals* are also needed by our body in small amounts. Each one is essential for the proper growth of the body and to maintain good health.
1. Sources of iodine are fish, ginger, crab, and so on.
 2. Sources of phosphorous are milk, banana, chilli and so on.
 3. Sources of iron are apple, spinach and so on.
 4. Sources of calcium are milk, eggs and so on.
- Our body needs dietary fibres. These are also known as roughage. Roughage is mainly provided by plant products in our foods. Whole grains and pulses, potatoes, fresh fruits and vegetables are main sources of roughage. It does not provide any nutrient to our body, but is an essential component of our food and adds to its bulk. This helps our body get rid of undigested food.

- Water helps our body to absorb nutrients from food. It also helps in throwing out some wastes from body as urine and sweat. We get water that our body needs from water, tea, milk that we drink and also food materials that we eat.

Balanced diet

- For growth and maintenance of good health, our diet should have all the nutrients that our body needs, in the right quantities. Not too much of one and not too little of the other. The diet should also contain a good amount of roughage and water. Such a diet is called a balanced diet. Eating the right kind of food is not enough but should also be cooked properly.
- The skins of many vegetables and fruits contain vitamins and minerals. It may result in the loss of some vitamins if the vegetables and fruits are washed after cutting or peeling.
- Eating too many fat-rich foods may end up suffering from Obesity.

Deficiency

- If the food of a person does not contain a particular nutrient and this continues over a long period of time, then the person may suffer from its deficiency.

Deficiency Diseases

- Deficiency of one or more nutrients can cause diseases or disorders in our body. Diseases that occur due to a lack of nutrients over a long period are called deficiency diseases. Deficiency of protein leads to stunted growth, swelling of the face, discolouration of hair, skin diseases, and diarrhoea. If the diet is deficient in both carbohydrates and proteins for a long period of time, the growth may stop completely. Such a person becomes very lean and thin and so weak that he/she may not even be able to move.

Vitamins, Deficiency and their symptoms

- All deficiency diseases can be prevented by taking a balanced diet.

Vitamin/Minerals	Deficiency disease/disorder	Symptoms
Vitamin A	Loss of vision	Poor vision, loss of vision in darkness(night), sometimes complete loss of vision
Vitamin B1	Beriberi	Weak muscles and very little energy to work
Vitamin C	Scurvy	Bleeding gums, wounds take a longer time to heal
Vitamin D	Rickets	Bones become soft and bent
Calcium	Bone and tooth decay	Weak bones, tooth decay
Iodine	Goitre	Glands in the neck appear swollen, mental disability in children
Iron	Anemia	Weakness

3

GETTING TO KNOW PLANTS

Herbs, Shrubs and Trees

- Plants with green and tender stems are called Herbs. They are usually short and may not have many branches, e.g., wheat, paddy, tomato, carrot and so on.

Shrubs

- Some plants develop branches near the base of the stem. The stem is hard but not very thick. Such plants are called Shrubs, e.g., rose, lemon, tulsi, and so on.

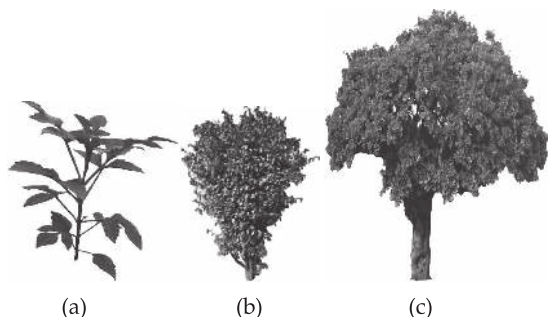


Figure: (a) Herb, (b) Shrub and (c) Tree

- Some plants are very tall and have a hard and thick stem. The stems have branches in the upper part, much above the ground. Such plants are called trees, e.g., mango tree, banyan tree and so on.
- Plants with weak stems that cannot stand upright but spread on the ground are called creepers (Fig.7.4), while those that take support and climb up are called climbers. These are different from the herbs, shrubs and trees



Figure: Creepers



Figure: Climbers

Parts of a Plant

Stem

- Stems bear leaves, branches, buds, flowers, and fruits. Stem helps in the upward movement of water and minerals to leaves and other parts of the plant. Potato, ginger are some examples of the stem.

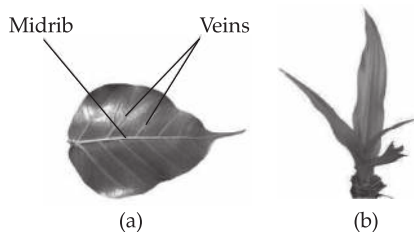


Figure : Leaf venation (a) Reticulate and (b) Parallel

Leaf

- The leaves prepare food. This food travels through the stem and is stored in different parts of the plant. Leaf stores energy in the form of starch.

Petiole

- The part of the leaf by which it is attached to the stem is called a petiole.

Lamina

- The broad, green part of the leaf is called the lamina.

Veins

- The network of lines on the leaf is called veins.

Midrib

- A prominent line in the middle of the leaf is called the midrib.
- **Leaf venation:** The design made by veins in a leaf is called leaf venation. Leaf venations are of two types.
 1. **Reticulate:** The design made by veins in a leaf is called the leaf venation.
 2. **Parallel:** If the veins are parallel to one another is called parallel venation.

Functions of leaf:

1. **Transpiration:** Water comes out of leaves in the form of vapour by a process called transpiration.
2. **Photosynthesis:** Leaves prepare their food in the presence of sunlight by using water and carbon dioxide. This process is called photosynthesis.

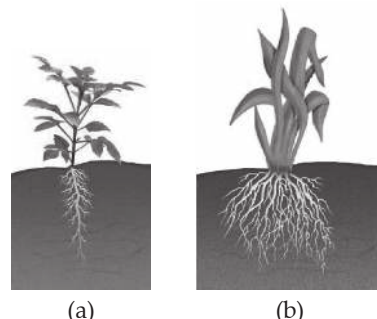


Figure : (a) Taproot and (b) Fibrous roots

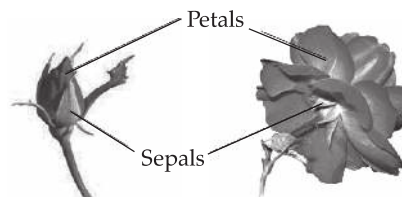


Figure: Bud and flower

Root

- Roots help in holding the plant firmly to the soil. They anchor the plant to the soil. Roots absorb water and minerals from the soil. Carrot, radish, sweet potato, turnip, and tapioca are some examples of roots.

Roots are of two types:

Taproot

- The main or primary root is called the taproot and the smaller roots on the taproot are called lateral roots.

Fibrous root

- Plants that do not have a main root. All roots that seem similar are called fibrous roots.

Flower

- It is a part of the plant. Sepals, petals, stamens, and pistils are the main parts of flowers.
- **Parts of a stamen**
 1. Anther
 2. Filament
- **Parts of a pistil**
 1. Stigma
 2. Ovary: Small bead like structures inside the ovary is called ovules.
 3. Style

4

BODY MOVEMENTS

Human Body and its Movements

- The ability of organisms to change position, by using their body parts, is called movement.

Joints

- Joints are the points where two parts of the skeleton are fitted together to make movement possible, e.g., Hip joints, shoulder joints and so on.

Types of Joints*Ball and socket joints*

- The rounded end of one bone fits into the cavity (hollow space) of the other bone. Joint allows movements in all directions, e.g., Hips and shoulders joints.

Pivotal Joint

- The joint where our neck joins the head is a pivotal joint. It allows us to bend our heads forward and backwards and turn our head to our right or left. In this joint, a cylindrical bone rotates in a ring.

Hinge joints

- Hinge joints bring about movement in only back and forth direction, e.g., Knee and elbow joints.

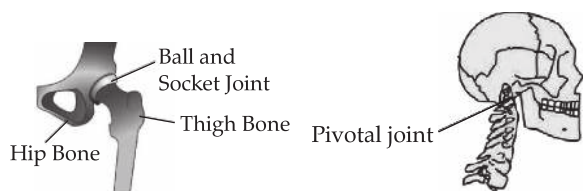


Figure: A ball and socket joint

Figure: A pivotal joint

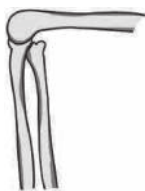


Figure: Hinge joints of the knee

Fixed joints

- The bones cannot move at these joints. Such joints are called fixed joints found in the skull.

Skeleton

- All the bones in our body form a framework to give a shape to our body. This framework is called **skeleton**.
- The human skeleton is composed of around 305 bones at birth. The number of bones in the skeleton changes with age. It decreases to 206 bones by adulthood.
- Skeleton is made up of many bones, joints and cartilage.

Carpals

- The carpal bones are the small bones that make up the wrist (or carpus) that connects the hand to the forearm.

Rib cage

- Ribs join the chest bone and the backbone together to form a box. This is called the rib cage. There are 12 ribs on each side of the chest. Some important internal parts of our body lie protected inside this cage.

Backbone

- It is made up of many small bones called vertebrae. The backbone consists of 33 vertebrae. The rib cage is joined to these bones.

Pelvic bones

- They enclose the portion of the body below the stomach. This is the part you sit on.

Skull

- The skull is made up of many bones joined together. It encloses and protects a very important part of the body, the brain.

Cartilage

- Part of the skeleton that is not hard as bones and can be bent, is cartilage. Cartilage is found in the upper part of the ear, the tip of the nose, and also in the joints of the body.

Muscle

- Muscles are parts of the body that help in bringing about movement. Muscles work in pairs. When one of them contracts, the bone is pulled in that direction. The other muscle of the pair relaxes. To move the bone in the opposite direction, the relaxed muscle contracts to pull the bone towards its original position, while the first relaxes. A muscle can only pull. It cannot push.

Gait of Animals

- The different patterns of movement of animals due to the differences in their skeletal structure are called the gait of animals.

Earthworm

- Earthworm does not have any internal skeleton. The body is made up of many rings joined end to end and muscles attached to these rings help to extend and shorten the body. The skin of earthworms also has a large number of tiny bristles that help them get a good grip on the ground.
- Repeated extension and contraction of the body muscles, enable the earthworm to move through the soil.

Snail

- Snails move with the help of their muscular, flat foot. They glide along a solid surface that is lubricated with mucus. This motion is powered by succeeding waves of muscular contractions of the foot.

Cockroach

- The body of a cockroach is covered with a hard outer skeleton that is made of different units joined together. Cockroaches walk and climb as well as fly in the air. They have three pairs of legs. These help in walking. There are two pairs of wings attached to the body behind the head. The cockroaches have distinct muscles - those near the legs move the legs for walking. The body muscles move the wings when the cockroach flies.

Birds

- Birds fly in the air and walk on the ground. Some birds like ducks and swans also swim in the water. The birds can fly because their bones are hollow and light. The bones of the hind limbs are typical for walking and perching. The bony parts of the forelimbs are modified as wings. The shoulder bones are strong. The breastbones are modified to hold

muscles of flight which are used to move the wings up and down.

Fish

- The head and tail of the fish are smaller than the middle portion of the body - the body tapers at both ends. This body shape is called streamlined. The shape is such that water can flow around it easily and allow the fish to move in the water. The skeleton of the fish is covered with strong muscles. During swimming, muscles make the front part of the body curve to one side and the tail part swings towards the opposite side.

Snakes

- Snakes do not have legs for movement but use their long backbone along with muscles for movement. Their body curves into many loops, which gives it a forward push by pressing against the ground.

5**THE LIVING ORGANISMS AND THEIR SURROUNDINGS****Organisms**

- An organism is simply defined as any living thing, ranging from microscopic bacteria to large animals.

Characteristics of organisms**Food**

- Plants make their own food by the process of photosynthesis. Animals depend on plants or other animals for their food. Food gives organisms the energy needed for them to grow. Organisms also need energy for other life processes that go on inside them.

Growth

- Young ones of animals also grow into adults. A chick hatched from an egg, grows into a hen or a cock. Plants also grow.

Respiration

- Organisms breathe. Breathing is part of a process called respiration.
- The process of releasing energy from food is called respiration. In respiration, some of the oxygen in the air we breathe in is used by the body. We breathe out carbon dioxide produced in this process.

Stimulation

- Changes in our surroundings that make us respond to them, are called stimuli. All living things respond to changes around them.

Excretion

- Our body produces some wastes in other life processes. The process of getting rid of wastes by organisms is known as excretion.

Reproduction

- Living things produce more of their own kind through reproduction. The mode of reproduction may be different, in different animals.
- Some animals produce their young ones through eggs and some give birth to the young ones.

- Many plants reproduce through seeds. Some plants reproduce through a bud which grows into a new plant, e.g., potato. Plants also reproduce through cuttings.

Movement

- Animals move from one place to another and also show other body movements.
- Plants are generally anchored in the soil so they do not move from one place to another. However, various substances like water, minerals, and the food synthesized by them move from one part of the plant to another.
- Organisms die.

Habitat

- The place where organisms live is called the habitat. Habitat means a dwelling place (a home). The habitat provides food, water, air, shelter, and other needs to organisms.

Terrestrial Habitats

- The plants and animals that live on land are said to live in terrestrial habitats. Some examples of terrestrial habitats are forests, grasslands, deserts, and coastal and mountain regions.

Deserts

- There is very little water available in the desert. It is very hot in the daytime and very cold at night in the desert. The animals and plants of the desert live on the desert soil and breathe air from the surroundings. Desert animals like rats and snakes, do not have long legs. To stay away from the intense heat during the day, they stay in burrows deep in the sand. These animals come out only during the night when it is cooler.

Mountain regions

- These habitats are normally very cold and windy. In some areas, snowfall takes place in winters. The leaves of some of these trees are needle-like which

helps the rainwater and snow slide off easily. Animals living in the mountain regions are also adapted to the conditions there. They have thick skin or fur to protect them from cold. For example, yaks have long hair to keep them warm. The snow leopard has thick fur on its body including feet and toes which protects its feet from the cold when it walks on the snow. The mountain goat has strong hooves for running up the rocky slopes of the mountains.

Grasslands

- A lion lives in a forest or grassland and is a strong animal that can hunt and kill animals like deer. It is light brown in colour which helps it to hide in dry grasslands when it hunts for prey (animals to eat). Lions have long claws in their front legs that can be withdrawn inside the toes. The eyes in front of the face allow it to have a correct idea about the location of its prey.
- A deer is another animal that lives in forests and grasslands. It has strong teeth for chewing hard plant stems of the forest. A deer needs to know about the presence of predators (animals like lions) in order to run away from them. It has long ears to hear the movements of predators. The eyes on the sides of its head allow it to look in all directions for danger. The speed of the deer helps them to run away from the predators.

Aquatic Habitats

- The habitats of plants and animals that live in water are called aquatic habitats. Lakes, rivers, and oceans are some examples of aquatic habitats.

Oceans

- Sea animals like squids and octopuses do not have streamlined shapes. They stay deeper in the ocean, near the seabed, and catch any prey that moves towards them. However, when they move in water, they make their body shapes streamlined. These animals have gills to help them use oxygen dissolved in water. Animals like dolphins and whales do not have gills so they breathe in air through nostrils or blowholes that are located on the upper parts of their heads. This allows them to breathe in the air when they swim near the surface of the water. They can stay inside the water for a long time without breathing. They come out to the surface from time to time, to breathe in air.

Ponds and lakes

- In aquatic plants, roots are much reduced in size and their main function is to hold the plant in place. The stems of these plants are long, hollow, and light. The stems grow up to the surface of the water while the leaves and flowers, float on the surface of the water. Some aquatic plants are submerged in water. Some of these plants have narrow and thin ribbon-like leaves. These can bend in the flowing water. In some submerged plants, leaves are often highly divided, through which the water can easily flow without damaging them.
- Frogs usually live in ponds. Frogs can stay both inside the water as well as move on land. They have strong back legs that help them in leaping and catching their prey. They have webbed feet which help them swim in the water.

Adaptation

- The presence of specific features or certain habits, which enable an organism to live naturally in a place, is called adaptation, e.g., Camels have long legs which help to keep their bodies away from the heat of the sand. They excrete a small amount of urine; their dung is dry and they do not sweat. They can live for many days without water. The streamlined shape of the fish helps them to move inside water. Fish have slippery scales on their bodies. These scales protect the fish and also help in easy movement through the water. Fish have flat fins and tails that help them to change directions and keep their bodies balanced in the water. Gills help them to use oxygen dissolved in water.
- Adaptation is the method by which organisms get well adjusted to the climate. Adaptation does not take place in a short time because the abiotic factors of a region also change very slowly. Organisms adapt to different abiotic factors in different ways. This results in a wide variety of organisms in different habitats.

Biotic Component

- The organisms, both plants, and animals, living in a habitat are its biotic components.

Abiotic Component

- The non-living things such as rocks, soil, air, and water in the habitat constitute its abiotic components.

Acclimatisation

- Small changes that take place in the body of a single organism over short periods, to overcome small problems due to changes in the surroundings, are called acclimatisation.

6

WATER

Sources of Water

- The sources of water are: 1. River, 2. Spring, 3. Pond, 4. Well, 5. Hand pump, 6. Lakes
- Two-thirds of the Earth is covered with water. Most of this water is in oceans and seas. The water in the oceans and seas have salts dissolved which means the water is saline.

Water Cycle

- Water from the ocean and surface of the earth goes into the air as vapour, returns as rain, hail, or snow, and finally goes back to the oceans. The circulation of water in this manner is known as the water cycle.
- This circulation of water between ocean and land is a continuous process. This maintains the supply of water on land.

Evaporation

- The process of changing water to its vapour form is known as evaporation. During the daytime, sunlight falls on the water in oceans, rivers, lakes, and ponds. The fields and other land areas also receive sunlight. As a result, water from all these places continuously changes into vapour.
- During the daytime all the air surrounding us gets heated. This warm air provides heat for evaporation of water in the shade. Thus, evaporation takes place from all open surfaces of water. As a result, water vapour gets continuously added to the air.

Transpiration

- Water is released by the plants into the air, as water vapours through the process of transpiration.

Condensation

- When vapour is cooled, it changes into liquid, this change of state is called condensation. The process of condensation plays an important role in bringing water back to the surface of the earth. As we go higher from the surface of the earth, it gets cooler. When the air moves up, it gets cooler and cooler. At sufficient heights, the air becomes so cool that the water vapour present in it condenses to form tiny drops of water called droplets. These tiny droplets remain floating in the air and appear to us as clouds.
- Some drops of water become so heavy that they begin to fall. These falling water drops are called rain. It may also fall as hail or snow.

Back to ocean

- Most of the water that falls on the land as rain and snow sooner or later goes back to the oceans in many ways.

Floods

- Excess rainfall may lead to many problems. Heavy rains may lead to a rise in the level of water in rivers, lakes, and ponds. The water may then spread over large areas causing floods. In our country, floods cause extensive damage to crops, domestic animals, property and human life.

Drought

- The soil continues to lose water by evaporation and transpiration. Since it is not being brought back by rain, the soil becomes dry. The level of water in ponds and wells of the region goes down and some of them even dry up. The groundwater also becomes scarce. This may lead to drought.

Groundwater

- Groundwater is the source for many lakes as well. It is also this groundwater that is drawn by a hand pump or a tube well.

Water Conservation

- It is the practice of using water efficiently to reduce unnecessary usage of water.

Rainwater Harvesting

- Collection of rainwater and storing it for later use is called rainwater harvesting.

Rooftop rainwater harvesting

- In this system, the rainwater is collected from the rooftop to a storage tank, through pipes. Instead of collecting rainwater in the tank, the pipes can go directly into a pit in the ground. This then seeps into the soil to recharge or refill the groundwater.
- Another option is to allow water to go into the ground directly from the roadside drains that collect rainwater.

7**GARBAGE IN, GARBAGE OUT****What is Garbage?**

- **Garbage:** All the waste materials and other household waste produced on a daily basis are known as garbage. Peels of vegetables and fruits, plastic bags, tins and other waste materials are garbage.

Dealing with Garbage

- Safai karamcharis collect the garbage in trucks and take it to a low-lying open area, called a **landfill**. Garbage has both useful and non-useful components.
- The non-useful component is separated out. It is then spread over the landfill and then covered with a layer of soil. Once the landfill is completely full, it is usually converted into a park or a playground. For the next 20 years or so, no building is constructed on it.
- To deal with some of the useful components of garbage, compost-making areas are developed near the landfill.

Composting

- The rotting and conversion of some materials into manure is called composting. Manure provides nutrients to the plants.
- In some cities and towns, municipalities provide separate dustbins for collecting two kinds of garbage.

The blue bin is for materials that can be used again such as plastics, metals, and glass. The green bins are for collecting kitchen and other plant or animal wastes.

Vermicomposting

- Preparing compost with the help of redworms (earthworms) is called vermicomposting. Vermicompost can be used in pots, gardens, or agricultural fields. It can save a lot of money that is spent on buying expensive chemical fertilizers and manure from the market.
- Redworms do not have teeth. They have a structure called 'gizzard', which helps them in grinding their food. A redworm can eat food equal to its own weight, in a day. They do not survive in very hot or very cold surroundings. They need moisture around them. If worms are in good care, in a month's time their number will double.

Recycling

- It is the reusing of waste materials that are discarded. Recycling reduces the wastage of products.

Plastics a boon or a curse?

- The use of plastics in itself might not create so much of a problem. Problems arise when we use plastics excessively and are ignorant about ways of disposing of their waste.
- Consuming food packed in plastic bags could be harmful to our health.
- All kinds of plastics give out harmful gases, upon heating or burning. These gases may cause many health problems, including cancer, in humans.
- Stray animals look for food in these plastic bags, they end up swallowing these. Sometimes, they die due to this.
- The plastic bags thrown away carelessly on roads and other places get into drains and the sewer system. Drains get choked and the water spills on the roads.

Ways to minimize overuse of plastics and deal with garbage:

- Re-use the bags whenever it is possible to do so without any adverse effects.
- Shopkeepers can use paper bags or we can carry a cloth or a jute bag when we go out shopping.
- Do not use plastic bags to store eatables.
- Do not throw plastic bags here and there, after use.
- Never burn plastic bags and other plastic items.
- Do not put garbage in plastic bags and throw it away.
- Use vermicomposting at home and deal with our kitchen waste usefully.
- Recycle paper.
- Use both sides of the paper to write, use a slate for rough work or use blank sheets of paper left in our notebooks for rough work.
- Make our family, friends and others to follow proper practices for disposing of different kinds of waste.

QUESTIONS**LEVEL-1 : MODERATE**

1. Which of the following is an attribute of polar bear?
 - (a) Omnivorous
 - (b) Carnivorous
 - (c) Herbivorous
 - (d) Marsupial
2. Which parts of plants are edible?
 - (a) Stem
 - (b) Flower
 - (c) Roots
 - (d) All
3. Which of the following is not plant based edible product?
 - (a) Tomato
 - (b) Potato
 - (c) Honey
 - (d) Spinach
4. Which vitamin is abundant in citrus fruits?
 - (a) Vitamin A
 - (b) Vitamin B
 - (c) Vitamin C
 - (d) Vitamin D
5. Cow milk is a rich source of which vitamin?
 - (a) Vitamin K
 - (b) Vitamin B
 - (c) Vitamin C
 - (d) Vitamin E
6. After the nutrient test in food the result shows a blue-black colour. This indicates the presence of _____.
 - (a) Protein
 - (b) Starch
 - (c) Mineral
 - (d) Iodine
7. Plants with tender stems are _____.
 - (a) Herbs
 - (b) Shrubs
 - (c) Climbers
 - (d) Trees
8. Lemon plant is an example of _____.
 - (a) Herb
 - (b) Tress
 - (c) Shrub
 - (d) Creeper
9. Bitter gourd is which type of plant?
 - (a) Shrub
 - (b) Herb
 - (c) Creeper
 - (d) Climber
10. Skeleton is made up of _____.
 - (a) Bones
 - (b) Cartilage
 - (c) Bones and cartilage both
 - (d) None
11. Fish swims by _____.
 - (a) Curving body into many loops
 - (b) Succeeding waves of muscular contractions
 - (c) Forming loops alternatively of the two sides of the body
 - (d) Alternate dipping and coming up
12. The organ that protects the main nerve cord is _____.
 - (a) Backbone
 - (b) Skull
 - (c) Skeleton
 - (d) Ribcage
13. Which one of the following uses its muscle for movement?
 - (a) Cockroach
 - (b) Bird
 - (c) Fish
 - (d) Snakes
14. Which is not a biotic component?
 - (a) Earthworm
 - (b) Animal
 - (c) Plant
 - (d) Air
15. Which is a biotic component?
 - (a) Air
 - (b) Water
 - (c) Tulsi
 - (d) Rock
16. Dolphins breathe through _____.
 - (a) Nostrils
 - (b) Gills
 - (c) Both a and b
 - (d) Skin
17. Which one is a process in which water changes into vapours in the atmosphere?
 - (a) Evaporation
 - (b) Photosynthesis
 - (c) Precipitation
 - (d) Condensation
18. Which is not a part of the water cycle?
 - (a) Cloud formation
 - (b) Rain
 - (c) Drinking by animals
 - (d) Sun
19. Circulation of water between ocean and land is known as _____.
 - (a) Water cycle
 - (b) Rain cycle
 - (c) Water management
 - (d) Water harvesting
20. Which of the following is not a source of water?
 - (a) Lake
 - (b) Pond
 - (c) Ocean
 - (d) Tap
21. Preparing compost with the help of worms is called _____.
 - (a) Fertilizer
 - (b) Vermicompost
 - (c) Composting
 - (d) Recycling

22. Which is not concern of using plastics?
 (a) Carry grocery items
 (b) Animals swallow
 (c) Environmental concern
 (d) Health concern

LEVEL-2 : ADVANCED

1. *Rafflesia* is the plant with the largest flowers and is found in many parts of South-East Asia. What is it?
 (a) Ornamental plant (b) Carnivorous plant
 (c) Parasitic plant (d) Mangrove plant
2. Consider the following match.

Type of animal	Definition
1. Carnivore	Animal eats another animal
2. Omnivore	Animal eats both plant and animal
3. Herbivore	Animal eats plant

Which of the above is/are correctly matched?

- (a) 1 only (b) 2 only
 (c) 1 and 2 only (d) 1, 2 and 3
3. Component that we consume provides nourishment to our body is _____.
 (a) Food (b) Nutrient
 (c) Ingredient (d) Water
4. Which one among the following is not sexually transmitted disease?
 (a) AIDS (b) Hepatitis B
 (c) Goitre (d) Syphilis
5. After diagnosis of a disease in a person, the doctor advises the patient iron and folic acid tablets. The person is suffering from
 (a) Beriberi (b) Goitre
 (c) Vitamin D deficiency (d) Anaemia
6. Consider the following match.

Part of a Leaf	Definition
1. Petiole	The broad, green part of the leaf
2. Veins	a line in the middle of the leaf
3. Lamina	part of a leaf by which it is attached to the stem

Choose the correct option.

- (a) 2 only (b) 2 and 3
 (c) None (d) 1 and 3
7. Consider the following statements with respect to roots
- Roots absorb water and minerals from the soil.
 - Maize and bamboo has fibrous root.
- Which of the following is / are correct?
 (a) 1 and 2 (b) 1 only
 (c) 2 only (d) None
8. Which is not a part of pistil?
 (a) Style (b) Stigma
 (c) Ovule (d) Anther
9. Which of the following is not a characteristic of birds?
 (a) Strong muscle
 (b) Bones are hollow and heavy
 (c) Forelimbs are modified as wings
 (d) All of these

10. Match the following.
 Select the correct answer using the codes given below:

List I	List II
A. Skull	1. Hinge joint
B. Elbow	2. Ball and socket joint
C. Shoulder	3. Fixed joint
D. Neck	4. Pivot joint

- (a) A-3, B-1, C-2, D-4 (b) A-3, B-1, C-4, D-2
 (c) A-4, B-2, C-1, D-3 (d) A-2, B-1, C-3, D-4
11. Consider the following statements
- Earthworm does not have any internal skeleton
 - Earthworms make the soil porous and loose.
 - Earthworm skin has tiny bristle for breathing.
 - Earthworm move by extending and contracting its muscle.

Which of the above is/are correct?

- (a) 1, 2 and 3 (b) 1, 2 and 4
 (c) 2, 3 and 4 (d) All
12. Consider the following statement.
- Organisms are living beings.
 - All organisms can move from one plane to another.
 - Organisms respond to their surrounding environment.

Which of the above is/are correct?

- (a) 2 and 3 (b) 1 and 2
 (c) 1 and 3 (d) 1, 2 and 3
13. Camels have long legs which help to keep their bodies away from the heat of the sand. This feature of the camel is _____.
 (a) Acclimatisation (b) Adaptation
 (c) Habitat (d) None

14. Consider the following statement
- Transpiration is a process of removal of water from the plant's surface area to the atmosphere.
 - Transpiration occurs only through the leaves of the plant.

Which of the above is/are correct?

- (a) None (b) 1 and 2
 (c) Only 1 (d) Only 2
15. Consider the following statements.
- Rainwater harvesting is the collection of rainwater and storing it for later use.
 - It increases the groundwater level.

Which of the above is/are correct?

- (a) 1 only (b) 1 and 2
 (c) 2 only (d) None
16. The method of rainwater harvesting which can be adopted by individual house owners is _____.
 (a) Construction of recharge trenches
 (b) On channel storage of water
 (c) Creation of new water bodies
 (d) Roof-top rainwater harvesting
17. Which of the following is not a method for water conservation?
 (a) Rainwater harvesting
 (b) Groundwater extraction
 (c) Improving irrigation efficiency
 (d) Avoiding water wastage

18. The method of refuse disposal, involving burial in trenches is called _____.
- (a) Incineration (b) Pulverization
(c) Composting (d) None
19. Which is wrong with respect to our responsibility as a human being to protect our environment?
- (a) Avoiding the use of floodlighted facilities
(b) Setting up compost tin in gardens
(c) Using plastic bags
(d) Restricting the use of vehicles
- (c) Living organism (d) None of the above
5. In which category of food is the greatest number of calories per unit? [UPPCS]
(a) Vitamins (b) Fats
(c) Carbohydrates (d) Proteins
6. Which one among the following statements is not correct? [CDS]
(a) Pulses are rich in proteins.
(b) Milk is a rich source of Vitamin A.
(c) Cereals are a very poor source of carbohydrates.
(d) Vegetables are a rich source of minerals.
7. Deficiency of which of the following elements is responsible for the weakening of bones? [CDS]
1. Calcium 2. Phosphorus
3. Nitrogen 4. Carbon

LEVEL-3 : PREVIOUS YEARS

1. Match List I with List II. [UPSC]

List I (Disease)	List II (Types of disease)
A. Haemophilia	1. Deficiency disease
B. Diabetes	2. Genetic disease
C. Rickets	3. Hormonal disorder
D. Ringworm	4. Fungal infection

Select the correct answer using the codes given below:

- (a) A-2, B-3, C-4, D-1 (b) A-2, B-3, C-1, D-4
(c) A-3, B-2, C-1, D-4 (d) A-3, B-2, C-4, D-1
2. Which one of the following statements is not correct? [UPSC]
(a) Milk contains none of the B-vitamins.
(b) Vitamin-A (retinol) deficiency leads to dry and scaly skin.
(c) One of the symptoms of scurvy is a pain in the joints.
(d) Vitamin B1 (thiamine) deficiency can lead to heart failure.
3. Consider the following pairs. [UPSC]

Vitamins	Deficiency disease
1. Vitamin C	Scurvy
2. Vitamin D	Rickets
3. Vitamin E	Night blindness

Which of the above pairs given above is/are correctly matched?

- (a) 1 and 2 only (b) 3 only
(c) 1, 2 and 3 (d) None
4. What are vitamins? [MPPCS]
(a) Organic compound (b) Inorganic compound

1. Calcium 2. Phosphorus
3. Nitrogen 4. Carbon
- Select the correct answer using the codes given below
(a) 1 and 2 (b) Only 1
(c) 1, 2 and 3 (d) Only 4

8. Match List I with List II [UPSC]

List I	List II
A. Fruit	1. Ovule
B. Seed	2. Leaf
C. Wood	3. Stem
D. Starch	4. Ovary

Select the correct answer using the codes given below:

- (a) A-2, B-1, C-3, D-4 (b) A-4, B-1, C-3, D-2
(c) A-2, B-3, C-1, D-4 (d) A-4, B-3, C-1, D-2
9. In making the saffron spice, which one of the following parts of the plant is used? [UPSC]
(a) Leaf (b) Petal
(c) Sepal (d) Stigma
10. Which one of the following is a modified stem? [UPSC]
(a) Carrot (b) Sweet potato
(c) Coconut (d) Potato
11. How do marine animals survive in water, without air contact? [CAPF]
(a) They don't require oxygen.
(b) They take oxygen from water.
(c) They only produce oxygen in their body.
(d) They get oxygen from water plants.

ANSWERS WITH EXPLANATION**LEVEL-1 : MODERATE**

1. Option (b) is correct.

Explanation: Unlike other bears, polar bears are carnivorous animal. Based on the mode of nutrition among animals, they are broadly classified into two categories:

1. Carnivores or Carnivorous animals
2. Herbivores or Herbivorous animals

2. Option (d) is correct.

Explanation: All parts of plant are edible. All of the fruits and vegetables we ingest, are one of six edible plant parts, namely, seed, root, stem, leaf, fruit and flower. Fruits are the ripe ovary of a flower, while vegetables are roots, tubers, leaves, stems and other plant bits.