



Thoroughly Updated
as per the Textbook and
Board's Activity Sheet

NAVNEET
SCIENCE AND
TECHNOLOGY
PART-2
DIGEST
STANDARD X



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Thoroughly revised edition as per the Latest Pattern of Activity Sheet

NAVNEET

SCIENCE AND TECHNOLOGY

PART 2

DIGEST

STANDARD X

• **Salient features :**

1. A completely revised book based on revised pattern of Board's Activity Sheet.
2. Chapter Outline/Important Points given at the beginning of each chapter.
3. Model answers given for all textual questions as well as additional questions in each chapter.
4. Model answers to HOTS questions asked under 'Use your brain power!', 'Think about it!', etc.
5. Inclusion of activity based questions given under 'Try This'.
6. Inclusion of answers to 'Can you tell?' and 'Can you recall?' given in each chapter.
7. Memory maps at the end of each chapter for the rapid revision of each chapter.
8. Scientifically correct and well-labelled diagrams, wherever necessary.
9. Inclusion of Board's March '20 Activity Sheet with their appropriate answers.

★ ★ ★ **Important Feature :**

In this 'Digest', Chapterwise Tests have been given.
For these Tests and their model answers, scan the
QR Code given at the end of each chapter.



By
NAVNEET

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PREFACE

We are glad to publish this thoroughly revised edition of **Navneet Digest for Science and Technology Part-2**, which is based on Board's textbook and revised pattern of Board's Activity Sheet.

This digest is prepared in a way that helps students to grasp the subject easily and smoothly.

The Digests have the following features :

- The important points are given in the beginning of each chapter. These points will help the students to understand every aspect of each lesson with ease. Information is in the form of points, at some places it is in the form of tables or memory maps. This will certainly make the understanding easier for students.
- Questions under 'Can you tell?', 'Can you recall?', 'Try this', from the textbook are mostly included under 'Important points' section with suitable guidelines/answers wherever necessary.
- The Questions and Answers contains different types of thought-provoking objective questions followed by short and long answer questions, short notes, give reasons, etc. in a logical sequence. This includes all textual as well as number of additional questions.
- In addition some novel questions are included too, like Paragraph based questions, Complete the flow chart or table, Diagram-based questions (Draw the diagrams, Label the diagrams, Correct the wrong diagrams, Complete the diagrams), Complete the paragraph.
- Some of the questions given under the heading of 'Use your brain power!' and 'Think about it' are HOTS (High Order Thinking Skills) questions.
- The questions from the Board's March 2020 and November 2020 are included along with their model answers.

To summarize, Science and Technology Digest (Part 2) : Standard X is a complete and unique book for the benefit of students. This Digest will help in fetching brilliant results in the examination and will lay a strong foundation for the future college education, thereby opening the way for opportunities of higher education.

We welcome all the suggestions that may improve the quality of this book.

- The Publishers

- For guidance of Science Experiments, refer to **Navneet Science and Technology Practical Book : Standard X**.
- For guidance on Projects and write them in, refer to **Vikas Science & Technology Project Book : Standard IX & X**

Chapterwise weightage



No.	Name of the lesson/Chapter	Marks	Marks with options
1	Heredity and evolution	03	05
2	Life processes in living organisms : part-1	04	06
3	Life processes in living organisms : part-2	05	07
4	Environmental management	05	07
5	Towards green energy	04	06
6	Animal classification	04	06
7	Introduction to microbiology	04	06
8	Cell biology and biotechnology	04	06
9	Social health	04	06
10	Disaster management	03	05
	Total marks	40	60

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SCIENCE AND TECHNOLOGY PART-2 : Question Paper Pattern

Time : 2 hours

Total Marks : 40

Instruction :

- (1) All questions must be attempted.
- (2) Wherever necessary scientifically correct diagrams and correct labelling should be drawn.
- (3) Start every main question on a new page.
- (4) Numbers to the right indicate marks.
- (5) For questions No.1 (A) MCQ marks will be given only for the first attempt.
- (6) The answer to every MCQ should be written as shown – Example 1 (A).

	Marks	Marks with option
Q. 1 (A) 5 Multiple choice questions of 1 mark each (Textbook based questions)	5	5
(Note : There will be no internal option for this question. You are expected to write only the correct alphabet for the appropriate alternative.)		
Q. 1 (B) 5 Questions of 1 mark each (No fill in the blanks questions)	5	5
(Note : All questions will be of different types.)		
Different types of questions :		
(1) Find the odd man out : To identify odd component/picture from the given ones.		
(2) Correlations : By observing the correlation in the first pair, complete the second pair.		
(3) Match the columns/pairs.		
(4) Write true or false.		
(5) Write the name/molecular formula : This question may also include a picture/ figure to be named.		
(6) Flow chart with a blank to be filled. This question will also not have any internal option.		
Q. 2 (A) 3 Scientific reason questions of 2 marks each (Attempt any 2) (Minimum 1 question from Biology and 1 from EVS)	4	6
(Attempt any 2 out of 3 questions of 2 marks each) (Questions based on scientific reason will have Minimum 1 question from Biology and 1 from Environment Science)		
Q. 2 (B) 5 Questions of 2 marks each (Attempt any 3) (Minimum 2 from Biology and 2 from EVS)	6	10
(Attempt any 3 out of 5 questions of 2 marks each) (Minimum 2 questions from Biology and 2 from Environment Science)		
Different types of Questions :		
(1) Solve the numerical problem.		
(2) Write laws/definitions/principles and explain with examples.		



(3) Write a short note : Write a note on the concept understood from a given figure/picture.

(4) Complete the flow chart

(5) Distinguish between / Give difference between : 4 points of differences to be written.

(6) Write properties/characteristics/uses/advantages/effects : A minimum of 4 statements to be written.

(7) Give examples

Q. 3 8 Questions of 3 marks each (Attempt any 5) (4 from Biology and 4 from EVS) **15** **24**

(Attempt any 5 out of 8 questions of 3 marks each) (4 from Biology and 4 from Environment Science)

Different types of questions :

(1) Give explanation using the given statements

(2) Suggest remedies/measures

(3) Explanation of diagrams

(4) Complete the table/chart

(5) Explain with the help of examples

(6) Complete the diagram

(7) Answer questions based on figures

(8) Write answers with explanations

(9) Write laws, theories and explain

(10) Complete the paragraph

Q. 4 2 Questions of 5 marks (Attempt any 1) (1 from Biology and 1 from EVS) **5** **10**

(Attempt any 1 out of 2 questions of 5 marks each) (1 from Biology and 1 from Environment Science)

Different types of questions :

(1) Draw a figure and give explanation

(2) To correct the incorrect diagram

(3) Classify with detailed explanation

(4) Read the given paragraph and answer the questions

(5) Complete the given incomplete table/chart and give explanation

(6) Answer the questions in detail

(7) Draw a concept diagram based on the given item and explain

Total **40** **60**

(**Note** : Different types of questions given, can be asked in Q. 1 (B), Q. 2 (B), Q. 3 and Q. 4. Chapter nos. 4, 5, 9, and 10 are considered to be from Environment Science, while all remaining are pertaining to Biology.)

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Heredity And Evolution

CHAPTER OUTLINE

- 1.1 Heredity and Hereditary Changes
- 1.2 Transcription, Translation and Translocation
- 1.3 Evolution
- 1.4 Evidences of Evolution

- 1.5 Darwin's Theory of Natural Selection
- 1.6 Lamarckism
- 1.7 Speciation
- 1.8 Human Evolution

IMPORTANT POINTS

Can you recall? (Textbook page no. 1)

- (1) Which component of the cellular nucleus of living organisms carries hereditary characters?

Ans. The chromosomes made up of nucleic acids and proteins, present in the nucleus of the cell are the components that carry hereditary characters in living organisms.

- (2) What do we call the process of transfer of physical and mental characters from parents to the progeny?

Ans. The process of transfer of physical and

mental characters from parents to the progeny is called inheritance or heredity.

- (3) Which are the components of the DNA molecule?

Ans. DNA molecule is made up of two helical strands consisting of deoxyribose sugar, phosphoric acid and pairs of nitrogenous bases. These three together is called a nucleotide.

1.1 Heredity and Hereditary Changes :

- 1. Heredity :** The transfer of biological characters from one generation to the next one with the help of genes is called heredity.

2. History of genetics :

Year	Scientist	Study topic	Discovery/Contribution
1866	Johann Gregor Mendel	Pioneer of the modern genetics	Series of experiments on pea plant to explain inheritance of characters.
1901	Hugo de Vries	Mutational theory	Reasons behind the sudden changes.
1902	Walter, Sutton	Study of chromosomes	Paired chromosomes in grasshopper cells.
1944	Oswald Avery, Mclyn McCarthy and Colin MacLeod	DNA	All living organisms have genetic material in the form of DNA (except viruses).
1961	Francois Jacob and Jack Monod	Protein synthesis	A model for process of protein synthesis with the help of DNA in bacterial cells.

3. After the process of protein synthesis was discovered ...

- (1) Genetic codes hidden in DNA were understood.

- (2) Field of genetic engineering was developed.
(3) Emergence of the technique of recombinant DNA technology.

4. The benefits of science of heredity :

- (1) Diagnosis of hereditary disorders.
- (2) Treatment of incurable hereditary disorders.
- (3) Prevention of hereditary disorders.
- (4) Production of hybrid varieties of animals and plants.
- (5) Use of microbes in industrial processes.

Can you recall? (Textbook page no. 1)

- (1) Sketch and explain the structure of DNA and various types of RNA.

Ans.

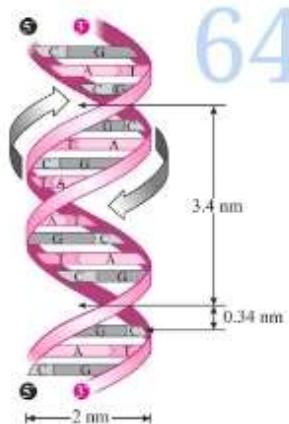
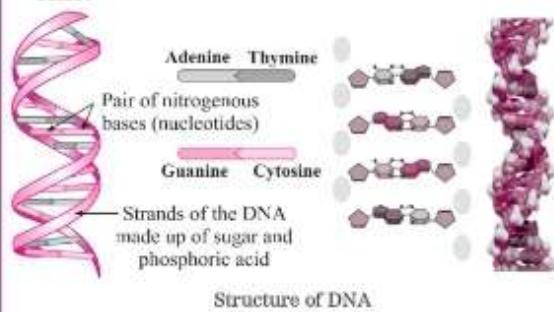


Fig. 1.1 : DNA (Watson of Cricks model)

1. DNA : DNA molecule is a double helix consisting of two strands. Each strand of this helix is made up of nucleotides. Each nucleotide is made up of a phosphoric acid, a deoxyribose sugar and a nitrogenous base. Nitrogenous bases are of two types, viz. purines and pyrimidines. The purines are of two types, viz. adenine and guanine and pyrimidines are of two types viz. cytosine and thymine. The adenine always pairs with thymine with double hydrogen bonds while

cytosine always pairs with guanine with triple hydrogen bond. The helices remain bound due to these hydrogen bonds.

2. RNA : RNA is nucleic acid having single strand of ribonucleotides. Each ribonucleotide is made up of ribose sugar, phosphate molecules and a nitrogenous base. There are four types of nitrogenous bases, viz. adenine, guanine, cytosine and uracil. RNA is found both in nucleus as well as in cytoplasm.

According to the functions RNA is of the following three main types: mRNA, rRNA and tRNA.



Fig. 1.2 : (a) mRNA

mRNA carries the information for protein synthesis from genes on DNA chain in nucleus to the ribosomes in the cytoplasm. Therefore, it is called messenger RNA.



rRNA is the component of the ribosome. It helps in protein synthesis.

Fig. 1.2 : (b) rRNA

tRNA is present in the cytoplasm. According to the message of the mRNA, it carries the specific amino acid up to the ribosomes as per the message coded on mRNA.



Fig. 1.2 : (c) tRNA

- (2) Explain the meaning of genetic disorders and give names of some disorders.

Ans. Genetic disorders are caused due to abnormalities in chromosomes and mutations in genes. Some important causes of genetic disorders

are as follows : (1) Increase or decrease in number of chromosomes causing numerical change. (2) Deletion of any part of the chromosome. (3) Translocation of chromosomes. (4) Sudden change or mutation occurring in a normal gene, turning it into a defective gene. (5) Mutations in more than one gene at the same time causing polygenic disorder.

Examples : 1. Disorders due to numerical changes in the chromosomes : (1) Down's syndrome (2) Turner's syndrome (3) Klinefelter's syndrome.

2. Monogenic disorders caused due to mutations: Hutchinson's disease, Tay-Sachs disease, galactosaemia, phenylketonuria, sickle cell anaemia, cystic fibrosis, albinism, haemophilia, night blindness, etc.

3. Polygenic disorders: Cleft lip, cleft palate, constricted stomach, spina bifida (a defect of the spinal cord), etc. are polygenic disorders. Diabetes, blood pressure, heart disorders, asthma, obesity are also polygenic disorders.

1.2 Transcription, Translation and Translocation :

1. Transcription :

- (1) Synthesis of mRNA as per the nucleotide sequence present on the DNA molecule, is called the process of transcription.
- (2) The nucleotide sequence present in the DNA molecule is called gene. Genes control the structure and functioning of cells of the body.
- (3) Information required for the synthesis of proteins is stored in the genes i.e. in the nucleotide sequences of DNA. The proteins are synthesised according to the need of the body.
- (4) **'Central Dogma'** : Synthesis of proteins by DNA through the RNA is called central dogma.

DNA Transcription → RNA Translation → Protein

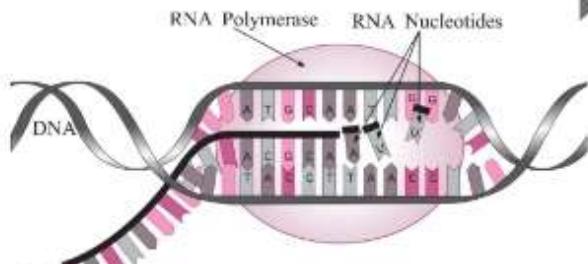


Fig. 1.3 : Transcription

- (5) Genetic information is thus used from DNA to RNA, then through RNA for protein synthesis.
- (6) mRNA is produced according to the sequence of nucleotides on DNA.
- (7) During transcription only one of the two strands of DNA is used.
- (8) The sequence of nucleotides present on DNA strand gets copied in mRNA. Hence there is always complementary sequence produced on the new mRNA molecule.
- (9) RNA molecules have uracil instead of thymine present in DNA.
- (10) Thus by transcription mRNA molecule which is complementary to DNA is produced.

• Role of different RNA in protein synthesis :

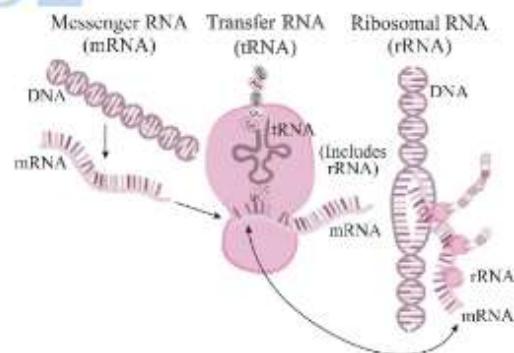


Fig. 1.4 : Process of protein synthesis

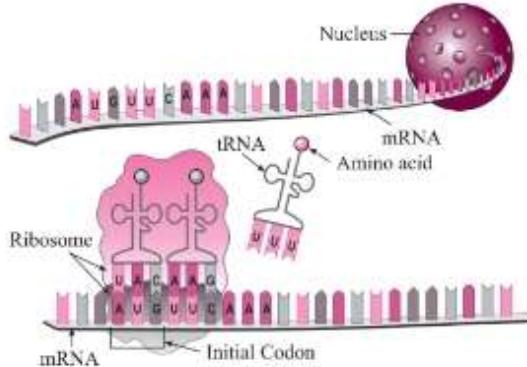


Fig. 1.5 : Translation and Translocation

2. Triplet codon :

- (1) The code for each amino acid consisting of three nucleotides, is called 'triplet codon'.
- (2) mRNA formed in nucleus brings the coded message from DNA when it comes in cytoplasm. This message contains the codes for amino acids.
3. Dr. Har Govind Khorana, made an important contribution in discovery of triplet codons for 20 amino acids. He was awarded the Nobel Prize in 1968 for this work, along with two other scientists.
4. Thousands of triplet codons are present in each mRNA molecule. As per the message on mRNA, amino acids are supplied by the tRNA.
5. **Translation** : As per the codon on mRNA, the tRNA molecule with complementary 'anticodon' is brought near mRNA, this process is called 'translation'.
6. **Formation of peptide bonds**: Every tRNA brings specific amino acid. These individual amino acids are joined together by peptide bonds with the help of rRNA.
7. **Translocation** : The ribosome keeps on moving from one end of mRNA to other end by the distance of one triplet codon. This process is 'translocation'.
8. Many such polypeptide chains come together to form different and complex proteins. The proteins are essential for controlling various functions of body of living organisms.

9. Mutation :

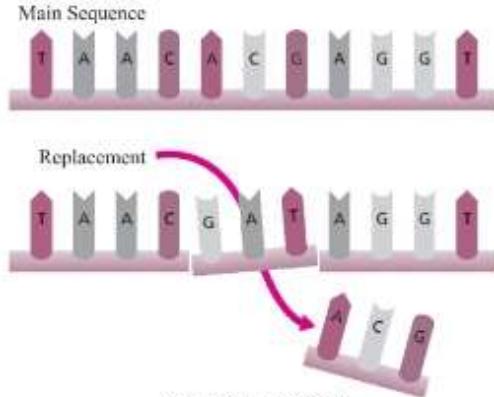


Fig. 1.6 : Mutation

- (1) Sudden change occurring in the genetic material is known as mutation.
- (2) Due to transmission of parental genes to offspring, there is remarkable similarity between parents and their offspring. But if there is mutation in any nucleotide then there are changes in the characters of the offspring.
- (3) Mutations are of two types, viz. minor and major. Minor mutations can also bring about considerable changes. E.g. Genetic disorders like sickle cell anaemia is caused due to mutation. Mutation is an everlasting process which leads to the process of evolution. It also offers proof for Darwin's theory of natural selection.

Can you recall? (Textbook page no. 3)

- (1) What is the function of the appendix of our digestive system?

Ans. Appendix of human digestive system is a functionless or vestigial organ.

- (2) Are our wisdom teeth really useful for chewing the food?

Ans. Wisdom teeth are not useful for chewing the food.

- (3) Why did the huge animals like dinosaur become extinct?

Ans. Dinosaur could not adapt to the environment in which they were trying to survive. There was beginning of ice-age which resulted in scarcity of food. The starvation was one of the reasons for extinction. According to one theory, a meteor collided with the earth and this resulted in catastrophic death of the dinosaurs.

- (4) Why are many species of animals and birds getting extinct?

Ans. There is continuous and rapid change in the environment which is causing threat to the natural habitats of the animals and birds. Pollution, climate change, increasing urbanization, etc. are the factors causing

depletion of food and shelter of animals and birds. Moreover, hunting and poaching has also resulted in extinction of many species.

1.3 Evolution :

1. **Evolution :** The gradual change occurring in living organisms over a long duration is called evolution. Evolution results in the development of organisms. Transformations ranging from changes in the stars and planets, to the changes in biosphere on the earth are studied in field of evolution.
2. Due to evolution, there is formation of new species. Due to natural selection, there are continuous changes in specific characters of several generations of living organisms.
3. Approximately 3.5 billion years ago, life was not present on the Earth.
The living organisms have been developed according to the following phases:
(1) Simple elements → (2) Organic and inorganic compounds → (3) Complex Organic compounds such as proteins and nucleic acids → (4) Mixture of different types of organic and inorganic compounds. → (5) First primitive type of cells → (6) Processes to take up surrounding chemicals developed leading to growth of cells in numbers → (7) First living organism → those organisms that could adjust and adapt to the surrounding conditions, survived and grew. This is according to the principle of natural selection. Some of them that could not adjust, perished.
4. **Ranging diversity in animals :** From unicellular amoeba and paramoecium to giant whale and man.
5. **Ranging diversity in plants :** From unicellular *Chlorella* to the huge banyan tree.
6. **Existence of life on Earth :** From equator to both the poles on the entire earth, living organisms are seen in air, water, land, rock, etc.
7. Theory of 'Gradual development of living organisms' is accepted worldwide.

8. Theory of Evolution :

- (1) First living material is the protoplasm which was formed in the ocean.
- (2) This gave rise to unicellular organisms in gradual time.
- (3) Over the span of approximately 300 crore years, very gradual changes occurred in the unicellular organisms which slowly evolved into larger and more complex life forms.
- (4) All round and multi-dimensional changes occurred which resulted in evolution of different types of organisms.
- (5) **Organizational evolution :** The progressive development of plants and animals over a very large period of time is called organizational evolution.
- (6) **Evolution :** Development of living organisms from the ancestors having different structural and functional organization is called evolution.

1.4 Evidences of Evolution :

Evolution is an everlasting process of changes. The proofs to support this process are called evidences of evolution which are of following types :

1. Morphological Evidences :

- (1) Similarities in the external and visible features are called morphological evidences.
- (2) In animals, similarities in the structures such as mouth, nostrils and ear pinnae, position of eyes, thickly distributed body fur or hair.
- (3) In plants, similar characters such as leaf shape, leaf venation, leaf petiole, etc.
- (4) These similar features indicate that origin of different animal or plant groups must be the same having a common ancestor.

2. Anatomical Evidences :

- (1) Human hand, forelegs of bull, flipper of whale and patagium of bat show difference in their features.
- (2) These organs also have different uses.
- (3) However, the structure of bones and joints in organs of each of those animals show similarity.

- (4) This is an indication that all these animals originated from a common ancestor.

Can you recall? (Textbook page no. 4)

- (1) Which are the different organs in body of organisms?

Ans. Higher organisms show different body organs and systems that carry out specific functions. Each system consists of definite organs. In the thoracic cavity, there are lungs and heart. In skull, brain is located. In abdominal cavity there is stomach, intestine, liver, kidney, etc.

- (2) Is each of the organs useful to organism?

Ans. Each important vital organ performs specific function which is necessary for survival. Brain controls and coordinates all the vital activities. Heart is responsible for the circulation of blood throughout the body. Lungs perform respiration. Kidneys filter out nitrogenous waste products from the blood. In this way, each organ performs its own function. Only few organs such as appendix do not perform any function.

3. Vestigial Organs :

- (1) **Vestigial organs :** The degenerated or underdeveloped organs which cannot perform any function are known as vestigial organs.
- (2) Existing organs undergo gradual changes during evolutionary process. Thus, they form new tissues, organs, etc.
- (3) Under certain environmental conditions such changes are necessary. However, some structures become useless in newly changed conditions.
- (4) Due to natural selection, such structures undergo degeneration and after a very long time span they vanish.
- (5) Appendix may be useful for grazing, ruminating herbivores but it is vestigial for man.

- (6) Other vestigial organs in human body are tailbone (coccyx), muscles of ear pinna, wisdom teeth and body hairs.

4. Paleontological Evidences :

(1) **Fossil :** Fossils are remnants of living organisms or their impressions which are preserved deep down in the earth's surface. Various natural calamities buried organisms in this way. Fossils throw light on the evolutionary process as they offer direct evidence of evolution.

(2) **Carbon dating :** Carbon dating is a technique to understand the age of a fossil. When alive, animals and plants consume carbon continuously but this process ends after their death. Later their body carbon in the form of C-14 undergoes continuous decaying process. C-12 is not radioactive. Therefore, the ratio between C-14 and C-12 changes continuously.

By calculating the following three aspects, the age of the fossil can be determined by knowing

- I. The time passed since the death of a plant or animal.
- II. Measurement of the radioactivity of C-14.
- III. The ratio of C-14 to C-12 present in the body.

(3) **Uses of carbon dating :** (a) Study of palaeontology (b) Understanding anthropology (c) Determining the age of human fossils and manuscripts. (d) Calculating the age of fossils and placing them in geological time scale (e) Deducing the information about other former organisms. E.g. Invertebrates gave rise to vertebrates gradually during evolution.

(4) **Willard Libby :** Willard Libby developed the technique of carbon dating method which is based upon the radioactive decay of naturally occurring C-14. For this contribution he was awarded the Nobel Prize in 1960. In the journal 'Radio Carbon' the data about the ages of the materials determined is compiled and published.

(5) **Connecting Links** : Some organisms share morphological characters of two groups and hence they are called 'connecting links'.

(i) **Peripatus** : It shows characters of Annelida and Arthropoda and thus it is the connecting link between these two phyla.

- **Annelid characters** : Segmented body, thin cuticle, and parapodia-like organs.

- **Arthropod characters** : Tracheal respiration and open circulatory system.

(ii) **Duck billed platypus** : Duck billed platypus is the connecting link between Reptiles and Mammals.

- **Reptilian characters** : Egg laying habit, scales on body.

- **Mammalian characters** : Presence of mammary glands and hair.

(iii) **Lung fish** : Lung fish is the connecting link between fishes and amphibians.

- **Fish characters** : Fish like body.

- **Amphibian characters** : Respiration with lungs.

The above connecting links prove that arthropods evolved from annelids, amphibians evolved from fish and mammals evolved from reptiles.

(6) **Embryological Evidences** : All vertebrate embryos show extreme similarities during initial stages of development. These similarities disappear gradually in later development. This initial similarity indicates that there may be a common origin of all these animals.

1.5 Darwin's Theory of Natural Selection :

1. **Charles Darwin** (1809-1882) proposed the theory of natural selection. This theory is an important milestone in the study of evolution.

2. **Theory of natural selection** : 'The survival of fittest', i.e. organisms which are fit for survival, evolve while those that are not, perish. The natural selection thus acts to produce new species.

3. Theory of natural selection is given in the book, 'Origin of Species' which is written by Darwin.

4. For this study of evolution, Darwin had collected and observed innumerable specimens of plants and animals.

5. Important explanation of Theory of natural selection :

(1) All living organisms reproduce prolifically.

(2) There is competition with each other or struggle for survival.

(3) Organisms that show essential modifications for survival, sustain while remaining perish.

(4) Survival of the fittest and elimination of misfit is the 'natural selection'.

(5) Well adapted, sustaining organisms reproduce more such offspring and in turn produce new species having specific characters.

6. Objections to Darwin's theory :

(1) Some more factors are responsible for evolution and not just the natural selection.

(2) Any explanation about useful and useless modifications was not provided by Darwin.

(3) Causes of slow and abrupt changes was not explained by Darwin.

1.6 Lamarckism :

1. **Jean-Baptiste Lamarck (1744-1829)** : Lamarck proposed principle of 'use or disuse of organs' and 'theory of inheritance/ancestry of acquired characters'. His concepts are known as Lamarckism.

2. Every living organism tries to evolve. During its lifetime, it acquires certain characters through adaptations and modifications. These characters are passed to the next generation.

3. Depending upon the activities or inactivity of that organism these changes occur.

4. Examples of acquired characters :

(1) For several generations, giraffe extended the neck for browsing on leaves from heights. Due to such extension of neck, giraffe became long-necked.

(2) Due to frequent hammering movements, shoulders of the ironsmith became very strong.



- (3) Flightless birds like emu and ostrich have weak wings as they do not fly.
- (4) Due to wading and swimming in water the hind limbs of aquatic birds such as swan and duck became fitter for such mode.
- (5) Due to burrowing habit, snakes lost the limbs. According to Lamarck such acquired characters are inherited by the next generation.

5. Objections to Lamarckism :

- (1) The view that unused organs degenerate and used ones evolve was accepted but inheritance of such characters was not agreed by the scientists.
- (2) Modifications formed are not transferred to the next generation.

6. Ancestry/Inheritance of acquired characters :

This concept states that the living organism is able to transfer the characters which it has acquired, to the next generation.

1.7 Speciation :

- 1. Due to evolution, new species of plants and animals are formed.
- 2. **Species :** The group of organisms that can produce fertile individuals through natural reproduction is called species.
- 3. **Speciation :** The process of formation of new species from earlier ones is called speciation.
- 4. Each species possesses specific characters. Each species differs in its geographical conditions, food preference, habitat, reproductive ability and period, etc. Therefore, the specific characters are retained.

5. Speciation depends upon following factors :

- (i) Genetic variation (ii) Geographical changes
- (iii) Reproductive changes (iv) Geographical or reproductive isolation for a long period.

1.8 Human Evolution :

- Stages of human evolution :

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When?	Where?	What happened?	Who were extinct? Who evolved?
Seven crore years ago	Entire earth	Various types of mammals started evolving.	Extinction of Dinosaurs
Four crore years ago	Africa	Tails disappear. Brain enlargement. Improvement in the hand.	Apes
Ape-like animals spread out to South and North-East Asia			
Four crore years ago	South and North-East Asia	Enlargement of brain strength in	Evolution of gibbon and orangutan
2 crore 50 lakh years ago	Africa	legs.	Evolution of gorilla and chimpanzee

Around 2 crore years ago some species of apes started evolving in different direction.

- (1) Changing climate, dry environment, loss of forest cover
- (2) Apes descended from trees and started living on land. (Arboreal → terrestrial transition)
- (3) Increasing use of hands for feeding and working.

Approximately 2 crore years ago.	Africa and some parts of India	Walking on two legs, instead of four. Development of lumbar bones. Walking semierect	First human-like animal : <i>Ramapithecus</i>
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When?	Where?	What happened?	Who were extinct? Who evolved?
Approximately 40 lakh years ago.	South Africa	Ape became larger and more intelligent.	
Approximately 15 lakh years ago.	China and Indonesia in Asia	Skillful man. Man who could walk upright.	Human like animals evolved. Rise of genus 'Homo'.
Approximately 1 lakh years ago.	Africa, Asia and Europe	Upright walking human. Enlargement of brain Well-developed brain. Use of fire.	First member of Wise man (<i>Homo sapiens neanderthalensis</i>) Neanderthal man was very intelligent
Approximately 50,000 years ago.	Africa, Asia and Europe	Evolution at very fast rate.	Cro-Magnon man
10,000 years ago	On entire earth	Invention of agriculture. Rearing of cattle. Establishing cities and civilizations. Development of culture.	<i>Homo sapiens sapiens</i> (Wise man)
5000 years ago	On entire earth	Invention of art of writing and beginning of historical periods.	Modern man
400 years ago	On entire earth	Emergence of Modern sciences	
200 years ago	On entire earth	Rise of industrial society	Cultural evolution of man

Important : First record of human-like animal : '*Ramapithecus*'

First example of wise-man: Neanderthal man

- Stages of human evolution and its time :

Stage of human evolution	Time period
1. Ancient animals like Lemur	7,00,00,000 years ago
2. <i>Egyptopithecus</i>	4,00,00,000 years ago
3. <i>Dryopithecus</i>	2,50,00,000 years ago
4. <i>Ramapithecus</i>	1,00,00,000 years ago
5. <i>Australopithecus</i>	40,00,000 years ago

Stage of human evolution	Time period
6. Skilled Human	20,00,000 years ago
7. Man with erect posture	15,00,000 years ago
8. Neanderthal	1,50,000 years ago
9. Cro-Magnon man	50,000 years ago

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- (1) Darwin has published a book titled _____

(a) *Natural selection* (b) *Mutation*
(c) *Fall of a sparrow* (d) *Origin of species*

*2) The proof for the fact that protein synthesis occurs through was given by George Beadle and Edward Tatum.

Note : Questions marked with asterisk (*) are textual questions.

- *(3) Transfer of information from molecule of DNA to mRNA is called process.
- (March '20)
- (a) *translocation* (b) *translation*
 (c) *transcription* (d) *mutation*
- *(4) Evolution means
- (a) *gradual development* (b) *exchanges*
 (c) *transcription* (d) *differentiation*
- *(5) Vestigial organ present in human body is proof of evolution.
- (a) *alveoli* (b) *appendix* (c) *liver* (d) *heart*
- (6) The age of materials determined are published in the journal named
- (a) *Evolution treatise* (b) *Origin of species*
 (c) *Radio carbon* (d) *Encyclopedia*
- *(7) The causality behind sudden changes was understood due to principle of Hugo de Vries.
- (a) *transcription* (b) *translocation*
 (c) *translation* (d) *mutation*
- (8) The man evolved about 50 thousand years ago.
- (a) *Cro Magnon* (b) *Neanderthal*
 (c) *Java man* (d) *Ramapithecus*
- (9) About 10 thousand years ago, started to practise agriculture.
- (a) *Gorilla* (b) *wise man*
 (c) *Ramapithecus* (d) *Australopithecus*
- (10) can be considered as the first example of wise-man.
- (a) *Australopithecus* (b) *Ramapithecus*
 (c) *Cro Magnon* (d) *Neanderthal man*
- (11) is a connecting link between Annelida and Arthropoda. (March '19)
- (a) *Duck-billed platypus* (b) *Peripatus*
 (c) *Lung fish* (d) *Whale*
- (12) Similarities in the initial stages indicate the evidence.
- (a) *connecting links* (b) *anatomical*
 (c) *embryological* (d) *Palaentological*
- (13) The process by which the gene in the nucleotide suddenly changes its position is called
- (a) *translation* (b) *translocation*
 (c) *mutation* (d) *transcription*

- (14) is not the vestigial organ in the human body.
- (a) *Appendix* (b) *Coccyx*
 (c) *Canine* (d) *Wisdom teeth*

For additional Information to the students :

George Beadle and Edward Tatum proposed the 'One gene–One enzyme hypothesis' in 1941. For this they performed mutational experiments of mould, *Neurospora crassa*.

Ans. (1–d); (2–a); (3–c); (4–a); (5–b); (6–c); (7–d); (8–a); (9–b); (10–d); (11–b); (12–c); (13–c); (14–c).

Note : As per the new pattern of activity sheet, no 'Fill in the blanks' questions will be asked in the examination. So all 'Fill in the blanks' questions of textbook are converted as MCQs.

Note : While answering MCQ, enter only option number that you choose as an answer.

Q. 2 Write whether the following statements are true or false with proper justification for your answer :

(1) It takes thousands of years for a useful structure to disappear.

Ans. False. (The useful structures of the body do not disappear. The functioning of the body is easier due to such organs. It takes thousands of years for a functionless organ to disappear.)

(2) Dr. Har Govind Khorana was awarded Nobel prize for his invention and publication in the journal Radio carbon.

Ans. False. (Willard Libby was awarded Nobel prize for his invention and publication in the journal Radio carbon.)

(3) Mesozoic era was dominated by variety of mammals.

Ans. False. (Mesozoic era was dominated by variety of reptiles.)

(4) It seems that invertebrates have been slowly originated from vertebrates.

Ans. False. (Vertebrates have been slowly originated from invertebrates in course of evolution. The primitive type of organisms always give rise to complex life forms. The invertebrates from Palaeozoic era gradually gave rise to vertebrates.)

(5) The decaying process of C-12 occurs continuously from the dead remains of living organisms.

Ans. False. (The decaying process of C-14 occurs continuously from the dead remains of living organisms. C-12 is not radioactive and hence it does not show decaying process.)

(6) The theory of natural selection which mentions 'Survival of fittest' is given by Lamarck.

Ans. False. (The theory of natural selection which mentions 'Survival of fittest' is given by Darwin.)

(7) Changes acquired during life time are transferred to next generation.

Ans. False. (Changes acquired during life time are not heritable. They are not transferred to next generation. Only the genes are transferred to the next generation.)

(8) Each species grows in specific geographical conditions and has specific food, habitat, reproductive ability and period.

Ans. True. (Each species has specifically evolved characters due to evolution and speciation.)

(9) Humans walking with upright posture were confined to Africa only during prehistoric period.

Ans. False. (Humans walking upright existed in Africa and China, Indonesia of Asian continent too.)

(10) Industrial society was established about 200 years ago.

Ans. True. (After the development and specialization of human brain, he started indulging in science and technology. Before this period, the idea of industrialization was not existing.)

Note : In examination students have to write only 'True' or 'False'. No need to rectify and rewrite the corrected statement, unless mentioned. Here explanation is given for the benefit of students.

Q. 3 Match the columns :

(1) Scientist	Discovery
(1) Johann Gregor Mendel	(a) Chromosomes of grasshopper
(2) Hugo de Vries	(b) DNA is genetic material (c) Pioneer of the modern genetics (d) Mutational theory

Ans. (1) Johann Gregor Mendel – Pioneer of the modern genetics.

(2) Hugo de Vries – Mutational theory.

(2) Scientist	Discovery
(1) Walter, Sutton	(a) Mutational theory
(2) McLyn McCarthy	(b) DNA is genetic material (c) Pioneer of the modern genetics (d) Chromosomes of grasshopper

Ans. (1) Walter, Sutton – Chromosomes of grasshopper.

(2) McLyn McCarthy – DNA is genetic material.

(3) Evidences of evolution	Examples
(1) Morphological evidences	(a) Duck-billed Platypus and Peripatus
(2) Anatomical evidences	(b) Remnants and impressions (c) Human hand and fore limb of bull (d) Shape and venation of leaf

Ans. (1) Morphological evidences – Shape and venation of leaf.

(2) Anatomical evidences – Human hand and fore limb of bull.

(4) Evidences of evolution	Examples
(1) Palaeontological evidences	(a) Duck billed Platypus and Peripatus
(2) Connecting links	(b) Remnants and impressions (c) Coccyx and wisdom tooth (d) Human hand and fore limb of cat

Ans. (1) Palaeontological evidences – Remnants and impressions.
(2) Connecting links – Duck billed Platypus and Peripatus.

Q. 4 Find the odd one out :

- (1) Transcription, Translation, Translocation, Mutation
- (2) Bones of the hands, structure of nostrils, position of eyes, structure of ear pinnae
- (3) Venation, Shape of seeds, Leaf petiole, Leaf shape
- (4) Human hand, wing of cockroach, forelimb of bull, flipper of whale

Ans. (1) **Mutation.** (All others are stages of protein synthesis.)

(2) **Bones of the hands.** (All the others are morphological evidences.)

(3) **Shape of seeds.** (All the others are morphological evidences in plants.)

(4) **Wing of cockroach.** (All others are anatomical evidences, they are homologous organs.)

Note : In examination, students have to write only answers of odd one out. No need to write explanation or reason.

Q. 5 Identify the correlation between the first two words and suggest the suitable words in the fourth place :

- (1) mRNA : Transcription :: tRNA :
- (2) Peripatus : Connecting link ::
Appendix :

- (3) Open circulatory system : Arthropods :: Thin cuticle and parapodia :
- (4) Between Annelida and Arthropoda :
Peripatus ::, Lung fish
- (5) Theory of natural selection : Charles Robert Darwin :: Theory of inheritance of acquired characters :
- (6) Survival of fittest : Darwin :: Acquired characters :
- (7) Wisdom teeth : Vestigial organs ::
Lung fish :

Ans. (1) Translation (2) Vestigial organs
(3) Annelida (4) Pisces/Fish and Amphibia (5) Jean Baptiste Lamarck (6) Lamarck (7) Connecting link.

Q. 6 Define the following :

(1) Heredity : The transfer of biological characters from one generation to another through genes is called heredity.

(2) Transcription : Process of synthesis of mRNA according to the nucleotide sequence present on DNA is called transcription.

(3) Translation : The process of bringing tRNA possessing anticodon that is complementary to the codon on mRNA for protein synthesis is called translation.

(4) Translocation : The process of movement of the ribosome from one end of mRNA to other end by the distance of one triplet codon is called translocation.

(5) Mutation : Sudden and drastic change that occurs in the genetic material is called mutation.

(6) Species : The group of organisms that can produce fertile individuals through natural reproduction is called a species.

Q. 7 Name the following :

(1) Three scientists who proved that except viruses, all living organisms have DNA as genetic material.

Ans. Oswald Avery, Mclyn McCarthy and Colin MacLeod.

(2) Genetic disorder caused due to mutation :

Ans. Sickle cell anaemia.

(3) Fish that can breathe with help of lungs :

Ans. Lung fish.

(4) Vestigial organs in human beings :

Ans. Appendix, tail-bone or coccyx, wisdom teeth and body hair.

(5) Father of modern genetics :

Ans. Johann Gregor Mendel

(6) I am a connecting link between reptiles and mammals. Who am I? (March '20)

Ans. Duck billed platypus

Q. 8 Distinguish between the following :

(1) Transcription and Translation :

Transcription	Translation
1. In the process of transcription, the sequence of nucleotides present on the DNA molecule is copied and carried to the cytoplasm by mRNA. 2. The process of transcription takes place in nucleus. 3. During transcription, RNA is produced from DNA. 4. Only mRNA takes part in transcription.	1. In the process of translation, the specific amino acids are picked up according to the codons brought by mRNA. 2. The process of translation takes place in ribosomes located in cytoplasm. 3. During translation, proteins are produced with the help of RNA. 4. mRNA, tRNA and rRNA take part in translation.

(2) Ape and Human :

Ape	6414132	Human
1. Brain of the apes is smaller in size. 2. Ape cannot walk upright. 3. Ape is less intelligent as compared to human. 4. Apes are arboreal in their habitat and they spend more time on the trees. 5. The forelimbs of ape are longer than the hind limbs.		1. Brain of humans is larger in size. 2. Humans can walk upright. 3. Human is considered to be the most intelligent animal. 4. Humans are terrestrial in their habitat. They cannot stay on the trees. 5. The forelimbs of humans are shorter than the hind limbs.

Q. 9 Give scientific reasons :

(1) Some of the characters of parents are seen in their offspring.

Ans. (1) The parental genes are transferred to their progeny through male and female gametes.
(2) These genes carry hereditary characters.
(3) Since they are transmitted from the parents to their offspring, one can see the parental characters in their offspring.

(2) Darwin's work on evolution has been a milestone.

Ans. (1) Darwin has proposed two very important

theories of evolution, viz. Theory of natural selection and Theory of origin of species. (2) The evolution has taken place on the earth for last many crores of years. (3) The exact nature and process of these evolutionary changes become clear after studying Darwinism. (4) The observations made by Darwin at that time are now tested according to the modern development in science and are found to be correct. Thus, his work is said to be a milestone.

(3) *Peripatus* is said to be a connecting link between Annelida and Arthropoda.

Ans. (1) *Peripatus* shows segmented body, thin

cuticle, and parapodia-like organs. (2) These characters are typical of Annelids. (3) Similarly, it also shows tracheal respiration and open circulatory system which is a characteristic feature of Arthropods. (4) Since *Peripatus* shares both these characters, it is said to be a connecting link between Annelida and Arthropoda.

(4) Vertebrates have been slowly originated from invertebrates.

Ans. (1) When the carbon dating method was used to assess the age of fossils, it was understood that invertebrates were present on the earth much before the vertebrates. (2) The fossils of invertebrates are present in lower layers of earth's strata. (3) They were seen in Palaeozoic era of geological time period. Vertebrates dominated during Coenozoic era. (4) Their fossils are seen in the upper strata of the earth's crust. (5) The structural complexity also increased in vertebrates. All these facts indicate that vertebrates have slowly originated from invertebrates.

(5) During human evolution the hands became available for use.

Ans. (1) During human evolution, the climate of earth started becoming dry. (2) This resulted in loss of forest cover. (3) The apes which were arboreal on the trees thus descended and started walking on land. (4) The lumbar bones underwent change and the apes started walking upright on the grasslands. (5) The vertebral column also underwent change. Due to upright posture the forelimbs were freed from locomotion. (6) The legs started bearing the weight of the body and the hands became available for use.

*** Q. 10** Read the following statements and justify the same in your own words with the help of suitable examples :

(1) Geographical and reproductive isolation of organisms gradually leads to speciation.

Ans. (1) Every species survives in specific geographical conditions. The requirements of food and habitat is specific for each species. Their reproductive ability and period is also different.

(2) Therefore, the individuals from one species

cannot reproduce with individuals from other species.

(3) When they are separated by a distance or geographical barriers they are said to be isolated geographically.

(4) When they cannot reproduce with each other, they are said to be isolated reproductively.

(5) The ancestor species of both these subspecies may be the same but due to isolation over a very long-time duration, there is genetic variation between the two. Therefore, the isolation leads to speciation.

(2) Study of fossils is an important aspect of study of evolution.

Ans. [For the answer refer to Q. 11 (8).]

(3) There is evidences of fatal Science* among chordates.

* Please read the above question as : Among different chordates there are embryological evidences.

Ans. (1) Very young embryos of fish, amphibians, reptiles, birds and mammals show quite similar structure in the early stages.

(2) As the further growth takes place, they acquire different patterns.

(3) The initial similarity between the vertebrate embryos is an evidence that during evolution, there was a common ancestor for all the vertebrate classes.

(4) This is called embryological evidence for vertebrate evolution.

(4) Human evolution began approximately 7 crore years ago.

Ans. (1) Approximately around 7 crore years back the ice age began on the earth. In such conditions, dinosaurs became extinct. The evolution and diversity of mammals started during this time. Due to change in climate the forest cover also declined rapidly.

(2) Ancestors of monkey-like animals were Lemur like animals which evolved during this time period.

(3) The tails of these monkey-like creatures started vanishing very gradually around 4 crore years ago.

(4) The body and brain both increased in volume forming first ape like animals. The monkey like

ancestors gave rise to two evolutionary links to apes and human like animals.

(5) Later, the human evolution took place by changes in the brain volume, the ability to walk upright, excessive use of hand for manipulations.

(6) This journey of human evolution began 7 crore years ago. But the true wise and intelligent man arose around 50,000 years ago.

Q. 11 Answer the following questions :

*(1) Define heredity. Explain the mechanism of hereditary changes.

Ans. (1) **Heredity** : Heredity is the process by which the biological characters from parental generation are transmitted to the next generation through genes.

(2) The mechanism of hereditary changes :

(i) **Mutation** : Sudden change in the parental DNA can cause mutations. This results into changes in the hereditary characters.

(ii) At the time of meiosis, the crossing over takes place. This creates new recombination of the genetic information. Therefore, the haploid gametes produced carry changed hereditary characters.

*(2) Explain the process of formation of complex proteins.

Ans. The proteins are synthesised in following steps, viz. transcription, translation and translocation. Protein synthesis takes place according to the sequence of nucleotides present on the DNA molecule with the help of RNA molecules. This is known as central dogma of protein synthesis.

(1) **Transcription** : In the process of transcription, mRNA is produced as per the nucleotide sequence on the DNA. For this the two strands DNA are separated. Only one strand participates in the formation of mRNA. The sequence of nucleotides which is complementary to that of present on DNA is copied on mRNA. Instead of thymine present in DNA, uracil is added on the mRNA. Transcription takes place in nucleus but the mRNA leaves nucleus, carries the genetic code and enters the cytoplasm. This genetic code is always in triplet form and hence is known as

triplet codon. The code for each amino acid always consists of three nucleotides.

(2) **Translation** : Each mRNA may carry thousands of codons. But each codon is specific for only one amino acid. The tRNA molecule brings the required amino acid as per the code present on mRNA. There is anticodon on each tRNA which is complementary to the codon on mRNA. This process is known as translation.

(3) **Translocation** : In translocation, the ribosome keeps on moving from one end of mRNA molecule to other end by distance of one triplet codon. While this process is taking place, rRNA, helps in joining the amino acids together by peptide bonds. The peptide chains later come together to form complex protein molecules.

(3) Answer the following questions :

(March '19)

(a) What do you mean by central dogma?

Ans. Information about protein synthesis is present in DNA. As per this information, proteins are produced by DNA through RNA molecules. This is called central dogma.

(b) What is transcription?

Ans. The process of synthesis of mRNA as per the nucleotide sequence present in DNA is called transcription. The nucleotide sequence on mRNA is complementary to that of the single DNA strand used in synthesis. Instead of thymine, mRNA possesses uracil.

(c) What is meant by triplet codon?

Ans. The code for each amino acids always consists of three nucleotides which is known as triplet codon.

*(4) How are the hereditary changes responsible for evolution?

Ans. Hereditary characters are transmitted from parental generation to the offspring. These characters are maintained through inheritance. But the genes which are beneficial for the organisms in helping them to adapt to the environment are transmitted to the next generations in a greater proportion. This happens due to natural selection.

The process of evolution happens at a very slow pace. The favourable genes are preserved in the species as they bring about better survival of the individuals. Such individual reproduces more efficiently and evolve. The individuals with unfavourable genes are not selected by nature and are thus removed from the population through natural death. The fuel for evolution is thus truly supplied by the hereditary changes.

***(5) Explain the theory of evolution and mention the proof supporting it.**

Ans. (1) [For the answer to theory of evolution, refer answer of Q. 12 (2).]

(2) Proof here means evidences of evolution. These evidences are as follows : (i) Morphological evidences (ii) Anatomical evidences (iii) Vestigial organs (iv) Palaeontological evidences (v) Connecting links (vi) Embryological evidences.

***(6) Explain with suitable examples importance of anatomical evidences in evolution.**

(July '19; March '20)

Ans. (1) There are similarities in the structure and anatomy of different animal groups. E.g. human hand, forelimb of bull, patagium of bat and flipper of whale are all similar in their internal anatomy. There is similarity in the bones and joints of all these specimens.

(2) External morphology does not show any similarity. Use of each of the organ is also different in different animals. Structurally, they may not be related.

(3) However, the similarities in the anatomy is an evidence that they may have a common ancestor.

(4) In this way, the anatomical evidence throws light on the process of evolution.

***(7) Define vestigial organs. Write names of some vestigial organs in human body and write the names of those animals in whom same organs are functional.** *OR*

Define vestigial organs. Write any two names of vestigial organs in human body. (July '19) *OR*

What do we call the degenerated or partially developed useless organs in living organisms?

Enlist such organs in human body. How the same organs are useful in other animals? *OR*

- (a) Define vestigial organs.
- (b) Write name of any two vestigial organs in human body.

- (c) Explain how one human vestigial organ is functional in another animal. (Nov. '20)

Ans. (1) Vestigial organs are degenerated or underdeveloped organs of organisms which do not perform any function.

(2) According to the principle of natural selection, such organs are on the verge of disappearance. But it takes many millions of years for its complete vanishing.

(3) The vestigial organs in one animal may be of use but to other kind of the animal as they still perform regular functions.

(4) Appendix is vestigial for humans, it does not perform any function but in ruminant animals it is concerned with digestion.

(5) Ear muscles are vestigial for us but in monkeys and cattle they are functional.

(6) Names of vestigial organs in human body—Appendix, tail-bone or coccyx, wisdom teeth and body hair.

***(8) Define fossil. Explain importance of fossils as proof of evolution.**

Ans. (1) Fossils offer palaeontological evidence for the evolutionary process.

(2) Due to some natural calamities the organisms get buried during ancient times.

(3) The impressions and remnants of such organisms remain preserved underground. The hot lava also traps some organisms or their impressions. All such formations form fossils.

(4) Study of fossils help the researcher to understand the characteristics of the organisms that existed in the past.

(5) Carbon dating method also helps in finding out exact age of the fossil. According to the structure of earth's crust the fossils are obtained at specific depths.

(6) The oldest ones are obtained at the depth while the relatively recent ones occupy the upper surface. Thus fossils of invertebrates were seen in very old Palaeozoic era. Later were seen fossils of Pisces, Amphibia and Reptilia. The Mesozoic era was dominated by reptiles while Coenozoic era showed presence of mammals.

(7) In this way, study of fossils unfold the evolutionary secrets.

(9) In which way is science of heredity useful these days?

Ans. The science of heredity is useful in the following ways :

- (1) For diagnosis of hereditary disorders.
- (2) For treatment of hereditary disorders.
- (3) For prevention of hereditary disorders.
- (4) For production of hybrid varieties of animals and plants.
- (5) For using microbes in the industrial processes.

(10) What is meant by carbon dating method?

Ans. (1) Carbon dating method is technique used for determining the age of fossils.

(2) After the death of the organisms, their consumption of carbon stops. But right from that moment the decaying process of C-14 occurs continuously.

(3) This results in change in the ratio between C-14 and C-12. C-12 is not radioactive as C-14.

(4) Thus the time passed since the death of a plant or animal is calculated by measuring the radioactivity of C-14 and ratio of C-14 to C-12 present in their body.

(5) The points noted during carbon dating are:

- (i) The period after the organism has been dead.
- (ii) The activity of C-14 in the dead organism.
- (iii) Ratio between C-14 and C-12.

***(11) Write evolutionary history of modern man.**

Ans. (1) Ancestors of humans developed from animals which resembled lemur like animals.

(2) Around seven crore years ago, monkey-like animals evolved from some of these lemur like animals.

(3) Then after about 4 crore years ago, in Africa the tails of these monkey like creatures very gradually disappeared.

(4) Simultaneously, there was enlargement in their body and brain volume too. The hands also improved and were provided with opposable thumb. In this way, ape-like animals were evolved.

(5) These ape-like animals independently gave rise to two lines of evolution, one giving rise to apes like gibbon and orangutan in the South and North-East Asia and gorilla and chimpanzee which stayed in Africa around 2.5 crores of years ago.

(6) The other line of evolution gave rise to human like animals around 2 crore years ago.

(7) The climate became dry and this resulted into reduction of forest cover. This made arboreal apes to descend on the land and start terrestrial mode.

(8) Due to this, there were changes in the pelvic girdle and vertebral column. The hands were also freed from locomotion and thus they became more manipulative.

(9) Later, journey of hominoid species started from around 2 crores years ago. The first record of human-like animal is 'Ramapithecus' ape from East Africa.

(10) *Ramapithecus* → *Australopithecus* → Neanderthal man → Cro-Magnon are the important steps in human evolution.

(11) Neanderthal man was said to be the first wise man. The increasing growth of brain made man more and more intelligent and thinking animal.

(12) Later, more than biological evolution, it was cultural evolution, when man started agriculture, animal rearing. There was development of civilizations, arts and science etc. About 200 years ago there were industrial inventions and thus man now rules the earth.

(12) Answer the following questions :

(a) Describe briefly the Darwin's theory of natural selection. *(Nov. '20)*

(b) What were the objections raised against Darwinism?

(c) Which book was published by Darwin to explain this theory?

Ans. (a) Charles Darwin (1809-1882) proposed the theory of natural selection.

Theory of natural selection : 'The survival of fittest', i.e. organisms which are fit for survival, evolve while those that are not, perish. The natural selection thus acts to produce new species.

(b) Objections raised against Darwinism :

For the answer refer to answer of Q. 11 (13).

(c) Charles Darwin wrote the book 'Origin of Species'.

(13) What were the objections raised against Darwinism?

Ans. Some of the main objections raised against Darwinism are as follows :

(1) There are other factors too for evolution and just not the Natural Selection.

(2) Arrival of useful and useless modifications were not explained by Darwin, though he said about the survival of the fittest.

(3) He has not given any explanation about slow changes and abrupt changes occurring during evolution.

(14) Answer the following questions :

(a) Explain in brief-Lamarck's principle of 'use or disuse of organs'.

Ans. The theory of use and disuse of organs says that the morphological characters of organism develop because of specific activities that the organisms perform. If some organ is not used it gets degenerated. If excessively used, it develops. Thus, the morphological changes take place due to activities or non-working of a particular body parts in an organism.

(b) Give two examples.

Ans. Due to constant extension of neck to eat foliage from the top of the trees, giraffe's neck became long. Similarly, blacksmith has strong arms due to constant work. The flightless ostrich and emu did not fly and hence their wings became useless. Aquatic birds like swan and duck made their feet suitable for swimming by living in water. Snake lost limbs as it tried burrowing mode.

(c) What are acquired characters?

Ans. Acquired characters are those characters which are obtained during the life time by any organism and passed on to next generations.

Though it is given in the textbook, students should note that acquired characters are not passed on to next generations as they are not hereditary in nature.

Q. 12 Write short notes :

OR

Write short notes based upon the information known to you :

***(1) Evolution.**

Ans. (1) The sequential changes in the groups of living organisms that take place very gradually is called evolution.

(2) Evolution is also described as the formation of new species due to natural selection.

(3) The process of evolution takes millions of years for development and speciation of different organisms.

(4) Changes in stars and planets in space and the changes in biosphere occurring on the Earth are all included under study of evolution.

(5) Due to evolution organisms become fit, biodiversity is increased, and new species are created.

(6) Different scientists have put forth theories to explain the process of evolution. Among these Charles Darwin's theory of natural selection and speciation is accepted worldwide.

(2) Theory of evolution.

Ans. (1) According to the theory of evolution, first living material was in the form of protoplasm which was formed in ocean.

(2) Gradually, it gave rise to unicellular organisms. Changes took place in these unicellular organisms which made them evolve into larger and more complex organisms.

(3) All evolutionary changes were very slow and gradual taking about 300 crore years to happen.

(4) Different types of organisms were developed as the changes and development that occurred in living organisms was all round and multi-dimensional.

(5) Hence, this overall process of evolution is called organizational and progressive.

(6) Variety of plants and animals developed from the ancestors having different structural and functional organization during the process of evolution.

* (3) Connecting link.

Ans. Some living organisms possess some characters in them which are the distinctive features of different groups or phyla. Such individuals connect these two groups by sharing the characters of both and hence they are known as connective links.

Examples : (1) *Peripatus* : *Peripatus* is the connecting link between Annelida and Arthropoda. It shows characters of both animal phyla. Like annelid worm, it shows segmented body, thin cuticle and parapodia. Like an arthropod, it shows open circulatory system and tracheal system for respiration.

(2) **Duck Billed platypus** : This is a connecting link between reptiles and mammals. Like reptiles it lays eggs but like mammals it has mammary glands and hairy skin.

(3) **Lung fish** : Lung fish is a connecting link between fishes and amphibians. Though a fish, it shows lungs for respiration as in amphibian animals.

(4) Connecting links indicate the direction and hierarchy of evolution.

* (4) Embryology.

Ans. (1) Embryology is the study of developing embryos.

(2) These embryos in their initial stages are very similar to each other.

(3) These similarities decrease later in the development.

(4) This similarity in initial stages indicate that these vertebrates have originated from a common ancestor.

(5) In evolutionary science, comparative study of embryos of various vertebrates provide evidence for evolution.

* (5) Darwin's theory of natural selection.

Ans. (1) Charles Darwin proposed the theory of natural selection after making many observations on different specimens. He published a concept 'Survival of the fittest'.

(2) Darwin explains this concept as follows: All the organisms reproduce prolifically. Therefore, there is always a competition for food, mate, etc. Only

those organisms survive which show the adaptations for sustaining this struggle.

(3) Natural selection plays important role by selecting only those organisms which are fit to live. Those that do not have better adaptations, perish. Selected sustaining organisms then perform reproduction and form new species in a very long period of time.

(4) Darwin published his views in the book titled 'Origin of Species'.

* (6) Lamarckism.

Ans. (1) Lamarckism consists of two theories which were proposed by Jean Baptiste Lamarck. These are as follows : (a) Use and disuse of the organs (b) Inheritance of acquired characters.

(2) In theory of use and disuse of organs, Lamarck says : The characters of organs develop because specific activities that the organisms perform. If such organ is not used it gets degenerated. Thus the morphological changes take place due to activities or inactivity of a particular organism.

(3) To emphasise this theory, he quoted following examples. Due to constant extension of neck to eat foliage from the top of the trees, giraffe's neck became long. Similarly blacksmith has strong arms due to constant work. Flightless ostrich and emu did not fly and hence their wings became useless. Aquatic birds like swan and duck made their feet suitable for swimming by living in water. Snake lost limbs as it tried burrowing mode.

(4) Such acquired characters are passed from one parental generation to the offspring. This is called inheritance of acquired characters.

(5) The theory of inheritance of acquired characters is not accepted as such transmission of acquired character does not take place. Only genetic characters are transmitted.

Q. 13 By choosing appropriate words given in the bracket, complete the paragraph :

(1) (translation, anticodon, tRNA, mRNA, amino acids, triplet codon, transcription, DNA)

The formed in nucleus comes in cytoplasm. It brings in the coded message from DNA. The message contains the codes for amino

acids. The code for each amino acid consists of three nucleotides. It is called as '.....'. Each mRNA is made up of thousands of triplet codons. As per the message on mRNA, are supplied by the For this purpose, tRNA has '.....' having complementary sequence to the codon on mRNA. This is called '.....'.

Ans. The mRNA formed in nucleus comes in cytoplasm. It brings in the coded message from DNA. The message contains the codes for amino acids. The code for each amino acid consists of three nucleotides. It is called as 'triplet codon'. Each mRNA is made up of thousands of triplet codons. As per the message on mRNA, amino acids are supplied by the tRNA. For this purpose, tRNA has 'anticodon' having complementary sequence to the codon on mRNA. This is called 'translation'.

(2) (Cultural, agriculture, fire, brain, Cro-Magnon, Homo sapiens, Neanderthal)

Evolution of upright man continued in the direction of developing its for the period of about 1 lakh years and meanwhile he discovered the Brain of man, 50 thousand years ago had been sufficiently evolved to the extent that it could be considered as member of the species Neanderthal man can be considered as the first example of wise-man. The man evolved about 50 thousand years ago and afterwards, this evolution had been faster than the earlier. About 10 thousand years ago, wise-man started to practise the It started to rear the cattle-herds and established the cities. development took place later.

Ans. Evolution of upright man continued in the direction of developing its brain for the period of about 1 lakh years and meanwhile he discovered the fire. Brain of man 50 thousand years ago had been sufficiently evolved to the extent that it could be considered as member of the species Homo sapiens. Neanderthal man can be considered as the first example of wise-man. The Cro-Magnon man evolved about 50 thousand years ago and afterwards, this evolution had been faster than the earlier. About 10 thousand years ago, wise-man started to practise the agriculture. It started to rear the cattle-herds and established the cities. Cultural development took place later.

Q. 14 Read the paragraph and answer the questions given below :

With the help of RNA, the genes present in the form of DNA participate in the functioning of cell and thereby control the structure and functioning of the body. Information about protein synthesis is stored in the DNA and synthesis of appropriate proteins as per requirement is necessary for body. These proteins are synthesized by DNA through the RNA. This is called 'Central Dogma'. mRNA is produced as per the sequence of nucleotides on DNA. Only one of the two strands of DNA is used in this process. The sequence of nucleotides in mRNA being produced is always complementary to the DNA strand used for synthesis. Besides, there is uracil in RNA instead of thymine of DNA. This process of RNA synthesis is called 'transcription'.

Questions and Answers :

(1) Which part of the cell control the structure and functioning of the body?

Ans. Genes present in the form of DNA along with RNA control the structure and functioning of the body.

(2) How is a specific protein synthesised in the cell?

Ans. The information of protein synthesis is stored in the DNA which is utilised as per the requirement of the body. Later the proteins are synthesised by DNA through the RNA.

(3) What is the similarity between mRNA and DNA?

Ans. The sequence of nucleotides on DNA is copied on mRNA. The nucleotide sequence on mRNA is thus complementary to DNA.

(4) Give one difference between RNA and DNA.

Ans. RNA has uracil instead of thymine which is present in DNA.

(5) Define central dogma.

Ans. Central dogma is the concept that proteins are synthesised by DNA through the RNA.

Q. 15 Diagram-based questions :

1. Observe the figure 1.3 of transcription given on page 9 in this chapter and answer the following questions :

(1) What is the sequence of nucleotides present on one strand of the DNA?

Ans. A T G C A A T T

(2) According to the above sequence on DNA, what will be the transcribed sequence on the mRNA molecule?

Ans. U A C G U U A A

(3) Which enzyme is taking part in the above process of transcription?

Ans. RNA polymerase takes part in the process of transcription.

2. Observe the figure 1.5 of translation and translocation, given on page 9 this chapter and answer the following questions :

(1) Which is the initiation codon? Where is it present?

Ans. AUG is the initiation codon, which is present on the mRNA.

(2) What are the types of RNA present inside the ribosome? Which triplet codon is present on it?

Ans. There are two molecules of tRNA present inside the ribosome. The triplet codons present on them are UAC and AAG respectively.

(3) Which genetic code is present on mRNA that is leaving the nucleus? What must be the sequence on the DNA to have such code on mRNA?

Ans. The mRNA that leaves the nucleus has genetic code : A U G U U C A A A

The genetic code on DNA therefore should be as follows : T A C A A G T T T

3. Observe the figure 1.6 given on page 10 from this chapter. Answer the following question based on your observations :

• What is the significance of this figure from the viewpoint of evolution? Explain in brief.

Ans. In the figure, the process of mutation is shown. The original nucleotide sequence of TGC is replaced by new mutated sequence GAT. The change in the nucleotide sequence will change the DNA.

This will result in the change in genes and then changing the hereditary characters. Due to such change in genes, the evolution proceeds. The mutation so formed can be minor or major. The greater the impact of the change, the evolution takes place rapidly. The mutation thereby produce recombinations leading to diversity.

4. Observe the picture and answer the following questions :



(1) Which evidence of evolution is shown in the picture?

Ans. Embryological evidences of evolution are shown in this picture.

(2) What can be proven with this proof?

Ans. The similarities in the initial embryonic stages of different vertebrates shows that there was a common origin of all of them. Thus embryological evidences prove that there was common vertebrate ancestor.

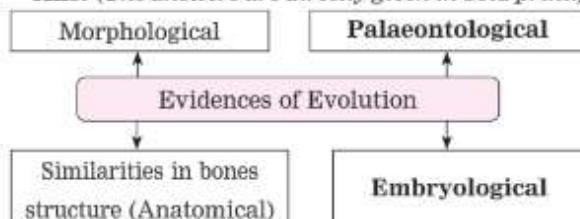
(3) Give one more example of evidence of evolution.

Ans. Palaeontological evidences such as vestigial organs and connecting links are another examples of evolutionary evidences.

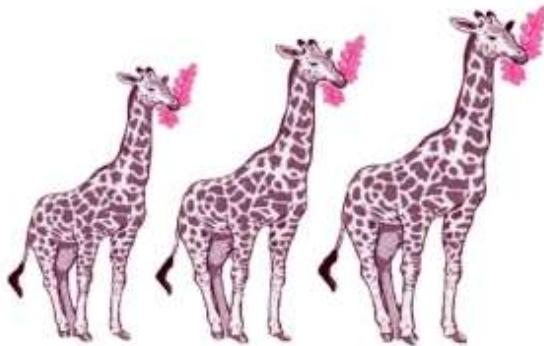
*5. Complete the following diagrams :

(March '19)

Ans. (The answers are directly given in bold print.)



6. Which concept/theory do you remember after seeing this picture of Giraffes? Describe it in brief.



Ans. (1) The picture is based on the Lamarck's principle of 'use and disuse of organs'.

(2) The morphological characters of organism develop because of specific activities that the organisms perform.

(3) If some organ is not used it gets degenerated. If excessively used, it develops further.

(4) Thus, the morphological changes take place due to activities or non-working of a particular body parts in an organism. Due to constant extension of neck to eat foliage from the top of the trees, giraffe's neck became long.

7. Define the evidence of evolution shown in the figure.



Ans. The evidence of evolution shown in the diagram is appendix which is vestigial organ. Definition of Vestigial organ. The degenerated or underdeveloped organ which cannot perform any function is known as vestigial organ.

Q. 16 Activity-based Questions :

- (1) Try this : (Textbook page no. 4)



Fig. 1.7 : Morphological evidences

- Observe the above images and note the similarities between given animal images and plant images.

Ans. The above pictures of the animals show similarities such as structure of mouth, position of eyes, structure of nostrils and ear pinnae and body fur. In pictures of plants there are similarities in characters like leaf shape, leaf venation, leaf petiole, etc.

These above morphological evidences show that there may be a common ancestor for all of the species shown.

OBSERVE AND DISCUSS

- (1) Observe the pictures given below.

(Textbook page no. 5)

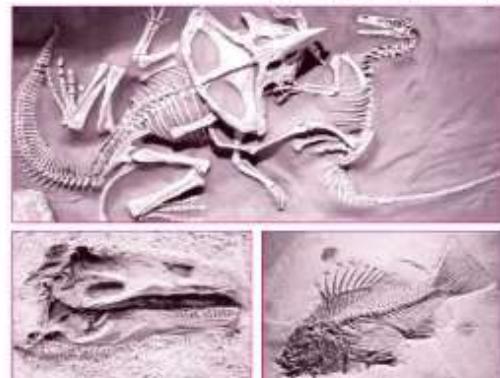


Fig. 1.8 : Fossils

(Refer to Q. 11 (9) for more information)

(2) Observe the pictures given and discuss the characters observed.

(Textbook page no. 6)



Duck-billed



Lung fish



Peripatus

Fig. 1.9 : Connecting links

(Refer to Q. 12 (3) for more information)

PROJECTS

(1) **Internet is my friend :** (T.B. page no. 3)

Collect the information from the internet about Big-Bang theory related with the formation of stars and planets and present it in your class.

(2) **Use of ICT :** (Textbook page no. 4)

Collect the information of geological dating and present it in the classroom.

(3) **Use of ICT :** (Textbook page no. 5)

Find how the vestigial organs in certain animals are functional in others. Present the information in your class and send it to others.

(4) **Internet is my friend :** (T.B. page no. 8)

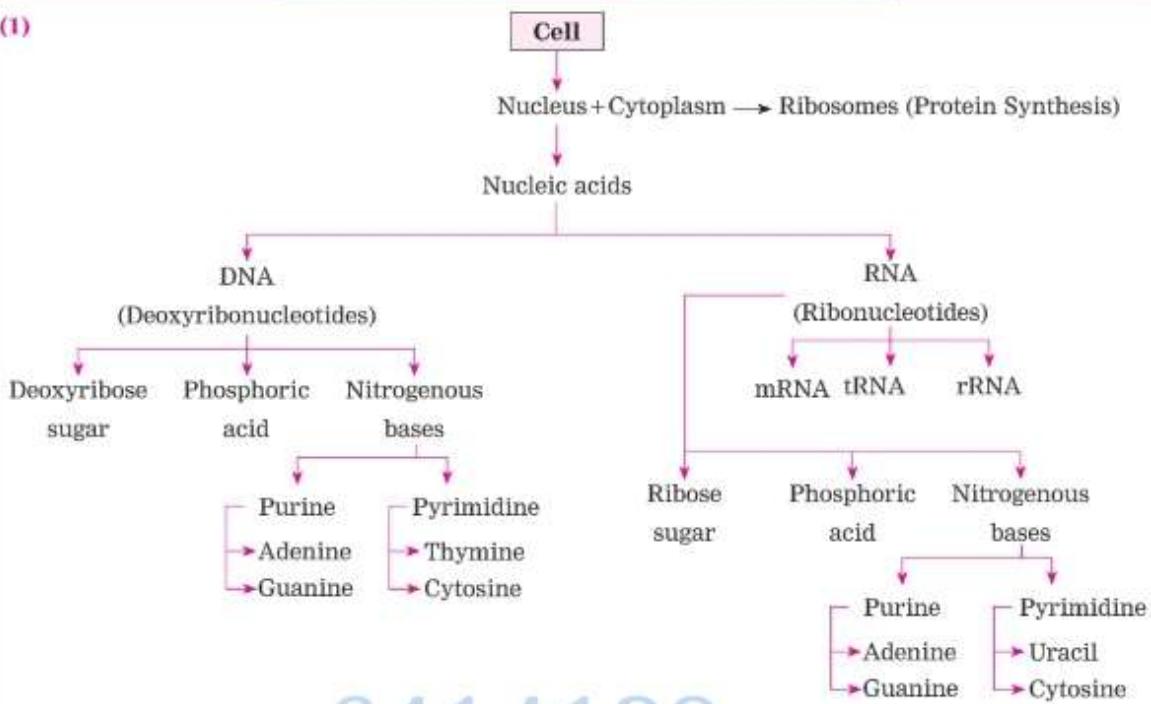
Collect the pictures and information of various species of monkeys from internet.

*(5) Make a presentation on human evolution using various computer softwares and arrange a group discussion over it in the classroom.

*(6) **Read the book :** 'Pruthvivar Manus Uparach' written by Late Dr. Sureshchandra Nadkarni and note your opinion on evolution.

MEMORY MAP/CONCEPT MAP

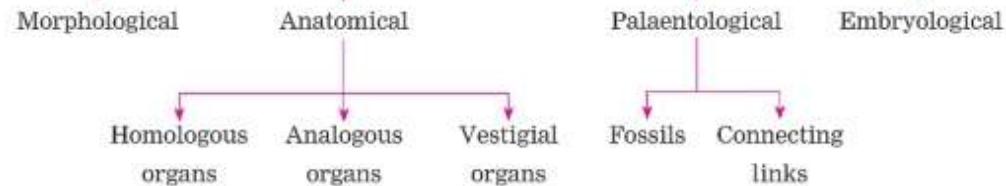
(1)



(2)

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Evidences of Evolution



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this **QR Code** for the test and its model answers.



CHAPTER OUTLINE

- 2.1 Living organisms and life processes
2.2 Living organisms and energy production

- 2.3 Some nutrients and energy efficiency
2.4 Cell division – A life process

IMPORTANT POINTS

Can you recall? (Textbook page no. 12)

(1) How are the food stuffs and their nutrient contents useful for body?

Ans. The food stuffs are digested and converted into soluble nutrients. These nutrients are carried by blood to every cell of the body. The oxygen inhaled at the time of respiration is also carried to every cell. In the body cells, this oxygen carries out oxidation of nutrients and thus energy is produced. The energy helps the body to carry out all its functions. The nutrients help in the growth and development of the body.

(2) What is the importance of balanced diet for body?

Ans. Balanced diet has carbohydrates, proteins, fats, vitamins and minerals in the right proportion. Each nutrient carries a specific important function. In balanced diet all these nutrients are in right proportion. Since balanced diet is required for energy and nutrition, it is very important to maintain our health.

(3) Which different functions are performed by muscles in body?

Ans. There are three types of muscles in our body. The voluntary muscles bring about all the movements according to our will. Involuntary muscles bring about all vital activities of the body. The visceral organs are under the control of involuntary muscles. The cardiac muscles control the movements of heart. Carbohydrates and proteins are stored in muscles.

(4) What is the importance of digestive juices in digestive system?

Ans. Digestive juice contains different enzymes. Enzymes act as catalysts and bring about the chemical reactions at faster pace. The digestive juices of stomach make pH of digestive tract acidic while that of intestinal juice make it alkaline.

(5) Which system is in action for removal of waste materials produced in human body?

Ans. Excretory system helps in the removal of nitrogenous waste materials produced in the human body.

(6) What is the role of circulatory system in energy production?

Ans. Due to circulatory system, glucose from digestive system and oxygen from respiratory system is transported to every cell. Red blood cells carry the oxygen as the blood is pumped by the heart. In every cell with the help of oxygen, glucose molecules yield the energy by the process of oxidation.

(7) How are the various processes occurring in the human body controlled? In how many ways?

Ans. The nervous system and the endocrine system bring about control by nervous and chemical coordination in the body. Due to such coordination different functions of the body are carried out in sequential and controlled manner.

2.1 Living organisms and life processes :

1. There are different systems in the human body. They function in coordination with each other. For this action, they need constant supply of energy.
2. Carbohydrates, fats and lipids in the diet provide energy to the body. The mitochondria present in cytoplasm of the cell synthesise the energy by utilizing these nutrients. For this reaction oxygen is necessary. It is provided by the circulating blood. Each cell is thus supplied with oxygen and nutrients to produce the energy.
3. Plants are autotrophic. They synthesise their own food by photosynthesis. After utilizing some for their own needs, the remaining food is stored in fruits, roots, stem-tubers, leaves, etc.
4. Plant matter is consumed by animals, thus taking the nutrients from them.

5. Carbohydrates :

- (1) **Source :** Milk, fruits, jaggery, cane sugar, cereals, vegetables, potatoes, sweet potatoes, sweet meats.
- (2) **Functions :** Carbohydrates provide 4 Kcal energy per gram.

Can you recall? (Textbook page no. 12)

• What is respiration? How does it occur?

Ans. Release of energy from the assimilated food is called respiration.

Inhalation and exhalation is called breathing. When inhalation is done, air enters the lungs. The oxygen from this air enters the blood while carbon dioxide from the blood exits from the blood. Through exhalation, CO_2 is given out. This gaseous exchange occurs through alveolar membrane. This is called external respiration.

The RBCs carry oxygen to every cell. Here inside the mitochondria tissue respiration or internal respiration takes place. The oxygen is used for production of energy. By oxidation of food nutrients energy is released in the form of ATP.

2.2 Living organisms and energy production :

1. Respiration in living organisms takes place at body and cellular level.
2. Body level respiration : Exchange of oxygen and carbon dioxide between body and environment.
3. Cellular level respiration : Oxidation of foodstuffs inside the cells.

Can you recall? (Textbook page no. 13)

- (1) How many atoms of C, H and O are respectively present in a molecule of glucose?

Ans. In one molecule of glucose, there are 6 atoms of C i.e. Carbon, 12 atoms of H i.e. hydrogen and 6 atoms of O i.e. Oxygen. Hence glucose is $\text{C}_6\text{H}_{12}\text{O}_6$.

- (2) Which types of chemical bonds are present between all these atoms?

Ans. These atoms have covalent bonds between them.

- (3) In terms of chemistry what happens actually when a molecule is oxidized?

Ans. When a molecule is oxidized, it gains oxygen atoms, or it loses electrons.

4. Dietary carbohydrates are utilized for production of energy in the form of ATP. Oxidation of glucose is carried out step by step in the cells during a process of cellular respiration.

Cellular respiration is done by following two methods, viz. aerobic respiration (in presence of oxygen) and anaerobic respiration (in absence of oxygen).

- **Aerobic respiration :** Oxidation of glucose occurs in three steps during the aerobic respiration. These are glycolysis, tricarboxylic acid cycle and electron transfer chain reaction.

(1) Glycolysis :

- (i) In glycolysis glucose molecule is oxidized step-wise into two molecules of each of pyruvic acid, ATP, NADH_2 and water.

(ii) This process takes place in cytoplasm. Pyruvic acid formed during glycolysis is converted into a molecule of Acetyl-Coenzyme-A and two molecules each of NADH₂ and CO₂.

(2) Tricarboxylic acid cycle : When Acetyl-CoA molecules enter the mitochondria, the tricarboxylic acid cyclic chain reactions take place in mitochondria. Acetyl part of Acetyl-CoA is completely oxidized releasing molecules of CO₂, H₂O, NADH₂, FADH₂.

(3) Electron transfer chain reaction : The electron transfer chain reaction takes place only in mitochondria. Molecules of NADH₂ and FADH₂ formed during all above processes participate in electron transfer chain reaction. From NADH₂ molecule, 3 molecules of ATP and from FADH₂ molecule 2 molecules of ATP are produced during these cyclic reactions.

Along with ATP, water molecules are also formed during chain reactions.

5. Thus one molecule of glucose gives CO₂ and H₂O along with energy after complete oxidation in the presence of oxygen.

6. The two coenzymes that help in cellular respiration :

- (1) NADH₂ - Nicotinamide Adenine Dinucleotide
- (2) FADH₂ - Flavin Adenine Dinucleotide. These co-enzymes are formed in the cell and they take part in cellular respiration.

7. ATP the 'energy currency' of the cell :

- (1) ATP or Adenosine triphosphate is energy-rich molecule.
- (2) There are three components in ATP : Adenine - a nitrogenous compound, Pentose sugar, Ribose (C₅H₁₀O₅) and three phosphate groups.
- (3) Thus it is a triphosphate molecule formed from adenosine ribonucleoside.

- (4) There is energy stored in the bonds by which phosphate groups are attached to each other. As per the need of the cell, energy is obtained from ATP by breaking the phosphate bond.
- (5) ATP molecules are stored in the cells as per need.

8. In case of less stores of carbohydrates in body, then lipids and proteins are utilized for producing energy.

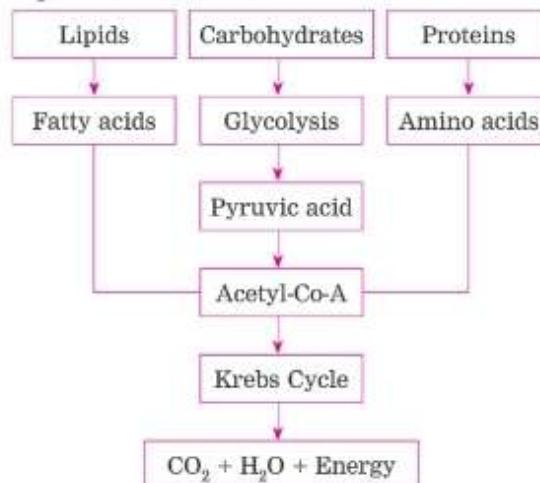
9. Lipids are converted into fatty acids and proteins are broken down to amino acids in such condition. Both, fatty acids and amino acids are converted into Acetyl-CoA for obtaining energy.

10. Molecule of Acetyl-CoA undergoes complete oxidation by the process of Krebs cycle in mitochondria for releasing the energy.

11. The cellular process and their researchers :

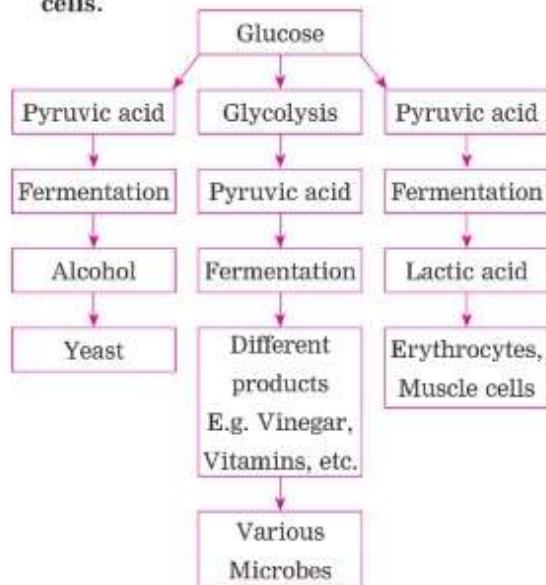
Process	Synonym	Researcher
Glycolysis	Embden-Meyerhof-Parnas pathway (EMP pathway).	Gustav Embden, Otto Meyerhof, and Jacob Parnas
Tricarboxylic acid cycle	Krebs cycle/ TCA cycle	Sir Hans Krebs

(a) Process of energy production through aerobic respiration of carbohydrates, proteins and fats :





• **Anaerobic respiration in living organisms/cells.**



(b) Energy Production in Microorganisms through Anaerobic Respiration :

- (1) Some bacteria and lower organisms do not live in presence of oxygen. They perform anaerobic respiration for energy production.
- (2) Anaerobic respiration has two steps : Glycolysis and fermentation. During this glucose is incompletely oxidized releasing less amount of energy.
- (3) Pyruvic acid produced through glycolysis is converted into other organic acids or alcohol (C_2H_5OH) in process of fermentation which is aided by some enzymes.
- (4) If there is deficiency of oxygen level in the surrounding, some higher plants, animals and aerobic microorganisms also perform anaerobic respiration.

E.g. If the soil is submerged under water during germination, seeds perform anaerobic respiration. Similarly, human muscle cells while performing the exercise may also switch to anaerobic respiration. This makes the person feel tired due to less amount of release of energy and due to lactic acid accumulation.

Can you recall? (Textbook page no. 16)

- (1) Which type of cellular respiration performs complete oxidation of glucose?**

Ans. The aerobic respiration or cellular respiration in presence of oxygen performs complete oxidation of glucose.

- (2) Which cell organelle is necessary for complete oxidation of glucose?**

Ans. Mitochondria is necessary for complete oxidation of glucose.

2.3 Some Nutrients and energy efficiency :

1. Carbohydrates which are not utilized are stored in liver and muscles in the form of glycogen.
2. Proteins are formed by amino acids which are held by peptide bonds. Therefore, it is called a macromolecule. When proteins are digested, they are converted back into amino acids. Amino acids are absorbed in blood circulation and transported to every cell.
3. As per the type of cell, the amino acids are again used for making proteins that are required by the body.

Which protein?	Where is it located?
Melanin, keratin	Skin
Ossein	Bones
Proteins of cell membrane, different enzymes	Cells
Insulin, Trypsin	Pancreas
Different hormones	Pituitary Gland
Flexible proteins : Actin and Myosin	Muscles
Haemoglobin, Antibodies	Blood

4. Proteins of animal origin are considered to be 'first class' proteins. Each gram of protein provides 4 Kcal of energy.
5. If protein intake is more than required, it does not result into storage of amino acids in the body. Instead they are broken down forming ammonia which is then eliminated from the body. Sometimes, excess of proteins is converted into glucose by process of gluconeogenesis.

6. Plants by themselves can produce the necessary amino acids from minerals and then also different proteins.

7. The most abundant protein found in nature is an enzyme RUBISCO which is found in the plant chloroplasts.

Can you recall? (Textbook page no. 16)

• From where do we obtain the lipids?

Ans. Lipids are obtained from oil, butter, ghee, margarine, tallow and oil seeds.

8. Lipids are formed of fatty acids and alcohol (glycerol) which have specific bond between them.

When lipids are digested they are converted into fatty acids and alcohol. Absorbed fatty acids are transported to all the cells through blood.

• Fatty acids produce different substances in different cells.

Examples : (1) Phospholipids – produce plasma membrane

(2) Progesterone, estrogen, testosterone, aldosterone, etc. are hormones produced from fatty acids.

(3) Covering around the axons of nerve cells.

9. Adipose connective tissue in the body stores excess of lipids. Each gram of lipids provides 9 Kcal of energy.

Think! (Textbook page no. 17)

(1) Many times, you cannot eat hot food due to inflammation/ulceration in mouth.

Ans. The inflammation or ulceration in the mouth occurs due to lack of enough vitamins in the diet. Therefore, hot and spicy food causes uncomfortable feeling. Particularly vitamin B complex deficiency is said to be responsible for such ulceration.

(2) Some persons experience difficulty in night vision since their childhood or adolescence.

Ans. For a better vision, vitamin A is essential. If there is deficiency of Vitamin A in the diet, then there is difficulty in night vision even in childhood or adolescence.

10. Vitamins :

(1) Vitamins are required for proper functioning and maintenance of the body.

(2) The main types of vitamins are as follows :

(i) Fat soluble vitamins : A, D, E and K

(ii) Water soluble vitamins : B and C.

(3) Riboflavin (Vitamin B₂) and Nicotinamide (Vitamin B₃) are necessary for their production of FADH₂ and NADH₂ respectively.

11. Water :

(1) Water is essential nutrient.

(2) Human body contains about 65 – 70% water.

70% water is present by weight in every cell.

Blood-plasma has 90% of water.

(3) Loss of water or dehydration can cause problems with the functioning of cells and later that of the body.

12. Fibres : Fibres cannot be digested and hence they become helpful in digestion of other substances and egestion of excreta. In leafy vegetables, fruits and cereals there is good amount of fibre.

2.4 Cell division : An essential life process :

Can you recall? (Textbook page no. 17)

(1) What happens to the cells of injured tissue?

Ans. After injury, the cells and the tissues are not able to perform the regular functions immediately. At the site of injury, the blood capillaries rupture and the area gets inflamed. Many cells are damaged. The pain receptor nerves induce pain.

(2) Whether new cells are formed during healing of wound?

Ans. As the wound heals there is scab developed. The cells surrounding the wound start dividing rapidly and the cells lost in the injury are restored back. In this way new cells are formed by cell division to heal the wound.

(3) Do the plants get injured when do we pluck the flowers? How are those wounds healed?

Ans. It was thought that plants do not have nervous system, so they do not have sensations either. But recent discoveries have proved that plants also have sensations. The tissues that are lost get restored by cell division.

(4) How does the growth of any living organism occur? Does the number of cells in their body increases? If yes, how?

Ans. Any living organism grows due to the increase in the number of cells in their body. The cells divide regularly and add new cells which are essential for growth. The cell division is thus necessary for the growth of the body and also for the regeneration and repair of tissues.

(5) How the new individual of a species is formed from existing one of same species?

Ans. Due to reproduction, the new individual is formed from the existing one. Reproduction can be asexual or sexual. In asexual reproduction, there is mitosis. This cell division helps in forming new individuals. In sexual reproduction, gametes are formed by reduction division called meiosis. Due to chromosomes, gene and DNA the new individual of a species becomes similar to the existing species.

1. Important property of all living cells is cell division.

2. Significance of cell division :

- (1) A new organism is created from existing one.
- (2) Growth of a multicellular organism.
- (3) Restoration of injured and emaciated body.

3. Types of cell division :

- (1) Mitosis and (2) Meiosis

4. Important features of mitosis and meiosis :

Mitosis	Meiosis
Occurs in somatic cells and in stem cells.	Occurs in germ cells
<ul style="list-style-type: none"> • Takes place in two stages : • Karyokinesis – division of nucleus • Cytokinesis – division of cytoplasm 	<ul style="list-style-type: none"> • Takes place in two parts. • Meiosis – I and Meiosis – II • In Meiosis – I there is crossing over and genetic recombination. • Homologous chromosomes are divided into two groups forming two haploid cells.
<ul style="list-style-type: none"> • Karyokinesis takes place in four stages. • It is followed by cytokinesis. 	Meiosis – I and Meiosis – II take place in four stages each, i.e. Prophase – I, Metaphase – I, Anaphase – I, and Telophase – I followed by Prophase – II, Metaphase – II, Anaphase – II, and Telophase – II.
Chromosome number does not change.	Chromosome number is reduced to half.
Mother cell gives rise to 2 daughter cells.	Mother cell gives rise to 4 daughter cells.
5. The diploid cells are $2n$ and the haploid are n . All the normal body cells are always $2n$ while only gametes formed by reduction division are n .	
6. In ' $2n$ ' condition, each type chromosome is in pairs while in ' n ' condition, there is a single chromosome of each type.	

Can you recall? (Textbook page no. 18)

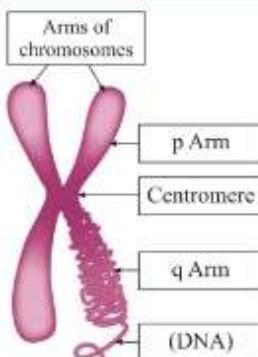


Fig. 2.1 : Organization of chromosome

- What is the shape of chromosome? Give its names in the adjacent figure :

Ans. Chromosomes are seen only at the time of cell division. Chromosomes are rod shaped and has a primary constriction or centromere. The arms of the chromosome seem

to be attached at the centromere. Depending upon the position of centromere and the length of the arms of the chromosome, there are four types of chromosomes.

- (1) **Metacentric** : It is V shaped chromosome with central centromere and equal chromatid arms.
- (2) **Submetacentric** : It is L shaped with centromere somewhere near the mid-point in chromosome. It's one arm is slightly shorter than the other.
- (3) **Acrocentric** : The j shaped chromosome with centromere near one end of chromosome.
- (4) **Telocentric** : The centromere is right at the end of chromosome resulting into only one arm and thus it looks like 'I' shaped.

7. Stages of Mitosis :

(1) Karyokinesis : (Nuclear division)

Prophase	Metaphase	Anaphase	Telophase
Condensation of thin thread-like chromosomes.	Completion of condensation of chromosomes.	Formation of daughter chromosomes which appear like bunch of bananas. They are then pulled away from each other.	Chromosomes reach at opposite poles of the cell and their decondensation begins.
Chromosomes become short and thick. Formation of sister chromatids begin.	Clearly visible along with their sister chromatids.	Splitting of Centromeres with separation of sister chromatids of each chromosome. Their separation begins. Movement in opposite direction due to help of spindle fibres.	Chromosomes become thread-like thin and start disappearing.
Duplication of centrioles and movement of each centriole to opposite poles of the cells.	Chromosomes arranged parallel to equatorial plane of the cell. Formation of spindle fibres between centromere of each chromosome and both centrioles.	Each set of chromosomes reach at two opposite poles of the cell.	Spindle fibres completely disappear.
Nuclear membrane and nucleolus start to disappear.	Nuclear membrane completely disappears.	Separated daughter chromosomes.	Two daughter-nuclei formed in a cell. Reappearance of nuclear membrane and nucleolus.

Note : Chromosome number does not change from $2n$ to $4n$ as given in the textbook page no. 18. Under normal conditions such change never happens. The chromosome number never doubles. During cell division initially the centromere of the chromosomes does not divide only chromatid arms divide. The division of chromatid arms take place in anaphase. Thus chromosome number $2n$ remains $2n$. It never becomes $4n$ during mitosis.

- (2) Cytokinesis :** Cytokinesis is the division of cytoplasm. In animal cells a notch is formed at the equatorial plane of the cell which deepens gradually and thereby two new cells are formed. In plant cells, a cell plate is formed exactly along midline of the cell.

8. Significance of mitosis :

- (1) Essential for the growth of the body
 - (2) Necessary for restoration of emaciated body
 - (3) For wound healing
 - (4) For the formation of blood cells, etc.

9. Meiosis :

- (1) There are two stages of meiosis : : Meiosis-I and Meiosis-II.
 - (2) By meiosis from one diploid cell, four haploid cells are formed.
 - (3) In meiosis crossing over between non-sister chromatids of homologous chromosomes occur. This results in genetic recombination.
 - (4) The four daughter cells formed after completion of meiosis are genetically recombined and not exactly alike and also not exactly similar to their parent cells.

- (5) Spores and gametes are formed by meiosis.
 - (6) Meiosis helps to restore and maintain the chromosome number.

(7) (a) Meiosis – I :

- (1) Homologous chromosomes undergo crossing over and hence there is genetic recombination.

(2) The homologous chromosomes are divided into two groups and from these, two haploid cells are formed.

(3) Prophase – I of meiosis is lengthy phase which is subdivided into five phases, viz. leptotene, zygotene, pachytene, diplotene and diakinesis. During pachytene, crossing over takes place.

(b) Meiosis – II : Meiosis – II is similar to mitotic division. The two haploid cells that are produced in meiosis – II now undergoes further division forming four haploid cells.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- (1) The process of glycolysis occurs in
 (a) cytoplasm (b) mitochondria
 (c) nucleus (d) cell membrane

*(2) After complete oxidation of a glucose molecules, number of ATP molecules are formed.
 (a) 14 (b) 28 (c) 29 (d) 38

*(3) At the end of glycolysis, molecules are obtained.
 (a) malate (b) fumarate
 (c) lactate (d) pyruvate

(4) ATP is called of the cell.
 (a) energy currency (b) combustion fuel
 (c) storage of glucose (d) protein depot

*(5) Genetic recombination occurs in phase of prophase of meiosis-I.

- (a) leptotene* *(b) zygotene*
(c) pachytene *(d) diplotene*

*(6) All chromosomes are arranged parallel to equatorial plane of cell in phase of mitosis.

(a) prophase *(b) metaphase*
(c) anaphase *(d) telophase*

*(7) For formation of plasma membrane, molecules are necessary.

(a) fatty acids *(b) phospholipid*
(c) proteins *(d) carbohydrates*

*(8) Our muscle cells perform type of respiration during exercise.

(a) aerobic *(b) anaerobic*
(c) cellular *(d) all the above*

(9) Excess of carbohydrates are stored in liver and muscles in the form of

(a) sugar *(b) glucose*
(c) glycogen *(d) protein*

- (10) Chemically vitamin B₂ is
 (a) Riboflavin (b) Nicotinamide
 (c) Cyanocobalamin (d) Pantothenic acid
- (11) Somatic and stem cells undergo type of division. (March '19)
 (a) meiosis (b) mitosis
 (c) budding (d) cloning
- (12) Protein located in bones is
 (a) myosin (b) melanin
 (c) haemoglobin (d) ossein
- (13) Which of the following vitamins is necessary for synthesis of NADH₂?
 (a) Vitamin B₂ (b) Vitamin B₃
 (c) Vitamin (d) Vitamin K
- (14) In mitotic division, nuclear membrane completely disappears in phase. (Nov. '20)
 (a) telophase (b) prophase
 (c) metaphase (d) anaphase
- (15) The spindle fibres start appearing from stage of karyokinesis. (March '20)
 (a) prophase (b) metaphase
 (c) anaphase (d) telophase
- (16) cells divide by mitosis.
 (a) Somatic (b) Gametes
 (c) Stem (d) Both A and C
- Ans.** (1-a); (2-d); (3-d); (4-a); (5-c); (6-b); (7-b); (8-b); (9-c); (10-a); (11-b); (12-d); (13-b); (14-c); (15-b); (16-d).

Q. 2 Write whether the following statements are true or false :

- Glucose is oxidized step by step in the cells during the process of respiration at the body level.
- In aerobic respiration, glucose is oxidized in three steps.
- Glycolysis is also called Embden-Meyerhof-Parnas pathway.
- Molecules of pyruvic acid formed in this glycolysis are converted into molecules of acetyl-co-enzyme A.
- Excess of ATP molecules obtained from proteins are not stored in the body.
- Proteins of animal origin are called 'first class' proteins.

- (7) The disease related with the deficient synthesis of insulin is heart disease.
- Ans.** (1) **False.** (Glucose is oxidized step by step in the cells during the process of cellular respiration.)
- (2) **True** (3) **True** (4) **True**.
- (5) **False.** (Excess of amino acids obtained from proteins are not stored in the body.)
- (6) **True.**
- (7) **False.** (The disease related with the deficient synthesis of insulin is diabetes.)

Q. 3 Match the columns :

[1]	Protein	Part of the body (July '19)
(1)	Haemoglobin	(a) muscles (b) skin
(2)	Ossein	(c) bones (d) blood

Ans. (1) Haemoglobin – blood (2) Ossein – bones.

[2]	Protein	Part of the body
(1)	Keratin	(a) muscles (b) skin
(2)	Myosin	(c) bones (d) blood

Ans. (1) Keratin – skin (2) Myosin – muscles.

Q. 4 Find the odd one out :

- Progesterone, Estrogen, Testosterone, Insulin
- Actin, Ossein, Myosin, Melanin
- Lipids, Carbohydrates, Fatty acids, Proteins
- Alcohol, Vinegar, Pyruvic acid, Lactic acid.
- Tricarboxylic acid cycle, Citric acid cycle, Krebs cycle, EMP pathway.

Ans. (1) **Insulin.** (All the others are hormones produced with the help of fatty acids.)

(2) Melanin. (All the others are proteins concerned with locomotion of the body.)

(3) Fatty acids. (All the others are food constituents; fatty acid is soluble nutrient.)

(4) Pyruvic acid. (All the others are chemical substances formed by the process of fermentation.)

(5) EMP pathway. (All the other terms are synonymous to each other.)

Q. 5 Considering the relationship in the first pair, complete the second pair by using a word or group of words :

- Process that occurs in the cytoplasm : Glycolysis :: Process that occurs in the mitochondria

- (2) Skin : Keratin :: Blood :
 (3) Energy obtained from protein : 4 kcal :: Energy obtained from fats/lipids :
 (4) Breakdown of glucose molecule : Glycolysis :: Formation of glucose from proteins :
 (5) Condensation of chromosomes : Prophase :: Formation of spindle fibres :
 (6) Division of nucleus : Karyokinesis :: Division of cytoplasm :
Ans. (1) Krebs cycle (2) Haemoglobin (3) 9 Kcal (4) Gluconeogenesis (5) Metaphase (6) Cytokinesis.

Q. 6 Write definitions :

- *(1) Nutrition :** The process of taking nutrients in the body and utilizing them by an organism is known as nutrition.
***(2) Nutrients :** The substances like carbohydrates, proteins, lipids, vitamins, minerals etc. which are components of the food are called nutrients.
***(3) Proteins :** Protein is a macromolecule which is formed by many amino acids which are joined by peptide bonds.
***(4) Cellular respiration :** Oxidation of glucose and other food components which takes place inside the cell in presence or absence of oxygen, is known as cellular respiration.
***(5) Aerobic respiration :** Cellular respiration taking place in presence of oxygen is known as aerobic respiration.
***(6) Glycolysis :** The process occurring in the cell where a molecule of glucose is oxidized in step by step process forming two molecules of each of pyruvic acid, ATP, NADH₂ and water, is called glycolysis.

***Q. 8** Distinguish between :

(1) Glycolysis and TCA cycle :

Glycolysis	TCA cycle
1. The process of glycolysis occurs in the cytoplasm of the cell.	1. TCA cycle takes place in mitochondria.
2. In glycolysis, one molecule of glucose is oxidized step-by-step to produce two molecules each of pyruvic acid, ATP, NADH ₂ and water.	2. In TCA cycle, molecule of acetyl-co-A is completely oxidized and in the process CO ₂ , H ₂ O, NADH ₂ , FADH ₂ and ATP is produced.
3. Glycolysis can take place in both aerobic and anaerobic respiration.	3. TCA cycle takes place only during aerobic respiration.
4. The first step in cellular respiration is glycolysis where glucose is converted into pyruvate.	4. The second step in cellular respiration is TCA cycle.

(7) Gluconeogenesis : Formation of glucose through non-carbohydrate sources such as protein is called gluconeogenesis.

(8) Fermentation : Conversion of pyruvic acid produced in the process of glycolysis into other organic acids or alcohol with the help of some enzymes is called fermentation.

Q. 7 Name the following :

(1) Products formed after complete oxidation of acetyl part present in the molecule of acetyl-coenzyme-A.

Ans. Molecules of CO₂, H₂O, NADH₂, FADH₂ and ATP.

(2) Place where electron transfer chain reaction take place.

Ans. Mitochondria present in the cytoplasm of the cell.

(3) Two co-enzymes involved in cellular respiration.

Ans. NAD → Nicotinamide Adenine Dinucleotide and FAD → Flavin Adenine Dinucleotide.

(4) Scientist who discovered the TCA cycle.

Ans. Sir Hans Krebs.

(5) Steps of anaerobic respiration.

Ans. Glycolysis and fermentation.

(6) Most abundantly found protein in nature.

Ans. An enzyme RUBISCO present in plant chloroplasts.

(7) Molecules forming plasma membrane. OR Which molecules are necessary for the formation of plasma membrane ?

(Nov. '20)

Ans. Phospholipids.

- | | |
|--|--|
| 5. Two molecules of pyruvate are obtained in glycolysis. | 5. Pyruvate is converted into CO_2 and H_2O during TCA cycle. |
| 6. Two molecules of ATP are used up in glycolysis. | 6. ATP molecules are not used up in TCA cycle. |
| 7. Four molecules of ATP are produced in glycolysis. | 7. Two molecules of ATP are produced in TCA cycle. |
| 8. CO_2 is not produced during glycolysis. | 8. CO_2 is produced in TCA cycle. |

(2) Aerobic and anaerobic respiration : (Nov. '20)

Aerobic respiration	Anaerobic respiration
<p>1. Oxygen is required for aerobic respiration.</p> <p>2. Aerobic respiration takes place in nucleus as well as in cytoplasm.</p> <p>3. At the end of aerobic respiration CO_2 and H_2O is formed.</p> <p>4. Energy is produced in large amount in aerobic respiration.</p> <p>5. Glucose is completely oxidized in aerobic respiration.</p> <p>6. 38 molecules of ATP are formed during aerobic respiration.</p> <p>7. Chemical reaction : $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 6 \text{CO}_2 + 686 \text{ Kcal}$</p>	<p>1. Oxygen is not required for anaerobic respiration.</p> <p>2. Anaerobic respiration occurs only in the cytoplasm.</p> <p>3. At the end of anaerobic respiration CO_2 and $\text{C}_2\text{H}_5\text{OH}$ are formed.</p> <p>4. Energy is produced in lesser amount in anaerobic respiration.</p> <p>5. Glucose is incompletely oxidized in anaerobic respiration.</p> <p>6. 2 molecules of ATP are formed during anaerobic respiration.</p> <p>7. Chemical reaction : $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2 \text{C}_2\text{H}_5\text{OH} + 2 \text{CO}_2 + 50 \text{ Kcal}$</p>

(3) Mitosis and meiosis OR Explain the difference between mitosis and meiosis :

Mitosis	Meiosis
<p>1. In mitosis the chromosome number does not change. Diploid cells remain diploid, without change.</p> <p>2. One cell gives rise to two daughter cells in mitosis.</p> <p>3. Karyokinesis of mitosis has four stages, viz. prophase, metaphase, anaphase and telophase.</p> <p>4. Prophase of mitosis is not lengthy.</p> <p>5. Genetic recombination does not happen in mitosis as there is no crossing over.</p> <p>6. Mitosis is essential for growth and development.</p> <p>7. Mitosis takes place both in somatic cells and germinal cells.</p>	<p>1. In meiosis, the chromosome number is reduced to half. The diploid cells become haploid.</p> <p>2. One cell gives rise to four daughter cells in meiosis.</p> <p>3. Meiosis has two major stages, viz. meiosis-I and meiosis-II. Each is further subdivided into prophase, metaphase, anaphase and telophase.</p> <p>4. Prophase of meiosis-I is very lengthy.</p> <p>5. Genetic recombination takes place in homologous chromosomes as there is crossing over during prophase-I.</p> <p>6. Meiosis is essential for formation of gametes in sexual reproduction.</p> <p>7. Meiosis takes place in only germinal cells. It does not take place in somatic cells.</p>

Q. 9 Give scientific reasons :

*(1) Oxygen is necessary for complete oxidation of glucose.

Ans. (1) when glucose is completely oxidized in aerobic cellular respiration, it produces 38 molecules of ATP. (2) In cellular respiration, three processes take place one after the other, these are glycolysis, Krebs cycle and electron transport chain reactions. (3) In absence of oxygen only glycolysis can occur but further two reactions will not take place. (4) If glycolysis occurs in absence of oxygen, it produces alcohol. (5) By anaerobic glycolysis only two molecules of ATP are produced. (6) This results in less energy supply to the body. Therefore, oxygen is necessary for complete oxidation of glucose.

*(2) Krebs cycle is also known as citric acid cycle.

Ans. (1) Sir Hans Kreb proposed this cycle and hence it is called Krebs cycle. (2) These are series of cyclic chain reactions which begins with acetyl-coenzyme-A molecules which act with molecules of oxaloacetic acid. (3) The reactions are catalysed with the help of specific enzymes. (4) The first molecule formed in this reaction is called citric acid. Therefore, Krebs cycle is also called citric acid cycle.

*(3) Sometimes, higher plants and animals too perform anaerobic respiration.

Ans. (1) When there is deficiency of oxygen in the surrounding, the aerobic respiration is not possible. (2) In such case, to survive, higher plants switch over to anaerobic respiration. (3) In some animal tissues in case of oxygen deficiency cells perform anaerobic respiration.

(4) We feel exhausted after exercising.

(March '20) OR

While performing exercise, we feel tired.

(Nov. '20)

Ans. (1) When we undertake constant exercises, there may be shortage of oxygen for the cells. (2) Therefore, our muscles and other tissues perform anaerobic respiration in such condition. (3) In this process, lactic acid is formed. (4) Molecules of ATP produced in oxidation of food are also much less. (5) Thus, there is less energy in the body and

accumulation of lactic acid too. All this brings about a feeling of exhaustion.

*(5) Fibres are one of the important nutrients.

Ans. (1) Fibres are indigestible substance. (2) They are thrown out along with other useless and undigested matter. (3) This aids in egestion. Some fibres also help in digestion of other substances. (4) Green leafy vegetables, fruits, cereals, etc. are considered as important in diet as they supply nutritious fibres. (5) Thus, fibres are considered as one of the important nutrients.

*(6) Cell division is one of the important properties of cells and organisms.

Ans. (1) Cell division is very essential for all the living organisms. (2) The growth and development is possible only due to cell division. (3) The emaciated body can be restored only through the cell division which adds new cells. (4) Offspring is produced only through the cell division that take place in parents. (5) In asexual reproduction, mitosis helps to give rise to new generation. (6) In sexual reproduction, meiosis helps to form haploid gametes. (7) All such functions show that cell division is one of the important properties of cells and organisms.

Q. 10 Answer the following questions in detail :

*(1) How do all the life processes contribute to the growth and development of the body ?

Ans. (1) Different systems work in co-ordination with each other in the body of the living organisms. In human body the homoeostasis is very advanced.

(2) Digestive system, respiratory system, circulatory system, excretory system, nervous system and all the external and internal organs in the body work independently but in coordination with each other.

(3) The digested and absorbed nutrients of the food are transported to various cells with the help of circulatory system due to pumping of the heart. Simultaneously, the oxygen absorbed in the blood by lungs is also transported to each cell by RBCs.

(4) Mitochondria in every cell brings about oxidation of nutrients and produce energy required for all of these functions.

(5) The control is exercised by the nervous system on all these actions. This keeps the organism alive and helps in growth and development of the same.

(2) Write the forms to which the following food materials are converted after digestion :

(a) Milk (b) Potato (c) Oil (d) Chapati.

Ans. (a) **Milk** : Proteins (caesin) are converted into amino acids. Lactose sugar is converted into glucose. Lipids are converted into fatty acids and glycerol.

(b) **Potato** : Carbohydrates (starch) are converted into glucose.

(c) **Oil** : Lipids are converted into fatty acids and glycerol.

(d) **Chapati** : Carbohydrates (starch) are converted into glucose.

(3) On which two levels does respiration take place in living organisms ? *OR*

What is cellular respiration ? What are its two types ?

Ans. (1) In organism respiration takes place at two levels, viz. Body level and Cellular level.

(2) **Respiration at body level** : The exchange of respiratory gases such as oxygen and carbon dioxide between body and surrounding is called respiration at body level.

(3) **Cellular respiration** : Oxidation of nutrients inside the cell with or without oxygen is called cellular respiration.

Aerobic in presence of oxygen and anaerobic in absence of oxygen are its two subtypes.

(4) Answer the following questions : (July '19)

(a) Write main types of vitamins.

Ans. A, B, C, D, E and K are main types of vitamins.

(b) Name water soluble vitamins.

Ans. Water soluble vitamins are B and C.

(c) Name fat soluble vitamins.

Ans. Fat soluble vitamins are A, D, E and K.

(5) What are vitamins ? State its two groups and six types.

Ans. (1) Vitamins are a group of heterogenous compounds essential for proper functioning of the body.

(2) Two groups of vitamins = Fat soluble vitamins and water soluble vitamins.

(3) Six types : A, B, C, D, E, K.

(6) Answer the following questions :

(a) Why some living organisms have to perform anaerobic respiration ?

Ans. Some bacteria and lower organisms do not live in the presence of oxygen. In order to survive, they have to perform anaerobic respiration. Sometimes, muscle cells and erythrocytes also perform anaerobic respiration when there is lack of enough oxygen.

(b) Give two examples of such living organisms.

Ans. Yeast and bacteria.

(c) What are the two steps of anaerobic respiration ?

Ans. Glycolysis and fermentation are the two steps of anaerobic respiration.

(7) Which molecules are formed after whole oxidation of acetyl-co-enzyme A ?

Ans. By the process of Krebs cycle acetyl-Co-A is oxidized forming CO_2 , H_2O , NADH_2 , FADH_2 , and molecules of ATP.

*(8) Explain the glycolysis in detail.

Ans. (1) Carbohydrates are converted to glucose after the process of digestion is completed. The oxidation of glucose for releasing energy is called glycolysis which takes place in cytoplasm.

(2) Glycolysis can occur in presence of oxygen or without oxygen too. The first type of glycolysis takes place in aerobic respiration and the second type is in anaerobic respiration.

(3) In aerobic respiration, there is step-wise oxidation of glucose molecule forming two molecules each of pyruvic acid, ATP, NADH_2 and water.

(4) Later the pyruvic acid formed in this process is converted into molecules of Acetyl-Coenzyme-A along with two molecules of NADH_2 and two molecules of CO_2 .

(5) During anaerobic respiration along with glycolysis there is fermentation too. This is

incomplete oxidation of glucose and thus it results in formation of lesser energy.

(6) The process of glycolysis was discovered by Gustav Embden, Otto Meyerhof, and Jacob Parnas. Therefore, in their honour, glycolysis is also called as Embden-Meyerhof-Parnas pathway (EMP pathway). For the discovery they had performed experiments on muscles.

*** (9) Explain the Krebs cycle with reaction.**

Ans. (1) Krebs cycle was proposed by Sir Hans Kreb. This cycle is named after him. It is also called tricarboxylic acid cycle or citric acid cycle.

(2) The acetyl-coenzyme-A molecules enter the mitochondria located in the cytoplasm.

(3) They participate in the chemical reactions taking place in Krebs cycle.

(4) In the cyclic chemical reactions, acetyl-coenzyme-A is completely oxidised

(5) It yields molecules of CO_2 , H_2O , NADH_2 , FADH_2 and ATP upon complete oxidation.

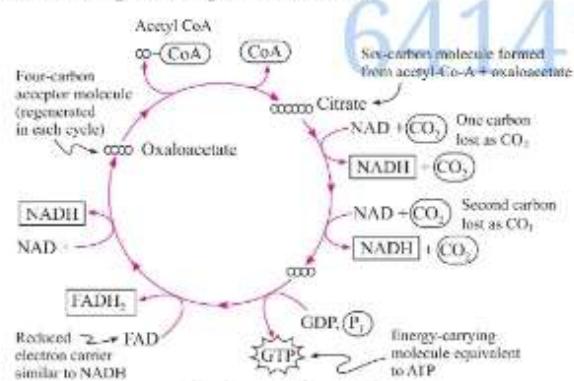


Fig. 2.2 : Krebs cycle

(10) Which is the energy currency of the cell? Explain it in detail.

Ans. (1) ATP or Adenosine triphosphate is the 'energy currency' of the cell.

(2) Chemical composition of ATP is as follows : it is a triphosphate molecule having adenosine ribonucleoside. The nitrogenous compound-adenine, pentose sugar-ribose and three phosphate groups are present in ATP.

(3) In this energy-rich molecule the energy remains trapped in the bonds by which phosphate groups are attached to each other.

(4) ATP molecules are stored in the cells. As per the need, energy is derived by breaking the phosphate bond of ATP.

(5) During cellular respiration, the oxidation of glucose yields 38 molecules of ATP. Whenever required they are consumed to liberate energy.

(11) How is energy obtained during starvation or hunger?

Ans. (1) Due to starvation or hunger, there is less supply of nutrients and energy to the body. In such condition, the stored carbohydrates in the body also deplete.

(2) In such condition, fats and proteins present in the body are utilized.

(3) Fats or lipids are converted into fatty acids and proteins are broken down to amino acids.

(4) Fatty acids and amino acids both are converted to acetyl-coenzyme-A.

(5) Acetyl-coenzyme-A can undergo series of cyclic reactions and oxidised to liberate energy in the form of ATP molecules.

(12) Why glycolysis is also called EMP pathway?

Ans. Process of glycolysis was discovered by Gustav Embden, Otto Meyerhof, and Jacob Parnas along with their colleagues. They performed experiments on muscles to understand glycolysis. Hence, in their honour, glycolysis is also called Embden-Meyerhof-Parnas pathway or EMP pathway.

(13) How are proteins obtained? What are the components of the proteins?

Ans. (1) Protein is a macromolecule which is formed by amino acids.

(2) When digestion of protein takes place, it forms different amino acids. These amino acids are transported to each cell by blood circulation.

(3) By protein synthesis, these amino acids are again used to make different kinds of proteins which our body needs.

(4) Animal proteins are said to be 'first class proteins' as they contain good quality amino acids.

(5) 4Kcal/gm energy is obtained from the proteins.

(14) Where and in which forms the amino acids formed after digestion of food are used in the body?

OR

Which amino acids are formed after digestion of proteins?

Ans. (1) After digestion of proteins, amino acids are formed. These amino acids are used to synthesise proteins in different forms e.g.

(1) In blood – Haemoglobin and antibodies are formed.

(2) In skin – Melanin and keratin are formed.

(3) In bones – Ossin is formed.

(4) In pancreas – Insulin and trypsin are synthesised.

(5) Pituitary and all other glands produce hormones by utilising amino acids.

(6) In muscles – Actin and myosin are formed.

(7) In all the cells, plasma membrane is formed by proteins. All enzymes are also synthesised using the amino acids.

(15) What are fatty acids? What are the different uses of fatty acids?

Ans. (1) The fatty acids are components of the lipids. When lipids are digested, it forms fatty acids and alcohol (glycerol).

(2) There are certain chemical bonds between fatty acids and alcohol.

(3) Fatty acids are very essential for the health.

(4) After digestion, fatty acids are absorbed into the blood and transported to the cells.

(5) Different types of cells produce their own substances from these fatty acids. E.g. (a) Plasma membrane is produced from phospholipids. (b) Hormones like testosterone, progesterone, estrogen, aldosterone are produced from fatty acids. (c) The axonal coverings around the neurons are also made from fatty acids.

***(16) With the help of suitable diagrams, explain the mitosis in detail.**

Ans. (1) There are two stages of mitosis. These are (a) Karyokinesis or nuclear division and (b) Cytokinesis or cytoplasmic division. Karyokinesis takes place in further four phases, viz prophase, metaphase, anaphase and telophase.

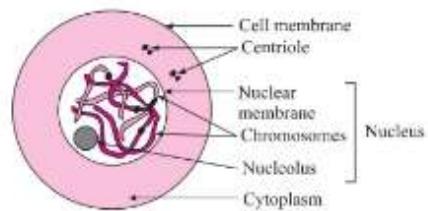


Fig. 2.3 : (a) Early Prophase

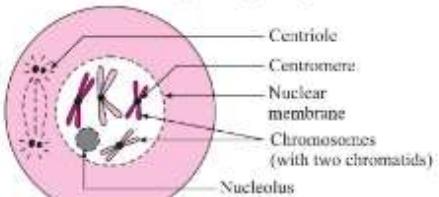


Fig. 2.3 : (b) Late Prophase

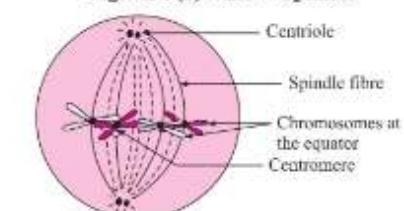


Fig. 2.3 : (c) Metaphase

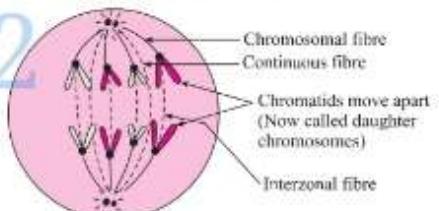


Fig. 2.3 : (d) Anaphase

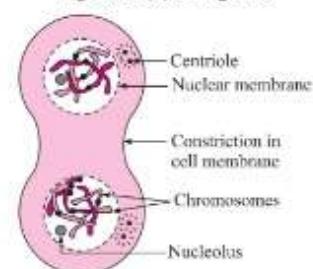


Fig. 2.3 : (e) Telophase

(a) Karyokinesis :

(i) Prophase : During prophase, condensation of chromosomes starts. The thin and thread like chromosomes start thickening. They are seen with their pair of sister chromatids. In animal cells the centrioles are seen to duplicate and move to opposite poles of the cell. Nuclear membrane and nucleolus disappear.

(ii) Metaphase : Chromosomes complete their condensation and each one is seen with its sister chromatids. The chromosomes are seen in equatorial plane of the cell. The spindle fibres are formed from polar region, where centrioles are present, and they attach themselves to the centromere of each chromosome. Nuclear membrane now disappears completely.

(iii) Anaphase : The centromeres of the chromosomes now divide forming two daughter chromosomes. The spindle fibres pull apart the chromosomes from equatorial region to the opposite poles. Chromosomes moving to the poles appear like bunch of bananas. One set of chromosomes reach each pole by the end of the anaphase.

(iv) Telophase : Telophase is reverse of events that occurred in prophase. The thickened chromosomes decondense. They again assume the thin and thread like appearance. Nuclear membrane and nucleolus appear again. The spindle fibres are completely lost. The cell looks as if it has two nuclei in one cytoplasm.

(b) Cytokinesis : In animal cells a notch develops in the middle of the cell. This notch goes on deepening down and later the cytoplasm divides into two. In plant cells, cell plate formation takes place and then cytokinesis takes place.

*(17) With the help of suitable diagrams, explain the five stages of prophase-I of meiosis.

Ans.

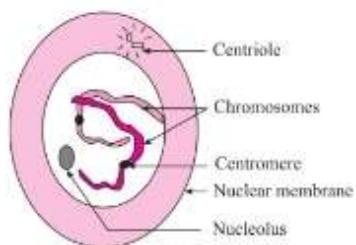


Fig. 2.4 : (a) Leptotene

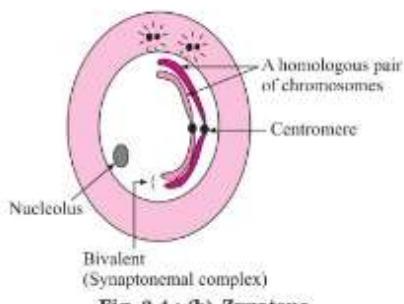


Fig. 2.4 : (b) Zygote

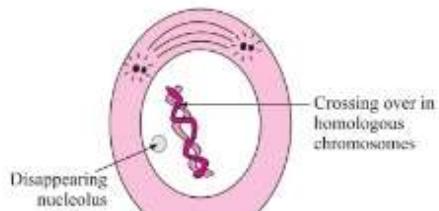


Fig. 2.4 : (c) Pachytene

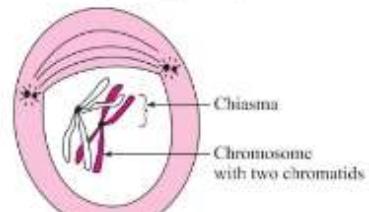


Fig. 2.4 : (d) Diplotene

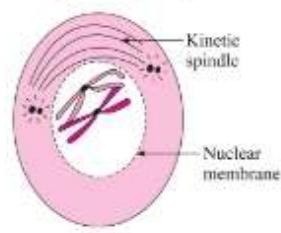


Fig. 2.4 : (e) Diakinesis

Prophase-I : Prophase-I of meiosis is much longer phase of the meiosis.

It is subdivided into 5 substages, namely leptotene, zygotene, pachytene, diplotene and diakinesis.

(1) Leptotene : Initially the chromosomes start condensation and they become compact during leptotene.

(2) Zygote : In zygotene, homologous chromosomes start pairing. This pairing is called synapsis. The structure called synaptonemal complex develops to hold chromosomes in place during this pairing. Each chromosome's chromatid arm divides and forms structure called bivalent or tetrad.

(3) Pachytene : During pachytene stage, crossing over of non-sister chromatids of homologous chromosomes takes place. Genetic recombination is produced due to such exchange. The homologous chromosomes still remain paired together at the sites of crossing over.

(4) Diplotene : During diplotene, synaptonemal complex dissolves and the homologous chromosomes

of the bivalents separate except at the point of crossing over. Thus, it looks like X-shaped structures called the chiasmata.

(5) **Diakinesis** : The last phase of prophase is for termination of chiasmata. The spindle fibres originate, and the cross-over homologous chromosomes are now separated. The nucleolus disappears, and the nuclear envelope breaks down.

Students should note that in their textbook meiotic prophase-I details are not explained. However, since question on this topic is asked, we provide the answer here, so that they can gain knowledge about the five phases of meiosis.

*(18) How energy is formed from oxidation of carbohydrates, fats and proteins?

Ans. (1) First of all the dietary carbohydrates are digested in the digestive system with the help of various enzymes and converted into glucose. Similarly, proteins are converted into amino acids and fats are broken down into fatty acid and glycerol (alcohol).

(2) Oxidation of carbohydrates takes place during cellular respiration. Glucose is oxidized by three steps during aerobic respiration, viz. glycolysis, tricarboxylic acid cycle or Krebs cycle and electron transfer chain.

(3) From one molecule of glucose two molecules of each pyruvic acid, ATP, NADH₂ and water are formed during glycolysis. Pyruvic acid which is formed in this process is converted into Acetyl-Coenzyme-A along with release of two molecules each of NADH₂ and CO₂.

(4) In the next step, i.e. in TCA cycle, molecules of Acetyl-Co-A enter the mitochondria and a cyclic chain of reactions take place. Acetyl part of Acetyl-Co-A is completely oxidized through this cyclical process. The molecules CO₂, H₂O, NADH₂, FADH₂ are released in this process.

(5) In third step, i.e. in ETC reaction, NADH₂ and FADH₂ formed during first two steps are used for obtaining ATP molecules. 3 molecules of ATP are obtained from each NADH₂ molecule and 2 molecules of ATP from each FADH₂.

(6) Thus, one molecule of glucose upon complete oxidation in presence of oxygen yields 38 molecules

of ATP. This is how from carbohydrates, energy is obtained.

(7) If carbohydrates are insufficient in diet, then proteins or lipids are used for energy production. Fatty acids derived from fats and amino acids derived from proteins are converted into Acetyl-Co-A. Acetyl-Co-A once again can yield energy through TCA cycle.

Q. 11 Give explanations for the following statements :

(1) After complete oxidation of a glucose molecules, 38 number of ATP molecules are formed.

Ans.

I. **Glycolysis** : No. of ATP molecules formed = 4
No. of ATP molecules used = 2

II. **Krebs cycle** : No. of ATP molecules formed = 2

III. **ETC Reaction** :

NADH₂ : 10 NAD₂ \times 3 ATP = 30 ATP
FADH₂ : 2 FADH₂ \times 2 ATP = 4 ATP
Total ATP molecules produced = (4 + 2 + 34)
= 40 ATP

ATP molecules used = 2 ATP

Therefore, total ATP molecules = 38 ATP

(2) At the end of glycolysis, pyruvate molecules are obtained.

Ans. The process of glycolysis takes place in the cytoplasm of the cell. One molecule of glucose is gradually oxidized step by step forming two molecules of each pyruvic acid, ATP, NADH₂ and water. Of these, pyruvate or pyruvic acid takes part in the further reactions.

(3) Genetic recombination occurs in pachytene phase of prophase of meiosis-I.

Ans. In prophase of meiosis I there are total 5 stages. Of these in pachytene the process of crossing over takes place between homologous chromosomes as chromosomes come near each other forming synapsis.

(4) All chromosomes are arranged parallel to equatorial plane of cell in metaphase of mitosis.

Ans. In mitosis, the metaphase is the stage when dividing chromosomes lie on the equatorial plane of

the cell. They are later pulled by the spindle fibres to the opposite poles.

(5) For formation of plasma membrane, phospholipid molecules are necessary.

Ans. Upon the digestion of fats, fatty acids and glycerol are formed. The fatty acids can be converted into phospholipid which are essential molecules for development of plasma membrane.

(6) Our muscle cells perform anaerobic type of respiration during exercise.

Ans. When the proportion of oxygen is less, then the cells switch over to anaerobic respiration. When we are exercising there is increased demand of oxygen for muscle cells. If this is not fulfilled, they perform anaerobic respiration during exercise.

(7) Excess of carbohydrates are stored in liver and muscles in the form of glycogen.

Ans. The carbohydrates which are not used to produce energy cannot be stored in the body in the form of glucose. This glucose is therefore converted into complex compound called glycogen. Glycogen is stored in muscles and liver.

Q. 12 Use your brain power :

(1) Many players are seen consuming some food stuffs during breaks of the game. Why may be the players consuming these food stuffs?

(Textbook page no. 12)

Ans. (1) Players require energy in greater amount.

(2) They perspire heavily at the time of game or sport which results in the loss of water and electrolytes from their body.

(3) This may affect their performance in sport. To prevent such unfavourable effect, they are given, juices or drinks.

(4) This helps them to restore the balance of water and electrolytes in their body. It also gives enhanced energy required for the performance.

(2) Many times, we experience dryness in mouth. (Textbook page no. 17)

Ans. (1) In our body there is 65-70% water. This proportion is always maintained.

(2) Sometimes we lose lots of water either through perspiration or due to unavailability of water for a

long time. In such situations, we experience dryness in our mouth.

(3) Dryness is a natural feeling which creates urge in us to drink water, thereby the proportion of water in the body is brought back to its normal levels.

(3) Oral rehydration solution (Salt-sugar-water) is frequently given to persons experiencing loose motions. (Textbook page no. 17)

Ans. (1) Loose motions cause lot of loss of water from the body.

(2) This may result in dehydration. This can be lethal if ignored.

(3) Especially in case of young children this is a very serious fatal problem.

(4) Thus, to bring back the normal proportion of water and electrolytes, oral rehydration solution or ORS is given to the patient who suffers from loose motions.

(4) We sweat during summer and heavy exercise. (Textbook page no. 17)

Ans. (1) During summer, the environmental temperatures are high.

(2) This causes rise in our body temperature. Exercising also cause rise in the temperature. But since we can regulate our body temperature to a constant level, the sweat glands get automatically stimulated.

(3) This induces perspiration.

(4) The sweat evaporates and causes fall in the body temperature. Thus, for regulation of body temperature, we sweat during summer or even after heavy exercise.

(5) What do you mean by diploid (2n) cell?

(Textbook page no. 20)

Ans. (1) The cells in which chromosome number is double are known as diploid cells.

(2) Male and female gametes unite together in the process of fertilization. Their chromosomes mix together in the zygote, therefore, the chromosome number is always diploid.

(3) E.g. Diploid chromosome no. in human beings is 46. We have 46 chromosomes in each of our body cells.

(6) What do you mean by haploid (n) cell?

(Textbook page no. 20)

Ans. (1) The cells with only one set of chromosomes is known as haploid cell.

(2) At the time of sexual reproduction, there is meiosis. In meiosis chromosome number of the parental germ cells are reduced to half. Therefore, gametes are haploid.

(3) The haploid chromosome number (n) in human beings is 23.

(4) Sperm and ovum both are haploid carrying 23 chromosomes each.

(7) What do you mean by homologous chromosomes? (Textbook page no. 20)

Ans. (1) Every species has definite number of chromosome pairs in their diploid cells.

(2) In every pair, the two chromosomes are alike in shape, type and genes located over them.

(3) Such chromosomes are called homologous chromosomes.

(4) E.g. In human diploid cell, pair of chromosome no. 1 shows chromosome no. 1 from mother and chromosome no. 1 from father. These two chromosomes are homologous to each other.

(8) Whether the gametes are diploid or haploid? Why? (Textbook page no. 20)

Ans. The cells that give rise to gametes are diploid (2n). But by meiosis they give rise to gametes which are haploid (n). Two haploid gametes undergo fertilization and the zygote formed becomes once again diploid (2n).

(9) How are the haploid cells formed?

(Textbook page no. 20)

Ans. Diploid cells undergo meiosis, which is a reduction division. In this way haploid cells are formed.

(10) What is the importance of haploid cells?

(Textbook page no. 20)

Ans. (1) The gametes that take part in the sexual reproduction should be haploid.

(2) Otherwise the chromosome number will not be maintained at constancy. E.g. Parents have $2n = 46$ chromosomes in their cells.

(3) If meiosis does not take place in them, the gametes formed will also contain 46 chromosomes.

(4) The resultant offspring will have $46 + 46 = 92$ chromosomes.

(5) Such skewed number will produce large scale abnormalities.

(6) But due to meiosis, the gametes formed are haploid and thus the chromosome number is maintained constant for every species. Gametes are haploid cells, this is the most important fact.

Q. 13 Complete the paragraph by choosing the appropriate words given in the brackets :

(1) (gamete, crossing over, haploid, Meiosis-II, meiosis-I, diploid)

..... is just like mitosis. In this stage, the two haploid daughter cells formed in undergo division by separation of recombined sister chromatids and four daughter cells are formed. Process of production and spore formation occurs by meiosis. In this type of cell division, four haploid (n) daughter cells are formed from one cell. During this cell division, occurs between the homologous chromosomes.

Ans. Meiosis-II is just like mitosis. In this stage, the two haploid daughter cells formed in meiosis-I undergo division by separation of recombined sister chromatids and four haploid daughter cells are formed. Process of gamete production and spore formation occurs by meiosis. In this type of cell division, four haploid (n) daughter cells are formed from one diploid cell. During this cell division, crossing over occurs between the homologous chromosomes.

(2) (external, inhalation, alveolar, breathing, respiration, exhalation)

Release of energy from the assimilated food is called Inhalation and exhalation is called When is done, air enters the lungs. The oxygen from this air enters the blood while carbon dioxide from the blood exits from the blood.

Through CO_2 is given out. This gaseous exchange occurs through membrane. This is called respiration. The RBCs carry oxygen to every cell.

Ans. Release of energy from the assimilated food is called respiration. Inhalation and exhalation is called breathing. When inhalation is done, air enters the lungs. The oxygen from this air enters the blood while carbon dioxide from the blood exits from the blood. Through exhalation, CO_2 is given out. This gaseous exchange occurs through alveolar membrane. This is called external respiration. The RBCs carry oxygen to every cell.

Q. 14 Read the paragraph and answer the questions given below :

(1) Dietary fibre — found mainly in fruits, vegetables, whole grains and legumes — is probably best known for its ability to prevent or relieve constipation. But foods containing fibre can provide other health benefits as well, such as helping to maintain a healthy weight and lowering your risk of diabetes, heart disease and some types of cancer. Dietary fibre, also known as roughage or bulk, includes the parts of plant foods your body can't digest or absorb. Unlike other food components, such as fats, proteins or carbohydrates — which your body breaks down and absorbs — fibre isn't digested by your body. Instead, it passes relatively intact through your stomach, small intestine and colon and out of your body.

Questions and Answers :

(1) Which food items provide rich fibre content?

Ans. Fruits, vegetables, whole grains and legumes give rich amount of dietary fibre.

(2) Enlist the advantages of fibres in diet.

Ans. Fibres help to relieve constipation and help in maintaining a healthy weight and lowering risk of diabetes, heart disease and some types of cancer.

(3) Are fibres digested in the body?

Ans. No, fibres are not digested in the body but are passed on without any alteration.

(4) Which is the path through which fibres pass in the digestive tract?

Ans. Fibres pass through stomach, small intestine and colon.

(5) What is a roughage?

Ans. Roughage is the fibre content of the food which consists of plant matter which cannot be digested by the human enzymes, hence form undigested bulk matter in the faeces.

Q. 15 Diagram-based questions :

(1) Draw a neat diagram of the structure of chromosome and label the parts :

(a) Centromere (b) p-arm (March '19)

Ans. For answer refer to Fig. 2.1 from this chapter.

(2) Sketch and label the diagram to show ATP—the energy currency of the cell.

Ans.

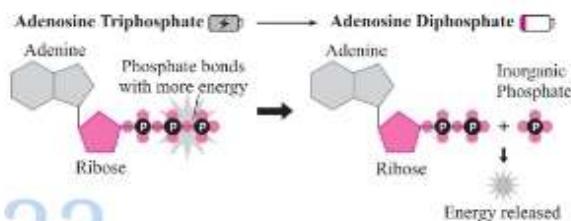


Fig. 2.5 : ATP—the Energy Currency

(3) Mitochondria and Krebs cycle :

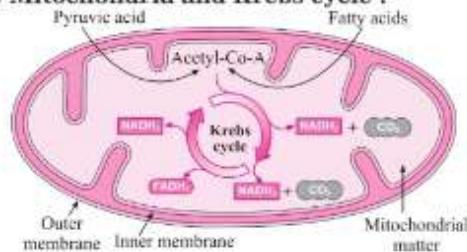


Fig. 2.6 : Mitochondria and Tri-carboxylic acid cycle

(a) Which co-enzymes are shown in the diagram?

Ans. The co-enzymes NADH₂ and FADH₂ are shown in the above diagram.

(b) Which chemical reaction takes place in the mitochondria? Which molecules are produced in this reaction?

Ans. The chemical reaction that takes place in the mitochondria is called Electronic Transport Chain reaction. The molecules of H_2O , carbon dioxide and energy in the form of ATP are produced in this reaction.

(4) Observe the diagrams 2.8 and 2.9 given on the Textbook page no. 19 and answer the following questions :

(a) Which peculiarity do you observe in the figure of Metaphase-I of meiosis ?

Ans. The chromosomes are seen lying on the equatorial plane in the metaphase-I of meiosis.

(b) What is the important difference between Telophase-I and Telophase-II of meiosis ?

Ans. In figure of Telophase-I the diploid chromosomes are seen in two daughter cells. In Telophase-II four daughter cells are seen with haploid chromosomes in them.

(c) Which figure shows phenomena of crossing over ?

Ans. The third figure of Prophase-I shows phenomena of crossing over.

(5) Label the diagram below. Which phase of cell division is seen in the diagram given below ?

Ans. The diagram given below shows Telophase-II of Meiosis-II.

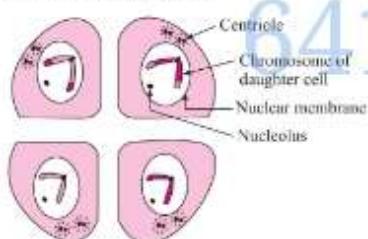
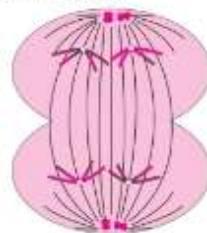


Fig. 2.7 : Telophase-II

(6) State the characteristics of step of cell division shown in figure.



Ans. (1) This figure shows anaphase - I of meiosis.

(2) This is the third stage of meiosis - I.

(3) The sister chromatids separate out and move to opposite poles.

(4) The chromatids have undergone crossing over leading to recombination in prophase - I.

(7) Observe and label the diagram :
(Textbook page no. 13)

Ans.

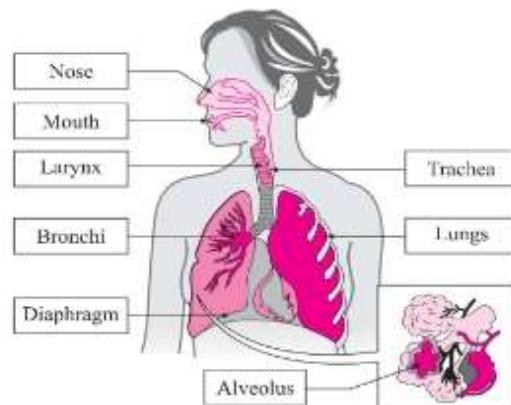
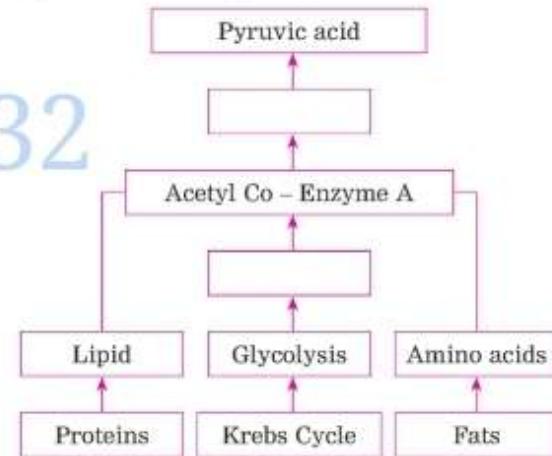


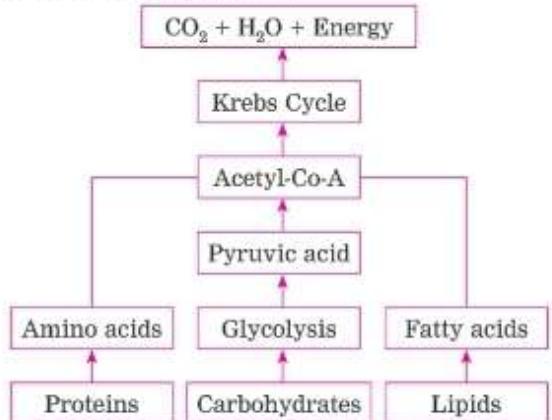
Fig. 2.8 : Human respiratory system

Q. 16 Activity-Based Questions :

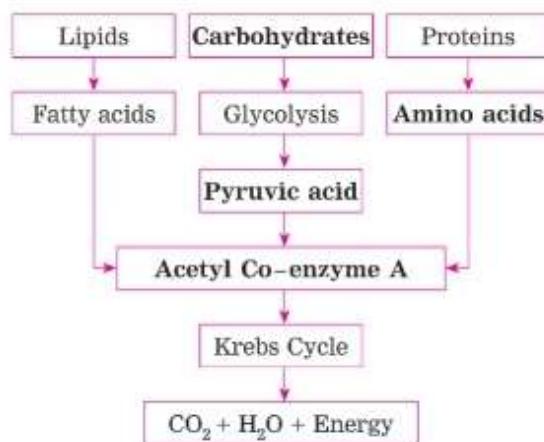
*(1) Correct the diagram given below :



Ans. Corrected diagram :



(2) Complete the following chart and state which process of energy production it represents : (March '19)



Ans. The chart shows process of energy production through aerobic respiration of carbohydrates, proteins and fats.

(Answers to the blanks in chart are given in bold.)

(3) Internet is my friend.

(Textbook page no. 17) Collect information :

(a) What are symptoms of diseases like night blindness, rickets, beriberi, neuritis, pellagra, anaemia, scurvy ?

Disease	Symptoms
Night blindness	<ul style="list-style-type: none"> Near sightedness, or blurred vision when looking at faraway objects. Cataracts, or clouding of the eye's lens. Inability to see in dark. Sometimes blindness.
Rickets	<ul style="list-style-type: none"> Weak and soft bones Stunted growth In severe cases, skeletal deformities.

Disease	Symptoms
Beriberi	<ul style="list-style-type: none"> Decreased muscle function, particularly in the lower legs. Tingling or loss of feeling in the feet and hands. Pain Mental confusion, difficulty in speaking Vomiting Involuntary eye movement, paralysis.
Neuritis	<ul style="list-style-type: none"> Numbness in hands and feet Tingling sensation, sharp, jabbing, throbbing, freezing or burning pain. Extreme sensitivity to touch. Lack of coordination and falling.
Pellagra	<ul style="list-style-type: none"> Delusions or mental confusion. Diarrhoea and nausea Inflamed mucous membrane. Scaly skin sores.
Anaemia	<ul style="list-style-type: none"> Fatigue and loss of energy Unusually rapid heartbeat, particularly with exercise Shortness of breath and headache, particularly with exercise Difficulty in concentrating Dizziness, Pale skin Leg cramps, Insomnia
Scurvy	<ul style="list-style-type: none"> Anaemia, debility, exhaustion, Spontaneous bleeding Pain in the limbs, and especially the legs, swelling in some parts of the body Ulceration of the gums and loss of teeth.

(b) What do you mean by coenzymes ?

Ans. Co-enzyme is a non-protein compound that is necessary for the functioning of an enzyme. It is bound to the enzyme as a catalyst. This increases the rate of reaction. Co-enzymes always act along the

enzymes. They cannot work independently. But the same molecule of coenzyme can be used again and again.

Many co-enzymes are vitamins or derived from vitamins. When vitamin intake is too low, then an organism also lacks the co-enzymes that catalyse reactions. Water-soluble vitamins, which include all B complex vitamins and vitamin C, lead to the production of co-enzymes. Two of the most important and widespread vitamin-derived co-enzymes are Nicotinamide Adenine Dinucleotide (NAD) and co-enzyme A.

(c) Find the full forms of FAD, FMN, NAD, NADP.

Ans.

FAD	Flavin Adenine Dinucleotide
FMN	Flavin Mono Nucleotide
NAD	Nicotinamide Adenine Dinucleotide
NADP	Nicotinamide Adenine Dinucleotide Phosphate

(d) How much quantity of each vitamin is required every day?

Ans.

Vitamin	Daily requirement
A	700 and 900 μ grams
B Complex	100 mg/day for adults
C	75 mg
D	5 μ g
E	10 mg
K	80 μ g

Q. 17 Experiment :

- Try this : (Textbook page no. 20)

Experiment : To observe phases of mitosis in onion root tip. (Refer to *Vikas Science Experiment book/Journal for the details of this experiment.*)

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PROJECTS

(1) Use of ICT : (Textbook page no. 20) Collect videos and photographs of different life processes in living organisms. Prepare a presentation and present it on the occasion of science exhibition.

(2) Books are my friend : (Textbook page no. 20)

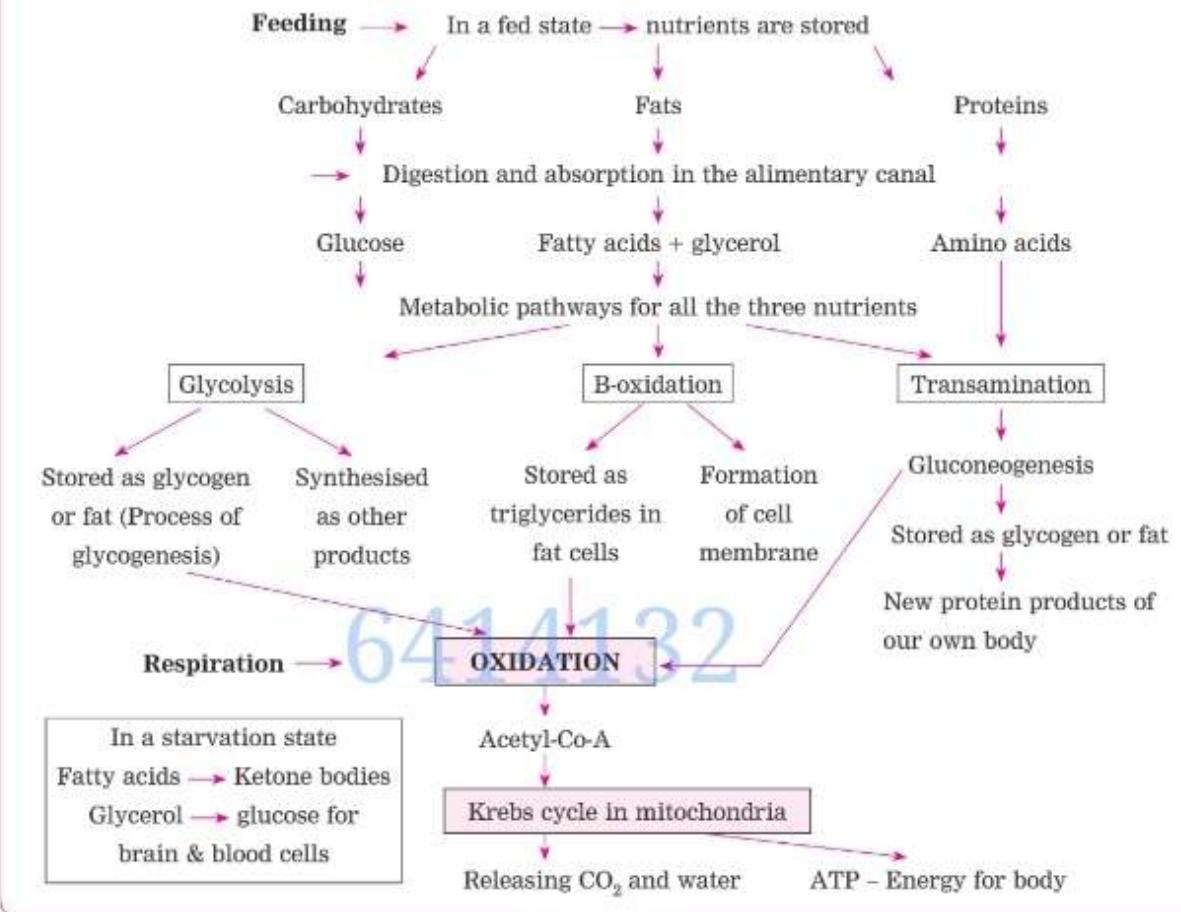
Read different Encyclopaedias of technical terms in biology and anatomy and other reference books.

(3) Project : (Textbook page no. 21)

With the help of information collected from internet, prepare the slides of various stages of mitosis and observe under the compound microscope.

MEMORY MAP/CONCEPT MAP

Metabolic pathways



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this QR Code for the test and its model answers.



CHAPTER OUTLINE

3.1 Reproduction : Asexual and Sexual reproduction
3.2 Reproduction and modern technology

3.3 Reproductive health
3.4 Population explosion

IMPORTANT POINTS

Can you recall? (Textbook page no. 22)

(1) Which are the important life processes in living organisms?

Ans. The important life processes in living organisms are respiration, circulation, nutrition, excretion, sensation and response through nervous system.

(2) Which life processes are essential for production of energy required by body?

Ans. The oxidation of nutrients that are absorbed in body is done because of oxygen supplied to cells by respiratory and circulatory system. This helps in liberation of energy. Thus respiration, circulation and nutrition are the life processes that are essential for production of energy required by body.

(3) Which are main types of cell division? What are the differences?

Ans. The main types of cell division are mitosis and meiosis. In mitosis, the chromosome number remains the same. 2 daughter cells are obtained from one cell. In meiosis, the chromosome number is reduced to half. From one cell, four daughter cells are obtained.

(4) What is the role of chromosomes in cell-division?

Ans. Due to chromosomes, the DNA from parental cells enter into daughter cells. The hereditary characters are transmitted to next generation by cell division.

3.1 Reproduction : Asexual and Sexual :

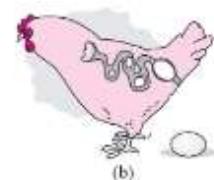
1. Life processes such as nutrition, respiration, excretion, control & co-ordination, etc. keep the organisms alive. The reproductive processes are not essential for survival of the individual but they are important in continuation of species to which that organism belongs.

Observe : (Textbook page no. 22)

- Observe the pictures and tell the life process which you identified.



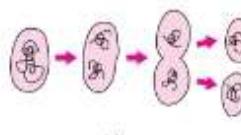
(a)



(b)



(c)



(d)

Fig. 3.1 : Some Life Processes

Ans. In picture 'a' vegetative propagation is shown. The planted twig is showing rootlets. This indicates that new plant is being produced.

In picture 'b' hen is laying eggs.

In picture 'c' the seed is germinating and has produced radicle and plumule.

In picture 'd' cell division or binary fission similar to mitosis is shown.

All the pictures, show different types of reproduction.

Can you recall? (Textbook page no. 22)

(1) What do we mean by maintenance of species?

Ans. Species undertaking successful reproduction and producing individuals of its own kind is called maintenance of species.

(2) Whether the new organism is genetically exactly similar to earlier one that has produced it?

Ans. No. The new organism produced from the old one is not genetically exactly similar to the parents. Due to genetic recombination, the new organism is different from the earlier one. However, if the reproduction is of asexual type, then the young one is exactly similar to the parents.

(3) Who determines whether the two organisms of a species will be exactly similar or not?

Ans. The type of reproduction, whether it is

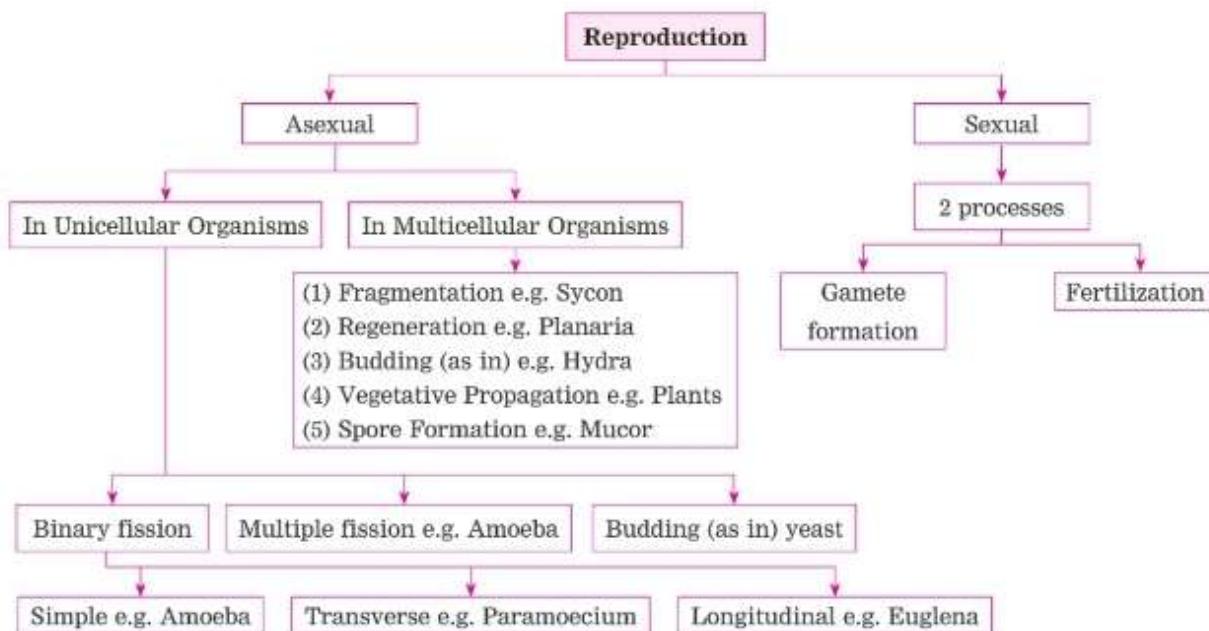
asexual or sexual, the type of crossing over, the extent of genetic recombination, etc. determine the similarity among the parent organisms and their offspring.

(4) What is the relationship between the cell division and formation of new organism of same species by earlier existing organism?

Ans. In the process of reproduction, there is division of chromosomes. Due to cell division, the gametes are formed. The union of gametes produce new offspring. In sexual reproduction, all these processes take place due to cell division. In asexual reproduction too there is cell division. Growth of new organism also occurs due to cell division.

2. Reproduction is formation of new offspring of same species by earlier existing parent organism. Evolution of every species occurs due to reproduction.

3. Two main types of reproduction : Asexual reproduction and Sexual reproduction.



4. Asexual reproduction : Asexual reproduction is uniparental reproduction in which there is no formation of gametes and fusion of the gametes. The offspring produced is exactly similar to the parent organisms. It takes place by mitotic cell division.

- Demerit of asexual reproduction : Absence of genetic recombination
- Merit of asexual reproduction : Rapid process of reproduction.

5. Different methods of asexual reproduction :

Name of the method	Process	In which organism?
Asexual reproduction in unicellular organisms		
Binary fission	<ul style="list-style-type: none"> • The parent cell divides into two similar daughter cells. • Occurs either by mitosis or amitosis. • Performed usually during favourable conditions • Axis can be (1) Simple (2) Transverse (3) Longitudinal 	(1) Simple : Bacteria and Amoeba (2) Transverse : Paramecium (3) Longitudinal : Euglena and eukaryotic cell-organelle like mitochondria and chloroplasts
Multiple fission	<ul style="list-style-type: none"> • Formation of pseudopodia stops, movements stop. • Becomes round and covered over by protective cyst. • In the cyst repeated nuclear divisions take place forming many nuclei. • Cytoplasm divides forming many amoebulae. • Cyst persists in adverse conditions. • It breaks open after favourable conditions return by releasing many amoebulae. 	Amoeba in unfavourable conditions.
Budding	<ul style="list-style-type: none"> • Two daughter nuclei by mitotic division formed by parent cell. • Appearance of a small bulge on the surface of parent cell. • Bulge is bud. • One daughter nucleus enters the bud. • Bud separates from the parent cell after sufficient growth. • Starts living independently. 	Yeast cells (Unicellular fungus)
Asexual reproduction in multicellular organisms		
Fragmentation	<ul style="list-style-type: none"> • The body of parent organism breaks up into many fragments. • Each fragment lives independently. • Spirogyra undergoes fragmentation in favourable conditions. • If Sycon breaks up accidentally, each fragment of its body develops into new Sycon. 	Algae – Spirogyra, Sponge – Sycon

Name of the method	Process	In which organism?
Regeneration	The body is broken into two parts. Each part regenerates remaining part of the body forming two new organisms.	Planaria
Budding	<ul style="list-style-type: none"> Repeated divisions of regenerative cells of body wall form a bud. Progressive growth of bud occurs and a small Hydra is formed. Parent hydra supplies nutrition to the budding hydra. After sufficient growth, new hydra separates and then leads an independent life. 	Hydra
Vegetative propagation	Reproduction with the help of vegetative parts of the plants such as roots, stems and leaves.	Potato - Eyes on tuber Bryophyllum - Buds on leaf margins Sugar cane, grass - Buds on leaf nodes Carrot, Radish - by roots.
Spore formation	Sporangia over the filamentous body burst to release spores. Germination takes place in moist and warm place forming new colony.	Fungi like Mucor

6. Sexual Reproduction :

(1) Reproduction with the help of male and female gametes is called sexual reproduction. It has two main processes, viz. gamete formation and fertilization.

(1) **Gamete formation :** By meiosis the gametes are formed. The diploid germ cells give rise to haploid gametes.

(2) **Fertilization :** From union of haploid male and a female gamete a diploid zygote is formed during fertilization.

(2) Subsequent mitotic divisions of zygote form embryo which then develops into new individual.

(3) Male parent produces male gamete or sperm and the female parent produces female gamete or ovum. The fusion of these forms zygote. Zygote has recombined genes of both the parents. Hence, the offspring shows some similarities and some differences in the parental characters.

(4) Genetic variation gives rise to diversity in living organisms. Those genetic variations that are helpful for adapting to the environment are retained. Such individuals continue to exist and do not become extinct.

Let's Think : (Textbook page no. 26)

(1) What would have been happened if the male and female gametes had been diploid?

Ans. Diploid ($2n$) gametes if united, they will form $4n$, i.e. tetraploid variety. Such zygote will show severe abnormality. The chromosome number will not be maintained.

(2) What would have been happened if any of the cells in nature had not been divided by meiosis?

Ans. If meiosis does not happen the gametes produced will be diploid. This will create abnormality.

7. Sexual reproduction in plants :

(1) Structural unit of sexual reproduction in plants is flower.

(2) Calyx, corolla, androecium and gynoecium are the four floral whorls.

(3) Different types of flowers :

(1) **Bisexual** : Flowers with both androecium and gynoecium.

(2) **Unisexual** : Flowers with either androecium or gynoecium

(3) **Male flower** : Flowers with only androecium

(4) **Female flower** : Flowers with only gynoecium

(5) **Pedicellate** : Flowers with stalk or pedicel.

(6) **Sessile** : Flowers without stalk.

Parts of the flower :

Part of the flower	Unit	Structure	Function
Accessory whorls			
Calyx	Sepals	Green coloured	Protective. Keeping all the parts safely covered during bud condition.
Corolla	Petals	Variously coloured	To attract insects for pollination.
Essential whorls			
Androecium	Stamens = 1. Filament → 2. Anther → 3. Four Locules → Pollen grains	Stamen is the male whorl. Inside the locules pollen grains are formed by meiosis. Anthers disperse the pollen grains out at proper time.	To produce pollen grains. These form male gametes.
Gynoecium	Carpels = 1. Ovary : containing one or many ovules. 2. Style : Hollow tube joining the ovary and stigma. 3. Stigma : Tip of style.	By meiosis, embryo sac is formed in each ovule. It has a haploid egg cell and two haploid polar nuclei.	To produce ovules which forms female gametes.

(4) Pollination : Transfer of pollen grains from anther to stigma is called pollination.

plants, the pollination with the help of brush, is done by scientists.

(5) Agents of pollination :

(1) **Abiotic agents** : Wind, water

(2) **Biotic agents** : Insects, birds or other animals.

(6) Types of pollination :

(1) **Self-pollination** : Pollination involves only one flower or two flowers borne on same plant.

(7) Fertilization :

(1) Pollens fall upon sticky stigma and germinate.

(2) A long pollen tube and two male gametes are formed upon germination.

(3) The pollen tube carrying male gametes travels through style and reaches the embryo sac.

(4) In embryo sac, tip of the pollen tube bursts releasing two male gametes.

(5) Here fertilization occurs by union of one male gamete and egg cell.

(2) **Cross-pollination** : Involves two flowers borne on two plants of same species.

(3) In artificial pollination for forming new

high yielding and resistant varieties of

(6) Second male gamete unites with two polar nuclei. This union forms endosperm. Since two nuclei take part in the process, it is called double fertilization.

(8) Germination :

- (1) The development of new plantlet from zygote after fertilization is called germination.
- (2) After fertilization ovule develops into seed and ovary into fruit.
- (3) Seeds from broken fruits fallen upon the ground start germinating if they get favourable conditions.
- (4) Development takes place due to food stored in endosperm of seed.

8. Sexual reproduction in human being :

Can you recall? (Textbook page no. 28)

- (1) Which different hormones control the functions of human reproductive system through chemical coordination?**

Ans. Pituitary gland secretes FSH and LH. LH is known as ICSH in males, as its function in the male body is different. The hormones testosterone secreted from testis in males and estrogen and progesterone secreted from the ovaries in females control functions of reproductive system.

- (2) Which hormones are responsible for changes in human body occurring during onset of sexual maturity?**

Ans. Testosterone in male body and estrogen in female body are responsible for maturity onset changes in human body.

- (3) Why has the Government of India enacted the law to fix the minimum age of marriage as 18 in girls and 21 in boys?**

Ans. The full growth of female body is not completed till the age of 18. Till 18 years of age the physical and emotional maturity is not attained. Therefore, she is not suitable for marriage, sexual relationship and pregnancy. Similarly, boy attains complete growth only by the age of 21. Therefore, to keep individuals and their progeny safe and healthy the Government of India enacted the law to fix the minimum age of marriage as 18 in girls and 21 in boys.

- (1) Sex determination :** Sex is determined according to the sex chromosomes, Human males have 44 somatic chromosomes and XY sex chromosomes whereas human females have 44 somatic chromosomes and XX sex chromosomes.

(2) Human male reproductive system :

Organ	Structure	Function
Testes (Pair)	Located outside the abdominal cavity in the scrotum,	1. Numerous seminiferous tubules. Each has germinal epithelium → the cells divide meiotically or by meiosis to produce sperms. 2. Testes also produce testosterone.
Different tubular structures	Rete testes → vas eferens → epididymis → vas deferens → ejaculatory duct → urethra	Sperms travel from one tubule to next. In this interval they are nourished and made mature for fertilization.
Glands	(1) Seminal vesicles (2) Prostate gland (3) Cowper's glands	Secretions released in urethra. All secretions + sperms = Semen
Urethra, Penis	Passage of urine as well as sperms	Penis transfers the semen during intercourse. Urethra is a common passage for sperms and urine.

(3) Human female reproductive system :

Organ	Structure	Function
Ovaries (Pair)	In lower abdominal cavity.	Produce ova, secrete female hormones.
Fallopian duct (pair)	Three parts; Free end-funnel like with an opening at centre. Middle part for fertilization. The third part opens in uterus. Entire duct have ciliated epithelium.	Transport of ovum to uterus.
Uterus	In the middle of lower abdomen.	Development of foetus, Helping in birth process.
Vagina	The passage of uterus to outside.	Passage for menstrual flow, intercourse and also for birth.
Bartholin's glands	In the vaginal wall.	For lubrication and protection of vagina.

(4) Formation of gametes :

- (1) Sperm from father and ovum from mother are haploid gametes formed by meiosis.
- (2) Man can produce sperms from puberty till death.
- (3) But in a woman the function of reproductive system stops at menopause.
- (4) In mature woman a single matured oocyte is released from ovary every month.
- (5) In woman's body from birth, there are 2 – 4 million immature oocytes in the ovary of female foetus. Till the age of 45 years woman can produce ova.
- (6) Later she attains menopause due to lessened secretion of female hormones. The reproductive functions then completely stop.

(5) Fertilization :

- (1) Union of sperm and ovum to form a zygote is called fertilization. There is internal fertilization in humans in which semen is deposited in vagina during intercourse. In the semen there are few millions of sperms. They swim from vagina through uterus and reach fallopian ducts. Only one sperm is required for fertilizing a single ovum that female produces.
- (2) Women with advanced age have strong chance of conceiving abnormal child. The ova that

develop around menopausal age are 45–50 years old and hence they can be abnormal due to faulty meiosis. If such ovum is fertilized there are increased chances of getting genetically abnormal child. e.g. Down's syndrome or Turner's syndrome.

(6) Development and Birth :

- (1) The fertilization takes place in fallopian duct. The zygote thus formed undergoes rapid and repeated mitotic divisions to develop embryo.
- (2) It travels from fallopian tubes to uterus. In uterus it gets implanted and grows for next 40 weeks or 9 months.
- (3) The nutrition during this period is provided by placenta which is developed in pregnant mother.
- (4) After completion of embryonic development for 9 months the pregnant mother gives birth to a baby.

(7) Sex determination in human beings :

- (1) The gametes develop from germ cells which are diploid (2n).
- (2) Each diploid cell has 22 pairs of autosomes and 1 pair of sex-chromosomes i.e. (44 + XX or 44 + XY).
- (3) Germ cells undergo meiosis forming haploid (n) gametes having chromosomal combination of 22 + X or 22 + Y.

- (4) Sperms produced are of two types viz. (22 + X) or (22 + Y) but ova/oocytes are all (22 + X) of similar type.
- (5) Type of sperm of father decides the sex of the child. If X bearing sperm fertilises the oocyte, the girl is born and if Y bearing sperm fertilises oocyte, it's a boy. Mother has all X bearing oocytes, hence she is neutral in sex determination of the child. Thus mother is not responsible for the sex of child.

Can you recall? (Textbook page no. 31)

- (1) Which hormone is released from pituitary of mother once the foetal development is completed?

Ans. The hormone oxytocin is released from the posterior pituitary of mother once the foetal development is completed.

- (2) Under the effect of that hormone, which organ of the female reproductive system starts to contract and thereby birth process (parturition) is facilitated?

Ans. Due to oxytocin, uterus contracts involuntarily and the baby is expelled out. Thus initiation of birth process is possible due to contractions of uterus.

(8) Menstrual Cycle :

- (1) Menstrual cycle is the naturally occurring repetitive changes in mature human female.
- (2) These cyclic events are controlled by four hormones.
- (a) Follicle stimulating hormone (FSH)
 - (b) Luteinizing hormone (LH)
 - (c) Estrogen
 - (d) Progesterone.
- (3) FSH and LH are secreted from pituitary and estrogen and progesterone are secreted from ovary.
- (4) One ovarian follicle develops along with the oocyte present in it due to effect of FSH. This developing follicle secretes estrogen.

- (5) This follicle produces estrogen under the influence of FSH.
- (6) Under the effect of estrogen, uterine endometrium develops or regenerates.
- (7) The oocyte also undergoes development.
- (8) Then under the influence of LH, ovulation takes place. Ovulation is bursting of ovarian follicle to release an oocyte.
- (9) The remaining tissue of empty ovarian follicle forms a body called the corpus luteum. It is a secondary endocrine source and it starts producing progesterone. Under its influence the uterine endometrial glands secrete and make this endometrium ready for implantation of embryo.
- (10) If oocyte is fertilized the endometrium forms placenta along with developing foetus. But if it is not fertilized, corpus luteum loses its function and becomes a degenerate body called corpus albicans.
- (11) Corpus albicans does not secrete estrogen and progesterone. Due to this, endometrium degenerates and starts sloughing off.
- (12) Degenerating endometrium, unfertilized ovum and blood is discarded out through vagina.
- (13) This results into continuous bleeding for five days which is called menstruation, which is repeated every month. It is interrupted only by pregnancy.

3.2 Reproduction and Modern Technology :

(1) Causes of sterility :

Causes of sterility in females	Causes of sterility in males
• Irregularity in menstrual cycle.	• Absence of sperms in the semen.
• Difficulties in oocyte production.	• Slow movement of sperms.
• Obstacles in the oviduct.	• Anomalies in the sperms.
• Difficulties in uterine implantation.	

Advanced medical techniques like IVF, Surrogacy, Sperm bank, etc. help the childless couple to have a baby.

(2) Modern reproductive technologies :

Method	In Vitro Fertilization (IVF)	Surrogacy	Sperm Bank / Semen Bank
Process done.	Fertilization is done in a test-tube → embryo implanted in uterus of woman.	Oocyte collected from the ovary → fertilized in test-tube by husband's sperms → Fertilized egg implanted in uterus of other surrogate woman who lends her normal uterus.	Ejaculated semen is stored in sperm bank. This semen is used to fertilize egg by IVF technique.
Reasons behind the method.	Less sperm counts in man. Obstacles in oviduct of woman.	Problems in implantation of embryo in uterus of a woman.	Various problems in sperm production.

(3) Twins :

- (1) Twins are two embryos that develop simultaneously in the same uterus producing two offspring.
- (2) Two main types of twins are ; (1) Monozygotic twins (2) Dizygotic twins.
- (3) **Monozygotic twins** : Formed from single embryo these twins are exactly alike and are of same gender. If within 8 days of zygote formation during the embryonic development cells of that embryo are divided into two groups, then monozygotic twins are formed.
- (4) **Siamese twins** : Twins with some parts of body joined to each other are called Siamese or conjoined twins.
- (5) **Dizygotic twins** : When two oocytes are released from the ovary of woman and both are fertilized by two separate sperms then there is formation of dizygotic twins.

3.3 Reproductive Health :

- 1. Health : The physical, mental and social well-being is called health.
- 2. In India, there is lack of awareness about reproductive health. Social customs, traditions,

illiteracy, shyness, etc. keep the society under pressure. There is always indifference towards the reproductive health of women.

- 3. Reproductive health can be achieved by keeping genitals clean.
- 4. Syphilis and gonorrhoea are sexually transmitted or bacterial venereal diseases.
- 5. **Symptoms of syphilis** : Occurrence of chancre (patches) on various parts of body including genitals, rash, fever, inflammation of joints, alopecia, etc.
- 6. **Symptoms of gonorrhoea** : Painful and burning sensation during urination, oozing of pus through penis and vagina, inflammation of urinary tract, anus, throat, eyes, etc.

3.4 Population Explosion :

- 1. **Population explosion** : Within a short duration if there had been excessive growth of population, then it is called population explosion.
- 2. The problems due to population explosion are unemployment, decreasing per capita income and increasing loan, stress on natural resources, etc.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write that alphabet against the sub-question number :

- *(1) In humans, sperm production occurs in the organ (Nov. '20)
 (a) prostate gland (b) testis
 (c) ovaries (d) Cowper's gland
- *(2) In humans, chromosome is responsible for maleness.
 (a) X (b) Y (c) Z (d) O
- *(3) Implantation of embryo occurs in
 (a) ovaries (b) fallopian duct
 (c) uterus (d) vagina
- *(4) Body breaks up into several fragments and each fragment begins to live as a new individual. This is type of reproduction.
 (March '20)
 (a) regeneration (b) fragmentation
 (c) binary fission (d) budding
- (5) Pranav and Pritee are twins in your class. They belong to twins type.
 (a) monozygotic (b) dizygotic
 (c) siamese (d) none of the above
- (6) Longitudinal binary fission is seen in
 (a) Paramoecium (b) Euglena
 (c) Amoeba (d) Spirogyra
- (7) Yeast cell performs asexual reproduction by
 (a) fragmentation (b) budding
 (c) binary fission (d) regeneration
- (8) Carrot and radish undergoes with the help of their roots.
 (a) vegetative propagation (b) fragmentation
 (c) budding (d) regeneration
- (9) Which of the following is not a type of asexual reproduction in multicellular organism?
 (a) Fragmentation (b) Regeneration
 (c) Budding (d) Binary fission

- (10) At the time of birth, there are oocytes in the ovary of a female foetus.
 (a) 1 to 2 million (b) 2 to 3 million
 (c) 2 to 4 million (d) none of these
- (11) on the inner surface of fallopian ducts (oviducts) push the egg towards uterus.
 (a) Cilia (b) Tentacles
 (c) Flagella (d) Fibres
- (12) Pregnant mother supplies nourishment to her foetus through
 (a) breasts (b) uterus (c) placenta (d) ovaries
- (13) modern remedial technique is used if there is a problem in implantation of embryo in the uterus.
 (a) Surrogacy (b) Sperm bank
 (c) In vitro fertilization (d) none of these
- (14) The length of a sperm is about micrometers.
 (a) 400 (b) 5 (c) 60 (d) 600 (July '19)
- (15) Vegetative propagation is performed with the help of in sweet potato.
 (a) root (b) stem (c) leaf (d) flower
- *(16) type of reproduction occurs without fusion of gametes.
 (a) Asexual (b) Sexual
 (c) Fertilization (d) Gamete formation
- *(17) Pollen grains are formed by division in locules of anthers.
 (a) meiosis (b) mitosis (c) amitosis (d) binary
- *(18) In male and female reproductive system of human, gland is same.

There is no similar gland in male and female reproductive system. There may be some homologies but there is no similarity.

Ans. (1-b); (2-b); (3-c); (4-b); (5-b); (6-b); (7-b); (8-a); (9-d); (10-c); (11-a); (12-c); (13-a); (14-c); (15-a); (16-a); (17-a); (18-No answer).

Q. 2 Write whether the following statements are true or false, with the suitable reason :

- (1) Absence of genetic recombination is an advantage whereas fast process is drawback of asexual reproductive method.

- (2) Prokaryotes show fission which occurs either by mitosis or amitosis.
- (3) During favourable conditions multiple fission is performed by amoeba.
- (4) Any encysted Amoeba or any other protist is called 'Cyst'.
- (5) If the body of Sycon breaks up accidentally into only large and few fragments, then only each fragment develops into new Sycon.
- (6) Pollen tube reaches the zygote via style.
- (7) There is glucose sugar in the semen.
- (8) Out of 2 – 4 million ova, approximately only 400 oocytes are released up to the age of menopause.
- Ans.** (1) **False.** (Absence of genetic recombination is a drawback whereas fast process is advantage of asexual reproductive method.)
- (2) **True.** (Prokaryotes show fission by both the methods, i.e. mitosis and amitosis.)
- (3) **False.** (During unfavourable conditions multiple fission is performed by amoeba.)
- (4) **True.** (Cyst is the tough capsule like structure which keeps the protists dormant inside it. This helps the organisms to tide over unfavourable conditions.)
- (5) **False.** (If the body of Sycon breaks up accidentally into many fragments, each fragment develops into new Sycon. Because the capacity to regenerate is very strong in poriferan Sycon, even a small piece of parent Sycon can give rise to entire new individual.)
- (6) **False.** (Pollen tube reaches the embryo sac via style. Later, double fertilization takes place and the zygote and endosperm is formed.)
- (7) **False.** (There is fructose sugar in the semen. Glucose is not present in semen.)
- (8) **True.** (During the reproductive span of the woman, from menarche to menopause only one oocyte per one month is released in the span of 30 to 35 years.)

Q. 3 Find the odd one out :

- (1) Circulation, Excretion, Sensation, Reproduction.

- (2) Budding in hydra, Regeneration, Binary fission, Fragmentation
- (3) Carrot, Radish, Potato, Sweet potato.
- (4) Vas eferens, vas deferens, prostate gland, epididymis.
- (5) Prostate gland, Bartholin's gland, Cowper's gland, Epididymis.
- (6) Stigma, style, pollen, ovary.
- Ans.** (1) **Reproduction.** (All others are processes necessary for survival of the individual.)
- (2) **Binary fission.** (All others are processes of asexual reproduction in multicellular organisms.)
- (3) **Potato.** (All others are edible roots.)
- (4) **Prostate gland.** (All others are duct systems in male reproductive system.)
- (5) **Bartholin's glands.** (All others are parts of male reproductive system.)
- (6) **Pollen.** (All others are parts of gynoecium.)

Q. 4 Identify the correlation between the first two words and suggest the suitable words in the fourth place :

- (1) Amoeba : Fission :: Hydra :
- (2) Transverse binary fission : *Paramoecium* :: Longitudinal binary fission :

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- (3) Calyx : Sepals :: Corolla :
- (4) Accessory whorls : Calyx and corolla :: Essential whorls :
- (5) Bisexual flower : Hibiscus :: Unisexual flower :
- (6) FSH : Development of oocyte :: LH :
- (7) Spirogyra : Fragmentation :: Planaria :

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- Ans.** (1) Budding (2) Euglena (3) Petals (4) Androecium and gynoecium (5) Papaya (6) Ovulation (7) Regeneration.

Q. 5 Define the following / Give meanings of the following :

- (1) **Budding in yeast :** Budding is the asexual reproductive process in which a small bulge or bud appears on the surface of parent cell as seen in unicellular yeast.
- (2) **Budding in hydra :** Budding in hydra is asexual reproductive process in which an outgrowth

is formed by repeated divisions of regenerative cells of body wall called bud.

(3) Regeneration : Regeneration is the asexual reproduction in Planaria in which the body is broken up into two parts and resulting each part regenerates remaining part of the body.

(4) Fragmentation : Fragmentation is the asexual type of reproduction in which the body of parent organism breaks up into many fragments. Each fragment can start living independently.

(5) Vegetative propagation : Vegetative propagation is a type of asexual reproduction in plants that takes place with the help of vegetative parts like root, stem, leaf and bud.

(6) Fertilization : The process by which two haploid gametes unite to form a diploid zygote is called fertilization.

(7) Pedicel : The stalk of the flower which is for the support is called pedicel.

(8) Pollination : Transfer of pollen grains from anther to the stigma is called pollination.

(9) Self-pollination : Pollination involving only one flower or two flowers borne on same plant is called self-pollination.

(10) Cross-pollination : Pollination involving two flowers borne on two plants of same species is cross-pollination.

(11) Endosperm : Endosperm is the nourishing substance formed by the union of second male gamete with two polar nuclei at the time of fertilization in plants.

(12) Embryo sac : There are many ovules in the ovary, the structure formed in each of the ovule by meiosis is called embryo sac.

(13) Menopause : Stoppage of functioning of female reproductive system due to lack of synthesis of hormones due to advancing age is called menopause.

(14) Placenta : An organ developed in the uterus of the pregnant mother, through which the embryo is given nourishment is called placenta.

(15) Menstrual cycle : The repetitive changes at the interval of every 28–30 days in female reproductive system that take place after puberty, form menstrual cycle.

(16) Corpus luteum : Corpus luteum is the secondary structure that is formed from empty ovarian follicle after ovulation. This corpus luteum produces progesterone and thereby maintains pregnancy.

(17) Corpus albicans : Corpus albicans is the degenerate body which is formed from corpus luteum, if the ovum is not fertilized.

(18) Ovulation : Bursting of mature ovarian follicle under the influence of hormones to release the oocyte is called ovulation.

(19) IVF : In Vitro Fertilization is the technique in which fertilization is brought about outside the female body but in the test-tube and the embryo is implanted in uterus of woman.

(20) Sperm bank : Sperm bank is the place where semen donated by the desired men is collected after their thorough physical and medical check-up and stored at sub-zero temperatures in sterile conditions.

Q. 6 Name the following / Give the names :

***(1) Hormones related with male reproductive system.**

Ans. Follicle stimulating hormone and ICSH or Luteinizing hormone secreted by pituitary gland, testosterone secreted by testis.

(2) Different glands associated with male reproductive system.

Ans. Seminal vesicles, Prostate gland, Cowper's or bulbourethral glands.

(3) Agents of pollination.

Ans. Biotic : Insects, birds, few animals.
Abiotic : Water and wind.

(4) Components of semen.

Ans. Secretion of prostate gland seminal vesicles and Cowper's glands along with sperms.

***(5) Hormones secreted by ovary of female reproductive system.**

Ans. Estrogen and progesterone.

(6) Two accessory whorls in flower.

Ans. Calyx and corolla.

(7) Two essential whorls in flower.

Ans. Androecium and gynoecium.

***(8) Types of twins.**

Ans. Monozygotic twins, Siamese twins and Dizygotic twins.

(9) The modern techniques in reproduction.

Ans. In Vitro Fertilization, Surrogate mother, Sperm bank.

***(10) Any two sexual diseases.**

Ans. Gonorrhoea and Syphilis.

(11) Symptoms of gonorrhoea.

Ans. Painful and burning sensation during urination, oozing of pus through penis and vagina, inflammation of urinary tract, anus, throat, eyes, etc.

(12) Symptoms of syphilis.

Ans. Occurrence of chancre (patches) on various parts of body including genitals, rash, fever, inflammation of joints, alopecia, etc.

***(13) Methods of family planning.**

Ans. Copper T, condoms, oral contraceptive pills.

Q. 7 Answer in one sentence :

(1) What is gamete formation?

Ans. By the process of meiosis when diploid germinal cells give rise to haploid gametes, it is called gamete formation.

(2) How are the sperms formed?

Ans. Germinal epithelium present in testis undergo meiosis and form haploid sperms.

(3) How is the semen produced?

Ans. Semen is formed by secretions of seminal vesicles, prostate glands, cowper's glands and sperms.

(4) Which parts are converted into seed and fruit respectively after fertilization?

Ans. Ovules develop into seeds and ovary develops into fruit after fertilization.

(5) What does germination mean?

Ans. Development of zygote with the help of food stored in endosperm of seed forming new plantlet is called seed germination.

(6) Write the name of the type of reproduction in the following figure.



Ans. In the figure given, asexual reproduction by budding is shown in case of hydra.

Q. 8 Write the functions of the following organs :

(1) Sporangium.

Ans. Storing the spores and releasing them by bursting.

(2) Calyx.

Ans. Protection of inner whorls of the flower.

(3) Corolla.

Ans. Attracting insects for pollination. Protecting inner whorls.

(4) Androecium.

Ans. Production of pollen grains, the male gametes of flower.

(5) Gynoecium.

Ans. Production of female gametes of flower. Participating in production of fruits.

(6) Endosperm.

Ans. Nourishment of the growing embryo.

(7) Testis. (March '20)

Ans. Production of sperms and male hormone - testosterone.

(8) Scrotum.

Ans. Protection and temperature control of testis.

(9) Seminal vesicles.

Ans. Secretion of seminal fluid which forms major portion of semen. Nourishment of sperms.

(10) Penis.

Ans. Transferring of sperms to vagina at the time of intercourse. Release of urine at the time of urination.

(11) Ovary.

Ans. Production of oocytes and female hormones - estrogen and progesterone.

(12) Uterus.

Ans. Growth and development of foetus during pregnancy. Helping in parturition (childbirth) by contractions.

(13) Fallopian tubes/ducts.

Ans. Transporting the released oocyte after ovulation to the uterus. Providing space for fertilization of oocyte by sperm. Conception is possible only when sperm and oocyte meet in the fallopian tube.

(14) Vagina.

Ans. Passage for copulation/intercourse. Birth canal. Passage for menstrual flow.

(15) Placenta.

Ans. Supplying nourishment to the growing foetus.

***Q. 9** Complete the following chart :

(Answers are underlined)

Asexual reproduction	Sexual reproduction
1. Reproduction that occurs with the help of somatic cells is called asexual reproduction.	1. <u>Reproduction that occurs due to fertilization of gametes</u> is called sexual reproduction.
2. For asexual reproduction only one parent is necessary.	2. Male and female parent are necessary for sexual reproduction.
3. This reproduction occurs with the help of mitosis only.	3. <u>This reproduction occurs with the help of both mitosis and meiosis.</u>
4. New individual formed by this method is genetically identical with parents.	4. New individual formed by this method is genetically different from parents.
5. Asexual reproduction occurs in different individuals by various methods like binary fission, multiple fission, budding, fragmentation, regeneration, vegetative propagation, spore production, etc.	5. Sexual reproduction occurs in two steps : First formation of haploid gametes by meiosis and then fertilization of these haploid gametes to form diploid zygote. There are no subtypes in the sexual reproduction.

Q. 10 Distinguish between :

(1) Binary fission and Multiple fission.

Binary fission	Multiple fission
1. Two new individuals are formed from one old individual at one time.	1. Many new individuals are formed from one old individual at one time.
2. The division of nucleus and cytoplasm takes place initially.	2. Only nucleus divides initially followed by division of cytoplasm.
3. The axis of division can be transverse, longitudinal or any one axis as it is in simple binary fission.	3. There is no exact axis for the fission.
4. Formation of protective cyst does not take place.	4. Protective covering is formed around dividing amoebulae which is called cyst.
5. Binary fission can be done during favourable period.	5. Multiple fission takes place only at the time of unfavourable period.

(2) Human male and Human female reproductive system.

Human male reproductive system	Human female reproductive system
1. Testis are essential organs which are located outside the abdomen in the scrotal sacs.	1. Ovaries are essential organs which are located along with all other organs inside the lower abdomen.
2. There is common urethra through which urine and semen, both are passed out.	2. Urethra and vagina are two separate openings that open to outside.
3. Reproductive system of male continues to work even in old age.	3. Reproductive system works only till the menopause.
4. Sperms or male gametes are produced by meiosis in the testis.	4. Oocytes or ova are produced by meiosis in the ovaries.
5. Sperms are produced in millions at one time.	5. Only single oocyte is produced per month.
6. Three accessory glands are associated with the male reproductive system.	6. Only one gland is associated with female reproductive system.
7. Testis secrete testosterone which is essential male hormone.	7. Ovaries produce estrogen and progesterone which are essential female hormones.

(3) Monozygotic twins and Dizygotic twins.

Monozygotic twins	Dizygotic twins
<ol style="list-style-type: none"> Two children developing from only one zygote are called monozygotic twins. Monozygotic twins develop from same oocyte. Gender of both the twins is same. The monozygotic twins are genetically exactly alike. 	<ol style="list-style-type: none"> Two children developing from two different zygotes are called dizygotic twins. Dizygotic twins develop from two different oocytes. Gender of both the twins can be same or can be different. The dizygotic twins are genetically not exactly alike.

Q. 11 Give scientific reasons :

(1) Flower is the structural unit of sexual reproduction in plant.

Ans. (1) Flower produces male and female gametes. (2) For this purpose there are essential whorls of androecium and gynoecium. (3) The double fertilization also takes place in flower. (4) Therefore, flower is called the structural unit of sexual reproduction in plants.

(2) By the age of 45–50 women gets menopause.

Ans. (1) By the age of 45–50, the secretion of hormones which control the functioning of the reproductive system is reduced gradually and then it stops. (2) This causes end of menstrual cycle. This results into menopause.

(3) Older mothers have greater chance of conceiving abnormal children.

Ans. (1) In older women the menopausal age approaches. (2) The oocytes, released from ovaries during this phase are not normal. (3) Their meiotic cell division is abnormal and thus oocyte becomes abnormal too. (4) If such abnormal oocytes are fertilized, the baby is born with many genetic problems. e.g. Down's syndrome or Turner's syndrome.

(4) Indians should follow family planning for controlling the population. (March '20)

Ans. (1) There is severe population explosion in India. It has almost reached to 121 crores. (2) This results into unemployment, decreasing per capita

income and increasing loan, stress on natural resources, etc. (3) Only by controlling population, the quality of life can be restored. (4) Therefore, Indians should follow family planning for controlling the population.

Q. 12 Answer the following questions in short :



***(1)** Explain with examples types of asexual reproduction in unicellular organism.

Ans.

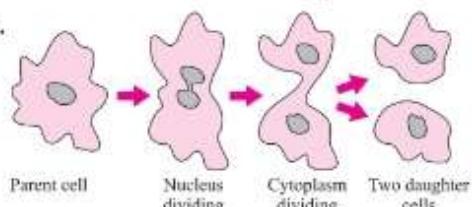


Fig. 3.2 : Binary fission in Amoeba

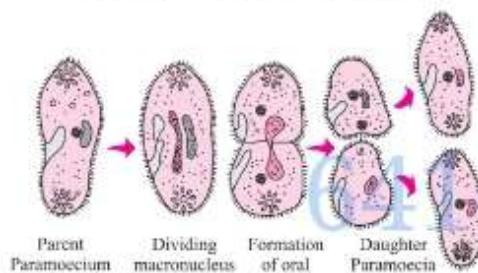


Fig. 3.3 : Binary fission in Paramoecium (Transverse binary fission)

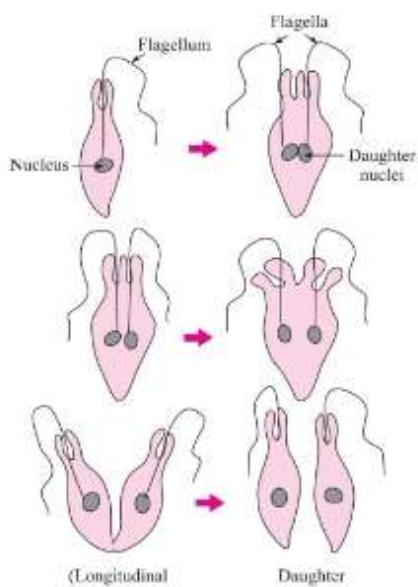


Fig. 3.4 : Binary fission in Euglena (Longitudinal binary fission)

There are different methods of asexual reproduction in different unicellular animals.

(1) Binary fission : The process in which the parent cell divides to form two similar daughter cells is binary fission. It takes place either by mitosis or amitosis. When there are favourable conditions and abundant food supply then the organisms undergo binary fission. Prokaryotes, Protists and eukaryotic cell-organelle like mitochondria and chloroplasts perform binary fission.

Based on axis of fission there are three subtypes of binary fission.

(a) Simple binary fission : The plane of division is not definite, it can be in any direction due to lack of specific shape as in Amoeba.

(b) Transverse binary fission : The plane of division is transverse, as in Paramoecium.

(c) Longitudinal binary fission : The plane of division is in length-wise direction as in Euglena.

(2) Multiple fission :

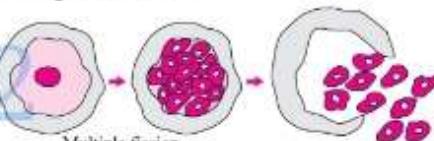


Fig. 3.5 : Multiple fission in Amoeba

During unfavourable conditions when there is lack of food, multiple fission is shown by amoeba. Amoeba forms protective covering and becomes encysted. Inside the cyst, amoeba undergoes repeated nuclear division. This is followed by cytoplasmic divisions. Many amoebulae are formed which remain dormant inside the cyst. When favourable conditions reappear, they come out by breaking the cyst.

(3) Budding in yeast :

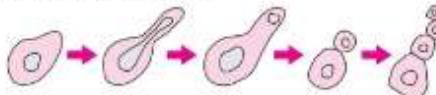


Fig. 3.6 : Yeast showing budding

Yeast is unicellular fungus that performs budding. The parent cell produces two daughter nuclei by mitotic division. This results in a small bulging bud on the surface of parent cell. One daughter nucleus enters the bud. It then grows and upon becoming big it separates from the parent cell to have independent life as new yeast cell.

* (2) Explain asexual reproduction in plants.

Ans.

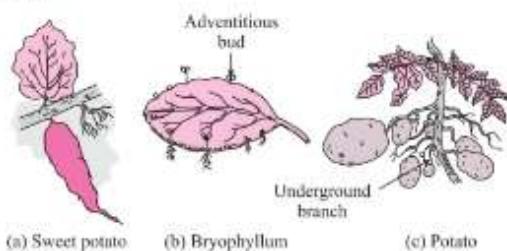


Fig. 3.7 : Vegetative propagation in plants

(1) Vegetative propagation is the method of asexual reproduction in plants with the help of vegetative parts like root, stem, leaf and bud.

(2) Potato, suran (*Amorphophallus*) and other tubers propagate with the help of 'eyes' which are buds. These eyes are present on the stem tubers.

(3) In case of plants like sugarcane and grasses, buds present on nodes perform vegetative propagation.

(4) Plants like *Bryophyllum* performs vegetative propagation with the help of buds present on leaf margin.

(3) How does reproduction take place in fungus *Mucor*?

Ans.

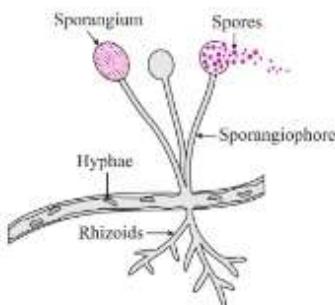


Fig. 3.8 : Spore formation

(1) *Mucor* reproduces asexually by spore formation.

(2) It has filamentous body that possess sporangia.

(3) When the spores are formed, the sporangia burst. The spores are released which settle down at suitable places.

(4) They germinate in moist and warm place forming a new fungal colony.

(4) What is the type of asexual reproduction shown in the diagram below?

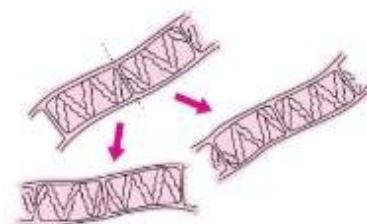


Fig. 3.9 : Fragmentation in Spirogyra

Ans. Type of asexual reproduction shown in the diagram above is fragmentation in *Spirogyra*.

(5) Describe the structure of a flower.

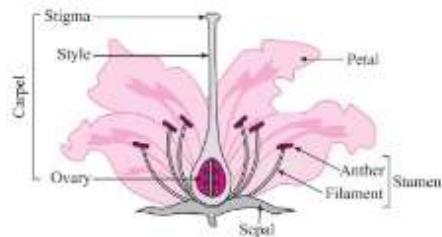


Fig. 3.10 : L.S. of a flower showing different parts

Ans. (1) The structural unit of sexual reproduction in plants is flower. There are total four floral whorls. Of these two are accessory floral whorls while two are essential floral whorls.

(2) Calyx and corolla are accessory whorls. They are protective in nature.

(3) Members of calyx are known as sepals. They are usually green in colour. They protect the inner whorls.

(4) The members of corolla are called petals. They can be of different colours.

(5) Androecium and gynoecium are essential whorls as they participate in sexual reproduction.

(6) The male whorl androecium is made up of stamens. Each stamen has a filament with anther located at the upper end. In the anther there are four locules. Inside the locules the meiosis takes place forming pollen grains. During suitable time, the pollen grains are released from anther lobes.

(7) Gynoecium is made up of carpels, either in separate form or are united. Each carpel is formed of ovary at the basal end, hollow 'style' and the stigma at the tip of style. There are one or many ovules inside the ovary.

(8) In bisexual flowers both androecium and gynoecium are located in the same flower. e.g. Hibiscus.

(9) In unisexual flowers, androecium is present in male flowers and gynoecium is present in the female flowers, e.g. Papaya.

***(6) Explain sexual reproduction in plants. OR Explain double fertilization in plants.**

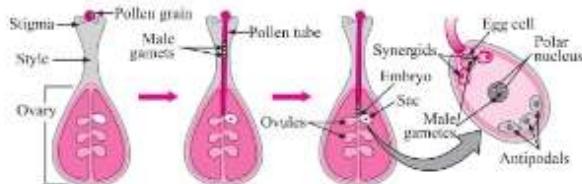


Fig. 3.11 : Double fertilization in angiosperms

Ans. (1) Plants reproduce sexually with the help of flowers.

(2) Androecium and gynoecium are male and female parts of the flowers respectively.

(3) In the carpel, the ovule undergoes meiosis and forms embryo sac.

(4) A haploid egg cell and two haploid polar nuclei are present in each embryo sac.

(5) The pollen grains from the anther reach the stigma of flower by the process of pollination. They germinate here on the stigma.

(6) As a result of germination, long pollen tube and two male gametes are formed.

(7) The pollen tube travels through the style of flower and the male gametes present in the pollen tube are transferred till the embryo sac in ovary. Upon reaching there, tip of the pollen tube bursts releasing two male gametes in embryo sac.

(8) One male gamete unites with the egg cell and forms zygote. While other male gamete unites with two polar nuclei forming the endosperm.

(9) Because there are two nuclei participating in this process, therefore it is called double fertilization.

(10) After fertilization ovule develops into seed and ovary forms a fruit. When the seed again gets favourable conditions, it can produce a new plant.

***(7) In case of sexual reproduction, newborn show similarities about characters. Explain this statement with suitable examples.**

Ans. (1) Sexual reproduction occurs due to two different gametes. One male gamete is from father while the other female gamete is from mother.

(2) Both the gametes are produced by meiosis.

(3) When the gametes unite it is called process of fertilization which produces diploid zygote.

(4) Due to the chromosomes of parents, their DNA pass to the next generation through such fertilization. Therefore, the characters of newborn show similarities with parents.

(8) Describe the human male reproductive system.

Ans. [Refer to the diagram in Q. 16 (1).]

In human male reproductive system, the reproductive organs are as follows :

(1) Testes, different types of duct systems and glands.

(2) Testes are in pair. Each testis lies in the scrotum which lies outside to abdominal cavity.

(3) Testes consist of numerous seminiferous tubules. The germinal epithelium of seminiferous tubules form sperms by undergoing meiosis.

(4) These sperm cells are immature.

(5) They are pushed gradually through various duct systems till the penis.

(6) This path is as follows :

Rete testis → vas efferentia → epididymis → vasa deferentia → Ejaculatory duct → urethra

(7) As the sperms are travelling, they gradually become mature. They are made capable to perform process of fertilization.

(8) Seminal vesicles (in pairs), Single prostate gland and a pair of Cowper's glands secrete their secretions. These secretions and the sperms together form semen.

(9) This semen is deposited in the vagina with help of penis.

(9) Describe the human female reproductive system.

Ans. [Refer to the diagram in Q. 16 (2).]

(1) All the organs of the human female reproductive system are located inside the lower abdomen.

(2) There are pair of ovaries, pair of fallopian ducts and a single median uterus.

(3) The uterus opens out by vagina. In vaginal walls there are Bartholin's glands.

(4) The urethra in female body is separate and not a common passage as in male body.

(5) The free end of fallopian duct is funnel-like having an opening in the centre. The oocyte released from the ovary due to ovulation is picked up by this funnel.

(6) The other end of fallopian duct opens into uterus. There are cilia on inner surface of oviduct. With the help of the cilia the oocyte is pushed to the uterus through the fallopian duct.

(7) The fertilization of oocyte can take place only in the middle part of the fallopian duct.

(8) The lower end of uterus opens into vagina. The contractions of uterus help in the process of parturition.

(9) Vagina is the birth canal as well as copulatory passage. It is also a passage for menstrual flow.

*(10) What is menstrual cycle? Describe it in brief.

Ans. (1) Menstrual cycle is the events of cyclic changes that takes place with the interval of 28 to 30 days in mature woman.

(2) Hormones from pituitary, FSH (Follicle Stimulating Hormone) and LH (Luteinizing Hormone) and hormones from ovary, estrogen and progesterone control the menstrual cycle.

(3) Due to influence of FSH, the ovarian follicle grows along with the oocyte that is present in it.

(4) This growing follicle produces estrogen.

(5) Under the influence of estrogen, the uterine inner layer called endometrium grows or regenerates. In the meantime the development of follicle is completed.

(6) LH from pituitary stimulates the bursting of ovarian follicle and releases the mature oocyte out of the follicle and the ovarian wall. This process is called ovulation.

(7) The empty ovarian follicle after the ovulation becomes corpus luteum. Corpus luteum produces hormone progesterone.

(8) Under the influence of progesterone, the glands from uterine endometrium start secreting. The oocyte if fertilized is implanted over this endometrium.

(9) If oocyte is not fertilized, the corpus luteum becomes a degenerate body called corpus albicans. The corpus albicans cannot secrete estrogen and progesterone.

(10) Due to lack of these hormones, the endometrial layer of the uterus collapses. The tissue debris, along with unfertilized egg is given out through the vagina as menstrual flow. This results in bleeding for about 5 days.

(11) If woman is not pregnant, then this menstrual cycle keeps on repeating with regularity.

*(11) **Gender of child is determined by the male partner of couple. Explain with reasons whether this statement is true or false.** *OR*

"A couple shall have a male child or female child totally depends upon husband." Prove truthfulness of this statement with scientific reason.

Ans.

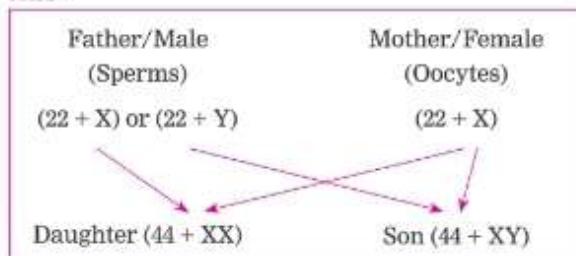


Fig. 3.12 : Sex determination in Human being

(1) The statement Gender of child is determined by the male partner of couple is true.

(2) It is clearly seen from the diagram that there are two types of sperms produced by males. One sperm has a X chromosome while the other has a Y chromosome, apart from autosomes. The mother on the other hand has all X bearing oocytes. Thus the sperm that fertilizes the oocyte decides the sex of the child.

(3) If X bearing sperm fertilizes the oocyte, daughter is born and when Y bearing sperm fertilizes the oocyte, son is born.

(4) Thus father or male partner is responsible for the determination of the sex.

*(12) Modern techniques like surrogate mother, sperm bank and IVF technique will help the human beings. Justify this statement.

OR

Despite of various diagnostic tests, a couple could not have a child. In this situation, which remedies will you suggest? *(July '19)*

Ans. (1) Some couples want a child but they are not able to bear one due to various problems either in mother or in father. In such cases modern techniques such as IVF, surrogacy and sperm bank are useful in conceiving a child.

(2) These methods are as follows :

(i) **Surrogacy** : In woman if there is problem regarding the implantation of embryo in uterus, then help of another women is taken. This women is called surrogate mother.

Oocyte from real mother is taken out and fertilized with sperms collected from her husband. These gametes are fertilized outside in a test-tube and then the fertilized zygote is implanted in the surrogate mother.

(ii) **In Vitro Fertilization (IVF)** is done when there are problems like less sperm count or obstacles in oviduct. In IVF, fertilization is done in the test-tube. The embryo formed is implanted in uterus of woman for further growth.

(iii) **Sperm bank** : If man has problems with the sperm production, then the sperms are collected from the sperm bank. Sperm bank is the place where the donor's donate the sperms and such sperms are kept stored. The donor's identity is kept secret and he should also be physically and medically fit person.

(13) Explain the following concepts in short :

(a) Surrogacy (b) In Vitro Fertilization (IVF)
(c) Sperm Bank. *(March '19 – '20)*

Ans. (a) **Surrogacy** : For answer refer to Q. 12 (12) point 2 (i).

(b) **In Vitro Fertilization (IVF)** : For answer refer to Q. 12 (12) point 2 (ii).

(c) **Sperm Bank** : For answer refer to Q. 12 (12) point 2 (iii).

(14) What problems cause infertility in couple?

Ans. (1) In woman if there are problems like irregularity in menstrual cycle, difficulties in oocyte production or implantation in uterus, obstacles in the oviduct, etc.

(2) In man if there are no sperms in the semen, slow movement of sperms, or anomalies in the sperms then he becomes sterile.

(3) But now with the help of advanced medical techniques these problems can be overcome and a childless couple can be parents.

*(15) Explain the concept of IVF. *OR*
Explain the term : Modern technology of reproduction IVF. *(Nov. '20)*

Ans. (1) IVF means In Vitro Fertilization (IVF)

(2) This is the technique in the modern medical field where childless couples can be blessed by their own child.

(3) IVF technique is used for childless couples who are faced with problems such as less sperm count, obstacles in oviduct, etc.

(4) The IVF technique is done by removing the oocyte from the mother and artificially fertilizing by the sperms collected from father. This fertilization is done in a test-tube. Thus it is also called test tube baby. The embryo formed is implanted in uterus of real mother or a surrogate mother at appropriate time.

*(16) Which precautions will you follow to maintain the reproductive health?

Ans. About reproductive health one should have scientific and authentic information. The cleanliness of body is very essential but keeping the mind clean is also important to maintain good reproductive health. One should be careful about sexual relationships. These things should not be experimented in young age. Mistakes committed like these can change the sexual health forever. The cleanliness and hygiene during menstruation, the cleanliness of genitals and other private parts are the aspects of personal hygiene. When living in a society, one should always be away from cross-infections of venereal type.

(17) Answer the following questions :

(July '19)

(a) In our country, there seems to be lack of awareness regarding reproductive health. Why?

(b) Write the symptoms of disease gonorrhea.

(c) What precautions will you take to maintain reproductive health?

Ans. (a) There is lack of awareness about reproductive health among majority of people of our country. This is due to social customs, traditions, illiteracy, social taboo and shyness.

(b) Symptoms of gonorrhea are as follows :

(1) Painful burning during urination. (2) Oozing of pus through penis or vagina. (3) Inflammation of urinary tract, anus, throat, eyes, etc.

(c) Precautions to maintain reproductive health are cleanliness and personal hygiene. Guarding against any sexual infections.

(18) If a piece of bread is kept in a container in moist place for 2-3 days, (1) What will you see? (2) Write scientific name and a character of the organism you may observe.

Ans. (1) If a piece of bread is kept in moist container we can see growth of fungus on it. (2) Fungi belonging to species *Mucor* is seen. It has filamentous body and sporangia. Sporangia burst open to spread spores. It has saprophytic mode of nutrition as it devoid of chlorophyll.

(19) Does the parent cell exist after asexual reproduction-fission?

(Use your brain power, Textbook page no. 24)

Ans. In fission, the parent cell divides into two. This nucleus and cytoplasm, both are divided. Thus, parent cell does not exist any longer, it is converted into new cells.

Q. 13 Write short notes :

(1) Multiple fission.

Ans. [For the answer, refer to the point 2 from Q. 12 (1).]

(2) Regeneration.

Ans.

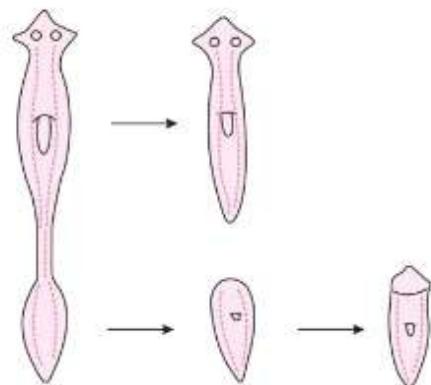


Fig. 3.13 : Regeneration in Planaria

In developed animals like wall lizard the process of regeneration is used to restore the lost parts like tail or limbs. As the reproductive system is one of the fullfledged system in the body, the process of regeneration cannot be called type of reproduction.

But some primitive organisms such as Planaria use this method for procreation.

Planaria breaks up its body into two parts. Each part has the ability to develop the lost part by process of regeneration. This forms two new Planaria.

(3) Seed germination.

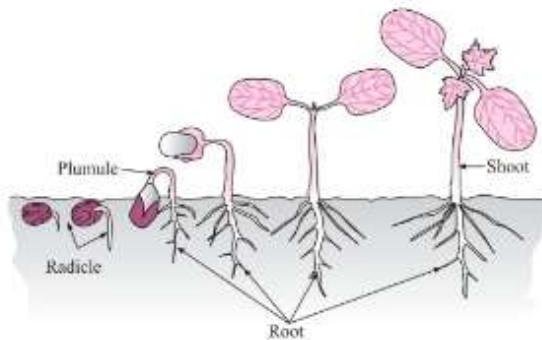


Fig. 3.14 : Seed germination

Ans. Seed germination is the process in which the seed develops into a new plantlet.

In the plants, after fertilization the ovule develops into seed and ovary turns into fruit. Seeds fallen on the ground due to bursting of the fruits start germinating. Only under favourable conditions in the soil, this germination takes place. The zygote

present inside the seed uses food stored in endosperm of seed and hence develops further to produce a new plantlet.

(4) Budding in hydra.

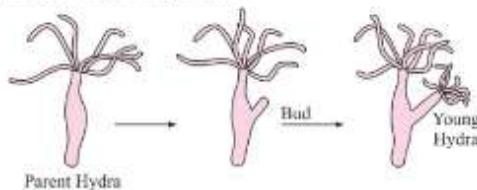


Fig. 3.15 : Budding in Hydra

Ans. In multicellular organisms asexual reproduction by budding is shown by hydra.

In fully grown *Hydra*, at specific part of its body there is development of bud.

This development is only during favourable period. The bud is an outgrowth developed due to repeated divisions of regenerative cells of body wall. It grows up gradually to form a small hydra. Parent hydra's dermal layers and digestive cavity are in continuity with those of the budding hydra. It receives all the nutrition from parent hydra. When the budding hydra grows sufficiently, it detaches from parent hydra. Then it leads an independent life.

(5) Fragmentation.

Ans. (For fig Ref. Fig 3.9) Fragmentation is one of the type of asexual reproduction in multicellular organisms. During fragmentation, the body of parent organism breaks up into many fragments. All the resulting fragments start to develop as an independent new organism. In alga *Spirogyra*, and sponge like *Sycon* asexual reproduction takes place by fragmentation. *Spirogyra* grow up very fast and break up into many small fragments when there are favourable conditions. Each newly formed fragment lives independently as a new *Spirogyra*. Similarly the body of *Sycon* if accidentally broken into many fragments, develops into new *Sycon* from each old fragment.

***Q. 14** Complete the paragraph with the help of words given in the bracket :

(*Luteinizing hormone, endometrium of uterus, follicle stimulating hormone, estrogen, progesterone, corpus luteum*)

Growth of follicles present in the ovary occurs under the effect of This follicle secretes estrogen. Ovarian follicle along with oocyte grows/ regenerates under the effect of estrogen. Under the effect of fully grown up follicle bursts, ovulation occurs and is formed from remaining part of follicle. It secretes and Under the effect of these hormones, glands of are activated and it becomes ready for implantation.

Ans. Growth of follicles present in the ovary occurs under the effect of follicle stimulating hormone. This follicle secretes estrogen. Ovarian follicle along with oocyte grows / regenerates under the effect of estrogen. Under the effect of Luteinizing hormone, fully grown up follicle bursts, ovulation occurs and corpus luteum is formed from remaining part of follicle. It secretes estrogen and progesterone. Under the effect of these hormones, glands of endometrium of uterus are activated and it becomes ready for implantation.

Q. 15 Read the paragraph and answer the questions given below :

Reproduction is the process by which the living species continues its existence. Lower organisms carry out asexual reproduction while higher plants and animals always show sexual reproduction. Plants reproduce asexually by methods such as fragmentation, vegetative propagation, budding, spore formation. For sexual reproduction they form gametes. In animal kingdom, budding, fission of different types and parthenogenesis are some of the methods that do not require both the sexes. Though regeneration also forms new individual, it is not considered to be a reproductive process because, basically it is a repair process. The ability to regenerate is lost in higher phyla. In human beings it is restricted only to wound healing. Sexual reproduction is also undergoing lots of experimentation such as cloning which may make females capable of producing their own baby without intervention of any male.

Questions and Answers :

(1) How do living species continue their existence?

Ans. Through the process of reproduction, living species continue their existence.

(2) Which are asexual methods of reproduction in kingdom Animalia?

Ans. Fission, budding and parthenogenesis are the asexual methods of reproduction in Kingdom Animalia.

(3) Why is regeneration not true method of reproduction?

Ans. Regeneration is the repair process than a reproductive process. It is not done with the intention of producing offspring, but is for healing or repairing the lost part.

(4) What are methods of reproduction in plants?

Ans. Plants reproduce by asexual as well as sexual methods. Asexual reproduction is by fragmentation, vegetative propagation, budding, spore formation, while by formation of gametes, sexual reproduction is done.

(5) What is the modern method of reproduction aimed at in higher organisms?

Ans. Cloning is the modern method of reproduction by which production of young one can be aimed at.

Q. 16 Sketch the labelled diagrams :

***(1) Human male reproductive system.**

Ans.

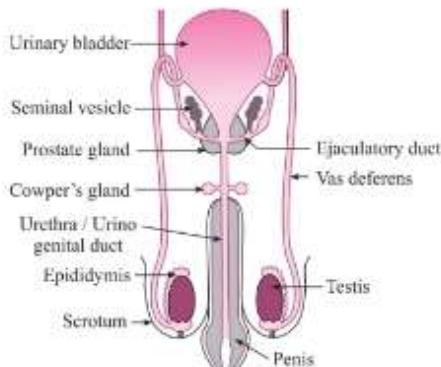


Fig. 3.16 : Male reproductive system of human

***(2) Human female reproductive system.**

Ans.

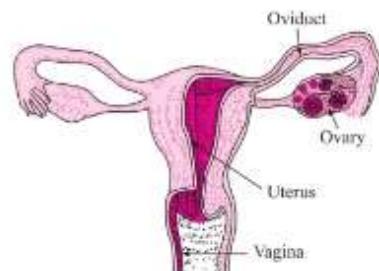


Fig. 3.17 : Human female reproductive system

***(3) Menstrual cycle.** 

Ans.

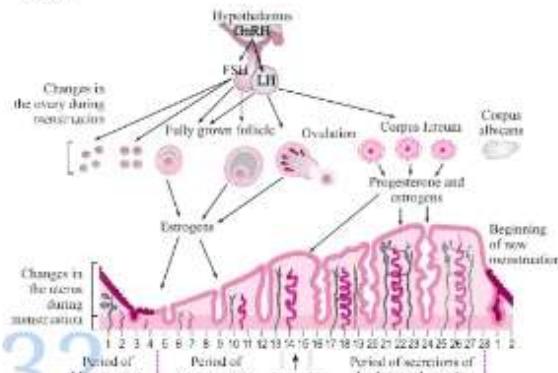


Fig. 3.18 : Menstrual cycle

***(4) Flower with its sexual reproductive organs.**

Ans. [Refer to the diagram 3.10 on page no. 71.]

(5) Sketch and label the diagram showing self and cross-pollination.

Ans.

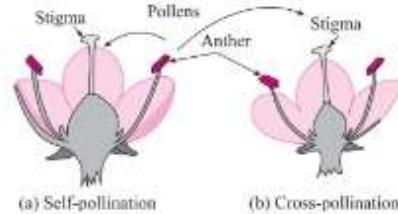


Fig. 3.19 : Pollination

Q. 17 Diagram-based Questions :

1. Observe the figure 3.18 and answer the questions below :

(a) What does the figure 3.18 indicate?

(Nov. '20)

Ans. The figure indicates the menstrual cycle in human female.

(b) Which human organs are involved in this process?

Ans. The ovary and uterus are primarily involved in this process. But the pituitary gland also controls this cycle.

(c) Which hormones take part in this process?

(Nov. '20)

Ans. Following hormones regulate this menstrual cycle.

Pituitary hormones : Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH).

Ovarian hormones : Estrogen and progesterone.

(d) What is the periodicity for these changes?

(Nov. '20)

Ans. The menstrual cycle shows repetitive changes every 28 to 30 days.

(e) The body of woman undergoing this process is impure, she should remain away from other people. What is your opinion about this statement? Give justification for your opinion.

Ans. A menstruating woman is not at all with impure body. It is a natural process in which the endometrium of the uterus is sloughed off and repaired.

She should get enough rest and nutrition during this period. It is painful period in which there is a possibility of infections. Therefore, she should take hygienic care and rest till the bleeding persists. But blind faith and superstition to keep her away from others should not be followed.

2. Observe the diagram (Fig. 3.18) of menstrual cycle and answer the following questions :

(1) What is the period of menstruation?

Ans. 1 to 5 days is the period of menstruation.

(2) On which day does ovulation occur during menstrual cycle?

Ans. Ovulation occurs on 14th or 15th day.

(3) During which period is corpus luteum active during menstrual cycle? Which hormones are secreted by corpus luteum ?

Ans. Corpus luteum is active till the 28th day of menstrual cycle. During this time if there is no

union of sperm and ovum, then corpus luteum degenerates. Corpus luteum secretes estrogen and progesterone.

(4) In menstrual cycle which reproductive organs undergo changes?

Ans. Ovary and uterus undergo changes during menstrual cycle.

(5) Which period is said to be period of regeneration of endometrium?

Ans. In menstrual cycle, days 5 to 14 are period of regeneration of endometrium.

(6) Which period is said to be period of secretions of glands in endometrium?

Ans. Period of secretions of glands in endometrium is 15 to 28 days.

3. Observe the Fig 3.13 and describe the type of reproduction shown in.

Ans. The figure shows regeneration. For detailed answer refer to Q. 13 (2).

4. Answer the following questions :

(March '19)

(a) "Gender of child is determined by the male partner of couple." Draw a diagram explaining the above statement.

Ans. Refer to figure 3.12.

(b) Prepare a slogan for campaign against female foeticide.

Ans. (1) Save the girl child. (2) Daughters give lot of joy, it is not only the boy.

(c) In the following figure explain how new fungal colonies of mucor are formed :

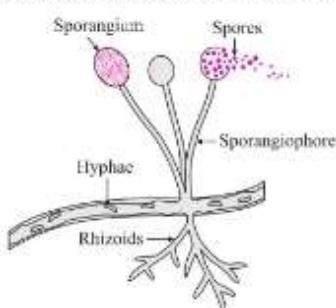


Fig. 3.20 : Spore formation

Ans. Mucor is a fungus having filamentous body. The filaments bear sporangia. Mature sporangia

burst and release spores. Spores germinate to form new hyphae upon getting favourable moist and warm place.

(d) Identify and state the type of reproduction represented in the above figure.

Ans. The spore formation is asexual type of reproduction seen in *Mucor*.

5. Write the type of asexual reproduction shown in the figure 3.6.

Ans. The figure shows budding in yeast. Budding is the type of asexual reproduction.

6. Write the answers to the questions by observing the figure.

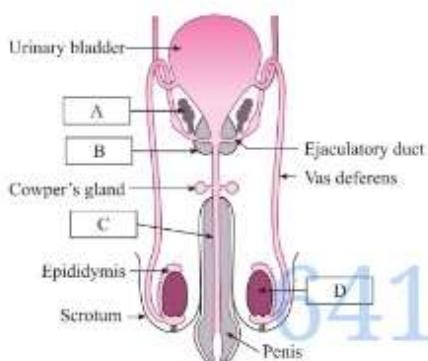


Fig. 3.21 : Male reproductive system of human

Questions :

(a) What does the above figure show?

(b) Write the names of parts A, B, C, D.

(c) Write the function of the part 'D'.

(d) How is semen formed?

Ans. (a) The figure shows human male reproductive system.

(b) A – Seminal vesicle, B – Prostate gland

C – Urethra, D – Testis.

(c) Part D is testis – *For answer refer to Q. 8. (7).*

(d) *For answer refer to Q. 7. (3).*

7. Write the answers to the questions by observing the figure.



(a) What process does the following figure show?

Ans. The figure shows process of fertilization in a test tube which is done for IVF.

(b) Describe in short that process.

Ans. *For answer refer to Q. 12 (12).*

(c) Who can benefit from that process?

Ans. *For answer refer to Q. 12 (14).*

Q. 18 Experiments :

(Try this : Textbook pages 23 and 24)

(1) Observation of Paramoecia.

(2) Observation of yeast.

(3) Study of Hibiscus.

(For detailed information on practicals, refer to Vikas Science and Technology Experiment Book : Standard X.)

PROJECTS

(1) Use of ICT. (Textbook page no. 27)

Make an video album of pollination and show it in the class.

(2) Internet is my friend.

(Textbook page no. 33)

You may have read that sometimes a woman may deliver more than two offspring at a time. Collect more information from internet about reasons for such incidences.

(3) Get information. (Textbook page no. 34)

Visit a public health centre nearby your place and collect the information through an interview of health officer about meaning and various methods of family planning.

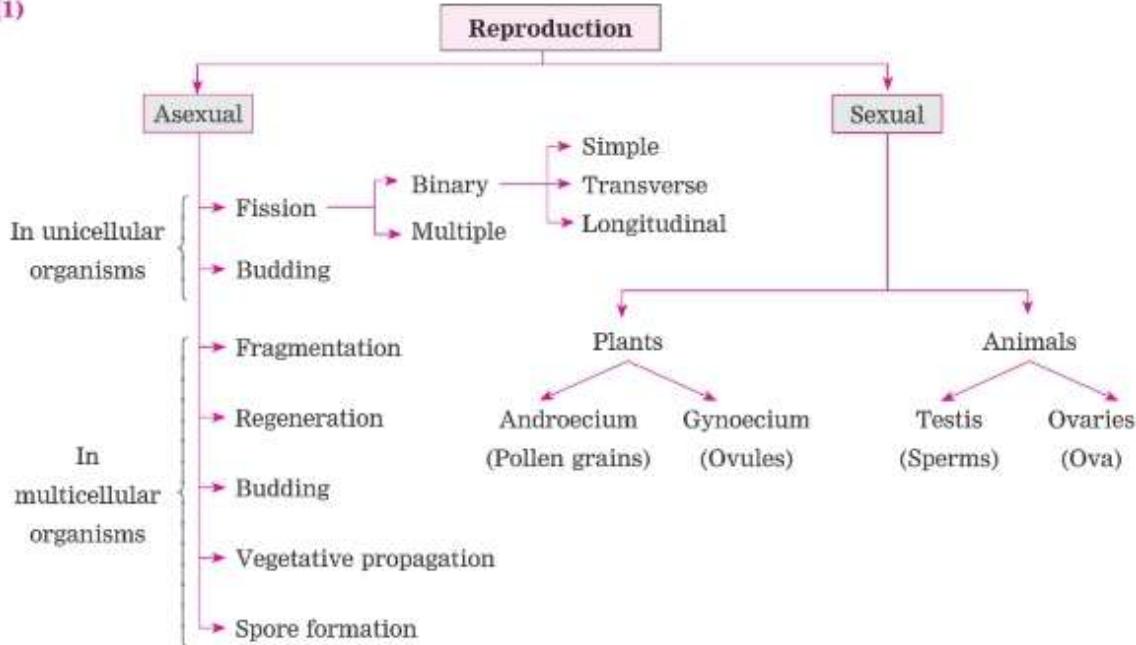
ACTIVITIES

***(1) Collect the official data about present and a decade old population of various Asian countries and plot a graph of that data. With the help of it, draw your conclusions about demographic changes.**

***(2) With the help of your teacher, compose and present a road show to increase the awareness about prenatal gender detection and gender bias.**

MEMORY MAP/CONCEPT MAP

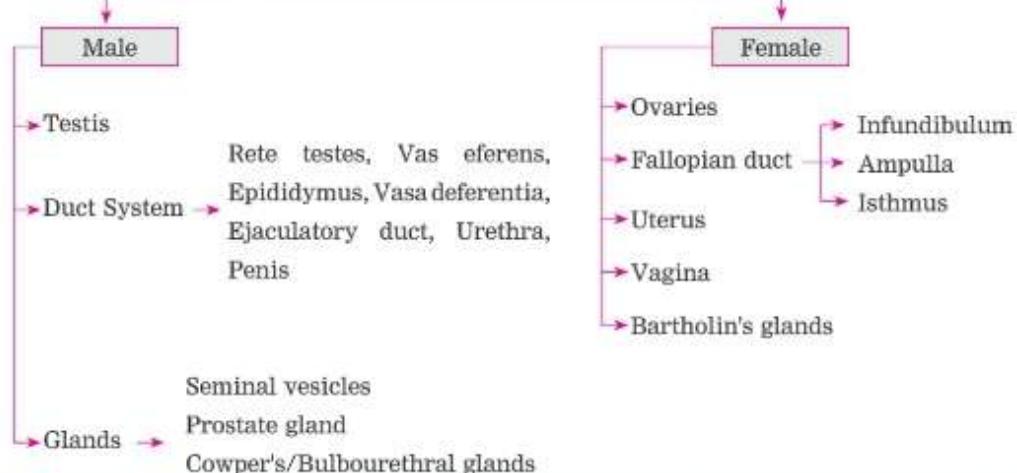
(1)



(2)

6414122

Human Reproductive System



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this **QR Code** for the test and its model answers.



CHAPTER OUTLINE

- 4.1 Ecosystem – A review
 4.2 Environment and Ecosystem
 4.3 Environmental Conservation

- 4.4 Environmental Management
 4.5 Biodiversity Hotspots

IMPORTANT POINTS

Can you recall? (Textbook page no. 36)

(1) What is ecosystem? Which are its different components?

Ans. In any environment, there are biotic (all the types of living organisms like bacteria, fungi, plants and animals.) and abiotic (air, water, soil, sunlight, temperature, humidity) etc. There are interactions among these components. All such interactions make an ecosystem.

(2) Which are the types of consumers?

What are the criteria for their classification?

Ans. Primary consumers, secondary consumers, tertiary consumers or apex consumers are the different types of consumers. These types are according to the trophic level to which they belong.

(3) What may be the relationship between lake and birds on tree?

Ans. The birds on the tree depend on the aquatic organisms in the lake for their feeding. Birds stay on the trees which are in the vicinity of the lake, so that it is easier for them to capture fishes, frogs, etc. They must also be using the same lake water for drinking.

(4) What is difference between food chain and food web?

Ans. In every ecosystem, there are always interactions between producers, consumers and

decomposers. This sequence of feeding interactions is called food chain. In every food chain, there are links between four to five trophic levels constituting the producers, primary consumers, secondary consumers, tertiary consumers, etc. The links of food chain are in linear sequence. But food web is a complex network of many small food chains. In fact, food web is the collection of many small food chains. Thus, when many food chains are interwoven, they form food web.

Think and Answer! (Textbook page no. 36)

(1) Write the name and category of each of the component shown in picture.

Ans. By utilizing the solar energy, the green plants perform photosynthesis. Thus, they are producers of the food chain. This food is consumed by the grasshopper. Thus, it is primary consumer. Frog is secondary consumer as its diet consists of insects like grasshopper. Snake is tertiary consumer as it feeds on frogs, while the hawk is apex consumer as it can kill the snake and feed on it. Last picture in the food chain is of fungi which are acting as decomposers. Few bacteria are shown in the picture, act on all the levels and bring about decomposition.

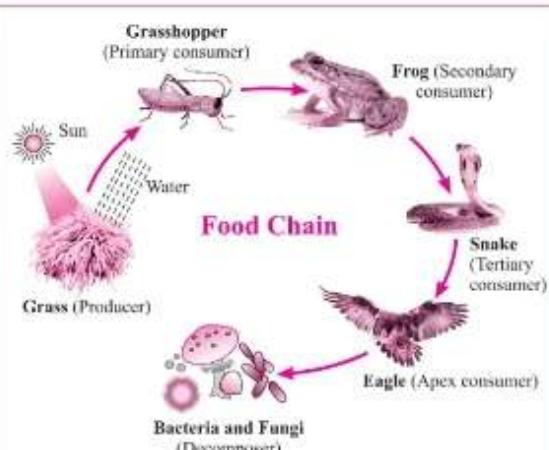


Fig. 4.1 : Food chain

(2) What is necessary to convert this picture into food web? Why?

Ans. If this food chain has to be converted into a food web, there should be interactions between the different components. Any living organism can be prey to different predators. Moreover, a predator can also be a prey for other. Frog eats different insects. The same frog can be either eaten by snake or by hawk.

4.1 Ecosystem – A review :

1. Biotic and abiotic factors and their interactions with each other form an ecosystem. Every factor has important role to play for functioning of the ecosystem.
2. Plants are producers of the ecosystem.
3. Various herbivores like deer, goats, sheep, cattle, horses, camels, etc. feed upon producers.
4. Carnivorous predators e.g. lion and tiger control the population of the herbivores.
5. The decomposers and scavengers like caterpillars, termites, insects present in the dung carry out decomposition and thus clean the environment.
6. Existence of human beings is dependent on the balanced ecosystem.

Think! (Textbook page no. 36)

- If fallen foliage in forest, dead trees, and carcasses in and around villages had not been decomposed for years.....

Ans. Only by decomposition the elements and molecules trapped in the bodies of organisms can be sent back to nature. These various components help in formation of the bodies of plants and animals. If they are not sent back to nature, the cyclic flow of these elements will halt. Only by the decomposition process, foliage in forest, dead trees and carcasses are sent back to nature. If such decomposition halts for years, the entire earth will be covered by heaps of unwanted garbage. The entire balance of nature would be lost.

Discuss! (Textbook page no. 36)

- 'Jivo Jivasya Jivanam'.

Ans. 'Jivo Jivasya Jivanam' is a Sanskrit saying which means that one living organism makes the living on the other. All the food chains occurring in the nature, function on this principle. Prey and predator interactions are based on the above concept. While discussing, students should give various examples that occur in their surrounding environment.

Can you recall? (Textbook page no. 36)

- (1) Which are different trophic levels in food chain?

Ans. The different trophic levels in food chain are producers (First trophic level), primary consumers (Second trophic level), secondary consumers (Third trophic level), tertiary consumers (Fourth trophic level), etc.

- (2) What is energy pyramid?

Ans. Energy pyramid is the diagrammatic representation, that depicts the energy levels at the various trophic levels. There are interactions in the form of energy transfer in all the food chains and food web. The energy pyramid shows how energy travels up a food chain.

Let's Think! (Textbook page no. 37)

- A bird building nest on a tree feed upon the fishes in a nearby pond. Whether this bird is part of both i.e. tree as well as pond ecosystem?

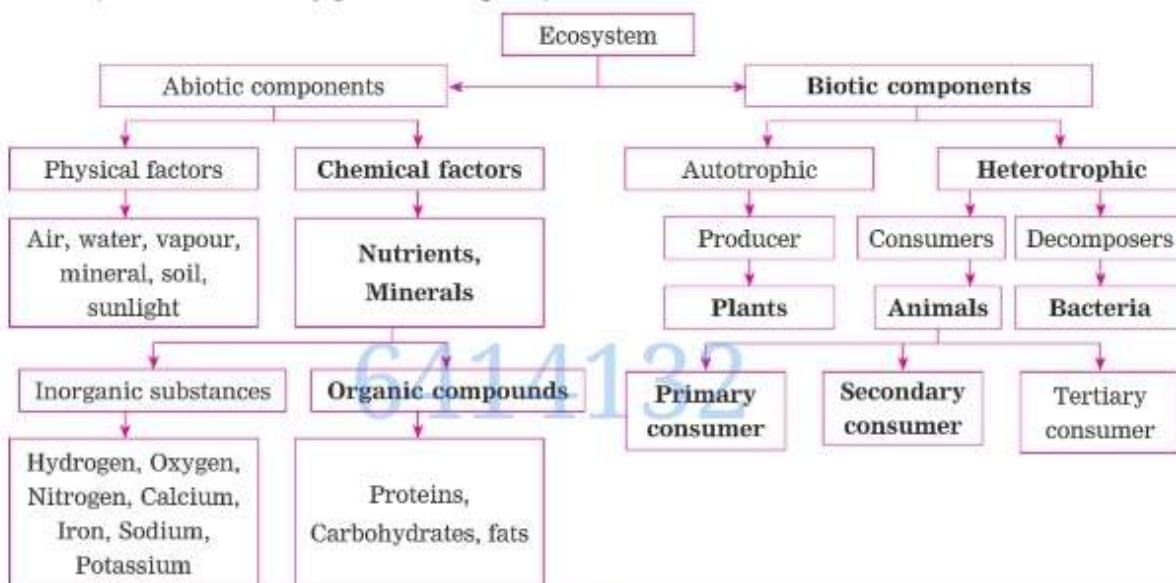
Ans. The bird is a part of both the ecosystems.

For shelter, the bird builds nest on the tree. That means it takes advantage of tree ecosystem (terrestrial ecosystem). Moreover, it feeds on the fish from the pond. Being a predator, the bird maintains the fish population of the pond and thus it also becomes the part of the pond ecosystem too.

- Complete the chart : Fill up the blank boxes and display the completed chart in classroom.

(Textbook page no. 37)

Ans. (Answers are directly given in bold print.)



Let's Think! (Textbook page no. 37)

In South India in various places there is paddy cultivation on a large scale → Frequent attack of the grasshoppers on fields → Predator frogs in large numbers → Snakes to feed on the frogs →

- If frog population declines all of a sudden,

(1) What will be the effect on paddy crop?

Ans. If the population of frog declines, then there will be rise in the population of grasshoppers. The paddy fields will hence be infested with insect pests.

(2) Number of which consumers will decline and which will increase?

Ans. The food chain if altered, results in imbalance in the ecosystem. 'Paddy → Grasshoppers → Frog → Snake', this food chain is natural. When by any reason there is decline in the number of frogs, thus secondary consumer will also decline. Due to this decline, snake which is at tertiary consumer level will also decline. The primary consumers i.e. grasshoppers will increase as there is now no check on their population. Due to increase in their population the paddy production will be reduced. Due to reduced number of snakes, rats and other rodents from neighbouring areas would also rise, which are also secondary consumers.

(3) What will be overall effect on that ecosystem?

Ans. If frogs' population declines, there would be imbalance of entire ecosystem. The number of prey and predator populations will change and thus the food chain will come to an end.

Can you tell? (Textbook page no. 37)

(1) What is environment?

Ans. Everything that is around a living organism is called environment.

(2) What is included in environment?

Ans. Environment includes physical, chemical and other natural factors which surround the living organism.

4.2 Relationship between Environment and Ecosystem :

1. Environment is the collective term for physical, chemical and biological factors that surround the living organisms.

2. Many biotic, abiotic, natural and artificial factors together constitute conditions of the environment.

3. Two main types of environment :

- (1) Natural environment :** Air, atmosphere, water, land, living organisms, etc.
- (2) Anthropogenic/Man-made/Artificial environment.**

4. Two main factors in environment :

- (1) Biotic factors (2) Abiotic factors.
- 5. Continuous interactions occur between all the factors in the environment.
- 6. Artificial environment, directly or indirectly affects the natural environment.
- 7. **Ecology :** Ecology is the science that deals with the study of interactions between biotic and abiotic factors of the environment

- 8. Ecosystem :** Ecosystem is the basic functional unit used to study the ecology.
- 9. Many ecosystems together form an environment.
- 10. Ecosystems constitute biotic and abiotic factors occupying a definite geographical area and their interactions.

Can you recall? (Textbook page no. 38)

• Which cycles are operated in environment? What is their importance?

Ans. In environment there are bio-geochemical cycles. These are of two types, viz. Gaseous cycles e.g. nitrogen cycle, oxygen cycle, etc. and sedimentary cycles e.g. phosphorus cycle.

Importance of bio-geochemical cycle :

(1) Plants require water, CO_2 , phosphorus, potassium, nitrogen, etc. as nutrients while animals require, carbohydrates, proteins, fats, etc. as nutrients.

(2) Producers and consumers after their death undergo decomposition and release elements which mix with the soil.

(3) The cyclic movement of nutrients is possible through bio-geochemical cycle.

(4) The cyclic movement of elements like carbon, nitrogen, phosphorus, etc. continuously occur on the earth.

(5) By the bio-geochemical cycles, the environmental balance is always maintained.

(6) If the environment is in proper condition, then human existence is possible. Therefore, it is our responsibility to preserve nature and maintain environmental balance.

(7) The planet Earth was given to us on lease from our future generations and not as an ancestral property from our ancestors. Therefore, we must conserve it for ourselves and for future generations.

4.3 Environmental Conservation :

Can you tell? (Textbook page no. 38)

(1) Which factors affect the environment? How?

Ans. The natural as well as artificial or man-made factors affect the environment. Among natural factors, the sudden changes in the weather, the different types of natural disasters,

etc. affect the normal environment. Due to such changes there are problems in the interrelationships that exist between food chain and food web. Due to various man-made causes, there are extreme destruction of environment. Industrialization, the pollution due to such industries, urbanization, hunting and poaching of wild animals, construction of dams, roads, bridges, etc. are all man-made changes that cause lot of damage to environment.

(2) What will happen if number of consumers in environment goes on increasing gradually?

Ans. If number of consumers increase gradually, it will create the scarcity of prey organisms. Then due to lack of prey, the number of consumers will also decline.

(3) What will be the effect of industry established on river bank on the river ecosystem?

Ans. If there are industries established on the river bank, then there is threat to the aquatic ecosystem. It is most likely that the hazardous effluents can be released into the river water. This can cause water pollution resulting into mortality of aquatic organisms. Moreover, this water will no longer remain potable. Hence the health of resident population may also be affected. The food chains and the food web in the river may be terminated due to such pollution.

1. The environment is affected due to some natural factors of environment and some man-made factors such as pollution. Such factors create imbalance in the environment which in turn affect the existence of biota.
2. Earth is suffering from many environmental problems caused due to effect of various natural and artificial factors.
3. **Environmental pollution** : Pollution brings about environmental degradation. It is largely due to natural or man-made causes. Pollution

contaminates and makes the unnecessary and unacceptable changes in the surrounding environment. This causes direct or indirect changes in physical, chemical and biological properties of air, water and soil. These changes are usually harmful for all living beings, including human.

4. Reasons for pollution : Population explosion, fast industrialization, and indiscriminate use of natural resources, deforestation, and unplanned urbanization are factors that pollute environment.

5. Our responsibility : Pollution of air, water, noise, soil, thermal, light pollution, etc. are different types of pollution that cause adverse effects. It ultimately affects existence of all the living organisms on the earth. Thus it is our responsibility to curtail polluting substances and aim at environmental conservation.

Can you recall? (Textbook page no. 39)

(1) Which are the types of pollution?

Ans. Air pollution, water pollution and soil or land pollution are main types of pollution. In addition to these, light pollution, plastic pollution, noise pollution and radioactive pollution are also other hazardous types of pollution.

(2) What do we mean by natural and artificial pollution?

Ans. The pollution which is caused by natural sources and due to natural processes is called natural pollution. E.g. Earthquake and eruption of lava. The pollution that is caused due to human activities is called artificial or man-made pollution.

6. Radioactive pollution : Radioactive pollution is caused by following two causes :

- (1) Natural radiations : Natural processes such as UV and IR radiations.
- (2) Man-made or artificial radiations : X-rays and radiations emitted from atomic energy plants.

(3) Major mishaps on the international level : Chernobyl, Windscale, and Three Miles Island mishaps. Due to these accidents thousands of people have been affected for long term.

7. Effects of radiations :

- (1) Cancerous ulcerations due to X-rays.
- (2) Destruction of body tissues.
- (3) Change in the genes.
- (4) Adverse effect on vision.

8. Need of environmental conservation :

- (1) Discussion of the environmental problems – In 1972 at UNO, Stockholm, (Conference arranged on human and environment.)
- (2) Later establishment of United Nations Environment Program (UNEP).
- (3) In India, discussion of environmental issues took place in IVth planning commission.
- (4) A separate environmental department was established later.
- (5) Ministry of environment and forests started various programmes since 1985 in planning, inducting and increasing awareness about environment and forest.

9. People's participation :

- (1) Awareness about environment conservation rules and laws should be developed for common people.
- (2) Large scale participation of the people in environment conservation can bring about environmental protection and effective conservation.
- (3) Values like positive attitude towards environment and knowledge and quest for the conservation should be imbibed right from school days. Increasing environmental awareness through schools and colleges is essential.

(4) Every nation has their own future plans about environmental protection and for this purpose they have formulated the laws.

10. Environmental Conservation – our social responsibility

- (1) Human – environment interrelationship existed since origin of man.
- (2) Human being has become supreme on the earth due to his intelligence, memory, imaginations, creative ability etc.
- (3) Human has used up natural resources without any thought. The development processes have caused extreme damage to the environment.
- (4) Maintaining the environmental balance is the duty of humans.
- (5) Since we have disturbed the environmental balance, only we should think of protection and conservation of nature.

Search : (Textbook page no. 41)

• How do butterflies contribute to environmental balance?

Ans. Butterflies carry out pollination. This results into reproduction of the plants. The flora is increased due to such increased pollination. Many weeds in the nature are consumed by the butterflies as their food. Some butterflies also consume harmful insects as their prey.

Due to beautiful coloured butterflies the environment becomes pleasant and joyful. Butterflies avoid polluted and barren areas. Thus, they indicate the health of the environments. Thus, the ecosystem is said to be in balance if there is presence of butterflies in its surroundings.

11. Laws enacted about environmental conservation :

Law	Year	Inclusion in the law	Punishment if the law is not followed
Forest Conservation Act	1980	Prohibition on the use of the land which is reserved for forest conservation.	Imprisonment for 15 days.
Environmental Conservation Act	1986	Control of pollution and action on the persons or institutes that harm environment.	Five years imprisonment or fine up to Rs. 1 lakh.
National Green Tribunal	2010	Effective implementation of environment related laws.	Court case.
Wildlife Protection Act	1972	Protection of the wild life.	Various punishments.
	Clause 49 A	Complete ban on trading of rare animals.	
	Clause 49 B	Complete ban on use of articles prepared from skin or organs of wild animals.	
	Clause 49 C	Compulsory disclosure of the stock of artifacts made from rare wild animals.	

12. Jadav Molai Payeng from Assam has made barren land into a forest which now stands on 1360 acres of land. Now, this forest is known as 'Molai Jungle'.

4.4 Environmental Management : Environmental Conservation and Biodiversity :

1. Environmental pollution affects the living organisms and reduces biodiversity.

2. Living world had a rich biodiversity. This richness of biodiversity is getting depleted at a very high rate only due to various activities of human beings.

3. **Biodiversity:** The richness of living organisms in nature due to presence of varieties of organisms, ecosystems and genetic variations is called biodiversity. Biodiversity occurs at following three different levels.

4. Levels of biodiversity :

Genetic Diversity	Species Diversity	Ecosystem Diversity
Diversity among the organisms of same species. The genetic constitution of each organism may be different.	Diversity in the species of organisms that occur in the nature. E.g. Various types of plants, animals and microbes.	Many ecosystems are present in a particular region. Diversity of the different ecosystems. E.g. Natural and artificial ecosystems.

5. Every ecosystem is different from others. It has its own characteristic animals, plants, microbes and abiotic factors.

(2) These groves are 'sanctuaries' conserved by the society.

6. Sacred Groves :

(1) Some green forest patches were conserved in the name of god by the locals and tribal people. These are considered sacred and hence the name sacred grove.

(3) Sacred groves have special protection because they are conserved as god's abode.

(4) Such patches of thick forests are mostly present in Western Ghats.

(5) In India, more than 13000 sacred groves have been reported.

7. How can biodiversity be conserved?

- (1) Protection of the rare species.
- (2) Creating National Parks and Sanctuaries.
- (3) Declaration of 'Bioreserves', thus offering protection to resident species.
- (4) Conservation of special species by carrying out projects.
- (5) Conservation activities for all living organisms.
- (6) Strictly following the environmental protection rules.
- (7) Recording and maintaining traditional knowledge.
- (8) There are many state-level, national and international level institutes that work for conservation of the environment.

4.5 Hotspots of Biodiversity :

1. Highly sensitive biodiversity spots in world : 34
2. Areas of the Earth were occupied by these hotspots : 15.7%
3. Currently, sensitive areas that are destroyed : 86%
4. Presently left over sensitive spots on the earth : 2.3%
5. Hotspots have 1,50,000 plant species which are 50% of the world count.
6. In Eastern India jungles, 85 species are found out of 135 species of animals.
7. In Western Ghats about 1,500 endemic plant species.
8. Out of the total plant species in the entire world, 50,000 are endemic.

9. Three Endangered Heritage Places of the Country :

Which one?	Where?	Problem?	Impact
1. The Western Ghats	Gujarat, Maharashtra, Goa, Tamil Nadu and Kerala	Endangered animals due to mining industry and search for natural gas.	Habitats of Asiatic lion and wild bison under threat.
2. Manas sanctuary	Assam	Dams and indiscriminate use of water.	Tiger and rhino under threat.
3. Sunderbans sanctuary	West Bengal	Dams, deforestation, excessive fishing, trenches dug.	The tiger population and overall local environment is seriously challenged.

Recall a little? (Textbook page no. 45)

- Collect the names of extinct birds and animals of India and tell those names to others.

Ans. 1. Animals :

- Asiatic cheetah (*Acinonyx jubatus venaticus*)
- Namdapha flying squirrel (*Biswamoyopterus biswasi*)
- Himalayan wolf (*Canis himalayensis*)
- Elvira rat (*Cremonomys elvira*)
- Andaman shrew (*Crocidura andamanensis*)
- Jenkins' shrew (*Crocidura jenkinsi*)
- Nicobar shrew (*Crocidura nicobarica*)

2. Bird : Pink-headed duck

10. Classification of Threatened Species :

Type of Species	Endangered Species	Rare Species	Vulnerable Species	Indeterminate Species
Information	Number of organisms is declined. Shrunken habitat which can lead to extinction.	Considerably declined number of these organisms. Endemic organisms may become extinct very fast.	Extremely less number of organisms which further declines. Continuous declining number of organisms is a threat.	Organisms appear to be endangered. The data is not enough as they have typical behavioural habits (like shyness)
Examples	Lion tailed monkey, Lesser florican.	Red panda, Musk deer	Tiger, Lion.	Giant squirrel, our state animal : 'Shekhru'

11. 22nd May is observed as a World Biodiversity Day.

12. International Union for Conservation of Nature (IUCN) prepares the 'Red List' which contains the names of endangered species from different countries.

13. The names of endangered species are on pink pages. The names of previously endangered but presently safe species are on green pages.

Think : (Textbook page no. 45)

• World Wildlife Fund (WWF) published a survey in 2008. According to it, about 30% of animal species have become extinct over the period of 30 years (1975 – 2005).

What will happen in future if this continues as it is?

Ans. If as per report of WWF, 30% of the animal species faced extinction during last

30 years, then it is very alarming. Once lost the flora and fauna will never get replenished. If in future, this rate of extinction continues, there will not be a single animal left on the earth. Only human species will outnumber all others due to no concern for the nature.

16. Some important slogans to spread environmental wisdom :

- (1) Destroying a plant is to destroy everything.
- (2) Practise afforestation to conserve environment.
- (3) Forest is Wealth.
- (4) Environmental protection is value education.
- (5) Provident use of paper is prevention of deforestation.
- (6) To practise the environmental protection is to develop human society.
- (7) Pure air, pure water is key to healthy life.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write that alphabet against the sub-question number :

- (1) Paddy fields are frequently attacked by
 (a) goats (b) birds
 (c) grasshoppers (d) monkeys

- (2) Basic functional unit to study the ecology is termed as
 (a) environment
 (b) niche
 (c) ecosystem
 (d) food chain

- (3) As per trading of rare animals has been completely banned.

(a) clause 48A (b) clause 49B
(c) clause 49A (d) all the above

(4) The jungle in Kokilamukh of Jorhat district of Assam is well known as

(a) Molai jungle (b) Rhino jungle
(c) Rhino forest (d) Payang jungle

(5) Maintaining record of knowledge is very necessary.

(a) modern (b) mythical
(c) vedic (d) traditional

(6) is world's largest organization engaged in environmental activities.

(a) Green Peace (b) Hariyali
(c) B. N. H. S. (d) I. I. T.

(7) sanctuary of West Bengal is reserved for tigers.

(a) Gir (b) Sunderban
(c) Molai (d) Corbett

(8) World Biodiversity Day is celebrated on every year.

(a) 22nd April (b) 5th June
(c) 16th September (d) 22nd May

(9) Out of the total plant species in the entire world, 50,000 are

(a) extinct (b) endangered
(c) endemic (d) rare

(10) Giant squirrel is an species.

(a) indeterminate (b) rare
(c) endemic (d) endangered

(11) In a food chain, autotrophic plants are present at the level. **(March '19)**

(a) tertiary nutrition (b) secondary nutrition
(c) producer (d) apex

(12) Which sanctuary of Assam is under threat due to dams and indiscriminate use of water?

(Nov. '20)

(a) Tadoba (b) Kaziranga
(c) Manas (d) Sundarbans

(13) from Manas sanctuary in Assam is under threat.

(a) One horned rhino (b) Lion
(c) Musk deer (d) Giant squirrel/Shekhrus

(14) Genetic changes occur due to pollution.

(Nov. '20)

(a) radioactive (b) air
(c) water (d) soil

Ans. (1-c); (2-c); (3-c); (4-a); (5-d); (6-a); (7-b); (8-d); (9-c); (10-a); (11-c); (12-c); (13-a); (14-a).

Q. 2 Write whether the following statements are true or false, giving suitable explanation for the same :

(1) Only abiotic factors play very important role in the ecosystem.

(2) Paddy fields are frequently attacked by frogs.

(3) Environmental pollution is necessary and acceptable change in the surrounding environment.

(4) X-rays and radiations from atomic energy plants are natural radiations.

(5) The person breaching the Environmental Conservation Act is entitled for either one year imprisonment or fine up to ₹ 5 lakh.

(6) Many people come together to establish a new forest but a single person, if determined can destroy the entire forest!

(7) There are clusters of thick forests only in Western Ghats of India.

(8) 86 highly sensitive biodiversity spots are reported all over the world.

(9) Flow of nutrients in an ecosystem is unidirectional.

Ans.

(1) **False.** (Both abiotic and biotic factors play very important role in the ecosystem. Only abiotic factors will not decide the working of an ecosystem.)

(2) **False.** (Paddy fields are frequently attacked by grasshoppers. Frogs feed on grasshoppers and control the population of these insects that cause destruction of the crops.)

(3) **False.** (Environmental pollution is never acceptable. It is always harmful to the entire ecosystem and thus never necessary.)

(14) Genetic changes occur due to pollution.
(Nov. '20)

Ans. (1-c); (2-c); (3-c); (4-a); (5-d); (6-a); (7-b); (8-d); (9-c); (10-a); (11-c); (12-c); (13-a); (14-a).

Q. 2 Write whether the following statements are true or false, giving suitable explanation for the same :

- 32

 - (1) Only abiotic factors play very important role in the ecosystem.
 - (2) Paddy fields are frequently attacked by frogs.
 - (3) Environmental pollution is necessary and acceptable change in the surrounding environment.
 - (4) X-rays and radiations from atomic energy plants are natural radiations.
 - (5) The person breaching the Environmental Conservation Act is entitled for either one year imprisonment or fine up to ₹ 5 lakh.
 - (6) Many people come together to establish a new forest but a single person, if determined can destroy the entire forest!
 - (7) There are clusters of thick forests only in Western Ghats of India.
 - (8) 86 highly sensitive biodiversity spots are reported all over the world.
 - (9) Flow of nutrients in an ecosystem is unidirectional.

Ans.

- (1) **False.** (Both abiotic and biotic factors play very important role in the ecosystem. Only abiotic factors will not decide the working of an ecosystem.)
 - (2) **False.** (Paddy fields are frequently attacked by grasshoppers. Frogs feed on grasshoppers and control the population of these insects that cause destruction of the crops.)
 - (3) **False.** (Environmental pollution is never acceptable. It is always harmful to the entire ecosystem and thus never necessary.)

- (4) **False.** (X-rays are not present in natural radiations. Infra-red and ultra-violet rays are present in natural radiations.)
- (5) **False.** (The person breaching the Environmental conservation Act is fined upto ₹ 1 lakh. He is also entitled to imprisonment for five years.)
- (6) **False.** (When anything constructive has to be done even a single man can start such action. In case of 'Molai jungle', this statement holds true. But when destructive actions are done, many people come together and cause damage.)
- (7) **False.** (Entire India is rich in biodiversity. Just not in Western Ghats but in entire India one can observe the clusters of thick forests and this is mainly due to suitable tropical climate.)
- (8) **False.** (As per the latest information and available data, there are 34 highly sensitive biodiversity spots.)
- (9) **False.** (Flow of energy in an ecosystem is unidirectional. Flow of nutrients is cyclic.)

Q. 3 Match the columns :

(1)	Column I	Column II
(1) Physical, chemical and biological factors together form	(a) Biodiversity (b) Ecosystem (c) Ecology (d) Environment	
(2) The science of interactions between biotic and abiotic factors		

Ans. (1) Physical, chemical and biological factors together form – Environment.

(2) The science of interactions between biotic and abiotic factors – Ecology.

(2)	Column I	Column II
(1) Basic functional unit in the environment	(a) Biodiversity (b) Ecosystem (c) Ecology (d) Environment	
(2) Different types of living organisms		

Ans. (1) Basic functional unit in the environment – Ecosystem.

(2) Different types of living organisms – Biodiversity.

(3)	Rules/Act	Year
(1)	Sound Pollution (Control and Prevention) Rule	(a) 1980 (b) 2011
(2)	Biomedical Waste (Management and Handling) Rule	(c) 1998 (d) 2000

Ans. (1) Sound Pollution (Control and Prevention) Rule – 2000.

(2) Biomedical Waste (Management and Handling) Rule – 1998.

(4)	Rules/Act	Year
(1)	Forest Conservation Act	(a) 1980
(2)	Environmental Conservation Act	(b) 1986 (c) 2011 (d) 2000

Ans. (1) Forest Conservation Act – 1980.

(2) Environmental Conservation Act – 1986.

(5)	Species	Examples
(1)	Endangered	(a) Red panda, Musk deer
(2)	Rare	(b) Tiger, Lion (c) Lion tailed monkey, lesser florican
		(d) Monkey, squirrel

Ans. (1) Endangered – Lion tailed monkey, lesser florican.

(2) Rare – Red panda, Musk deer.

(6)	Species	Examples
(1)	Vulnerable	(a) Giant squirrel (Shekhrus)
(2)	Indeterminate	(b) Red panda, Musk deer (c) Tiger, Lion (d) Lesser florican, sparrow

Ans. (1) Vulnerable – Tiger, Lion.

(2) Indeterminate – Giant squirrel (Shekhrus).

Q. 4 Find the odd one out :

- (1) Ash, Carbon dioxide, Lead, Asbestos
- (2) Manas sanctuary, Sunderbans sanctuary, The Western Ghats, Tadoba National Park
- (3) Lion tailed monkey, White rats, Musk deer, Tiger
- (4) Conservation, Regulation, Pollution, Prohibition
- (5) IPCC, UNEP, IUCN, BNHS

Ans. (1) **Carbon dioxide.** (All others are solid particulate pollutants.)

(2) **Tadoba National Park.** (All others are endangered heritage places of India.)

(3) **White rats.** (All others are species that are threatened.)

(4) **Pollution.** (All others are ways of environmental protection.)

(5) **BNHS.** (All others are international organizations. BNHS is Bombay Natural History Society.)

Q. 5 Find the correlation :

(1) Rare species : Musk deer :: : Lesser florican.

(2) Red panda : Rare species :: Giant Squirrel :

(3) Nitrogen, Oxygen : Gaseous cycle :: Soil and Rocks :

(4) Manas : One horned Rhino :: Gir :

(5) Mumbai : Bombay Natural History Society :: Tehri Garhwal :

Ans. (1) Endangered species (2) Indeterminate species (3) Sedimentary cycle (4) Asiatic lion (5) Chipko centre.

Q. 6 Answer the following questions in detail :

*(1) Reorganize the following food chain. Describe the ecosystem to which it belongs.

Grasshopper – Snake – Paddy field – Eagle – Frog.

Ans. (1) Correct food chain : Paddy field → Grasshopper → Frog → Snake → Eagle.

(2) Such food chain is seen in the terrestrial ecosystem. There are many biotic factors in the terrestrial ecosystem, such as insects, birds, mammals etc.

(3) The above example mentions about paddy field, so it must be in vicinity of coastal lands. There is water logging in the paddy fields. Therefore, it offers a habitat to the frogs.

(4) In the above example, paddy fields are producers in the ecosystem. The primary consumer

is grasshopper. Secondary consumer is frog, tertiary consumer is snake and the apex consumer is eagle. On every trophic level the bacteria, fungi and some scavenging worms can act as the decomposers.

(5) In this ecosystem, the solar energy is transferred from the paddy crops to eagle in a step wise food chain.

(2) Answer the following questions :

If frog population in paddy field declines all of a sudden,

(a) What will be the effect on paddy crop ?

Ans. For the answer refer to question in the box on page 83.

(b) Number of which consumers will decline and which will increase?

Ans. For the answer refer to question in the box on page 83.

(c) Name the Indian states where paddy is cultivated on a large scale.

Ans. West Bengal, Uttar Pradesh, Haryana, Punjab, Tamil Nadu, Andhra Pradesh, Bihar, Chhattisgarh, Odisha, Assam and Maharashtra.

*(3) Explain the statement – 'We have got this Earth planet on lease from our future generations and not as an ancestral property from our ancestors.'

Ans. (1) The earth was inhabited by older generations before us. We have replaced them.

(2) But during their life time, they have created hazardous impact on the earth. The industrialization, the quest for more and more natural resources, wars fought, the construction activities such as dams, roads and bridges, extensive deforestation, etc. were their thoughtless activities.

(3) All these activities were for development of mankind. But most of them have destroyed the delicate balance between the producers and different levels of consumers.

(4) Due to ever increasing population of human beings there is shortage of food, clothing and shelter. To procure these basic needs, we have exploited many natural resources causing destruction of the earth's natural ecosystem.

(5) Now it is our turn to protect the earth as on the same planet the next generations have to survive. We have to hand over the ecosystems of the earth which are in perfect balance to the new generations.

(6) The future generations need a good quality of air, water and land along with all other living organisms.

(7) Due to problems like climate change, global warming, pollution, droughts, etc. the environment is impacted, thus in order to keep sustainability of earth, we have to remember that the earth has not been obtained only as ancestral property but we have to save it for future generations.

***4) How will you justify that overcoming the pollution is a powerful way of environmental management?** *OR*

"Solving the problem of pollution is an effective way of environmental management."
Justify the statement.

Ans. (1) Pollution is created only due to human activities. Air, water, soil, noise, radiation, thermal, light, plastic are different types of pollution.

(2) All types of pollution affect environment and particularly threatening the survival of living organisms.

(3) Pollution must be controlled in order to have good quality of the environment. E.g. When plastic is thrown anywhere, it causes pollution of the land, it clogs the rain water drains, it affects feeding of the animals. Plastic pollution can be completely stopped by us through proper management of plastic waste. By recycling or reusing, we can overcome the plastic pollution. This would be a powerful way of environmental management.

(4) Similarly, when we reduce pollution of different types, we automatically help to regain the environmental health.

***5) Which projects will you run in relation to environmental conservation? How?** *OR*

Write six strategies implemented by you for conservation of the environment.

Ans. Initially, assessment of the environmental problems will be done. The nature and severity of

these problems will be understood by detailed study of the same. Then the projects can be undertaken to combat these problems.

(1) Tree plantation is one such easier project that can be undertaken to conserve environment. The further nurturing of the tree will also be our responsibility. While selecting the tree, the local and sturdy varieties will be selected. Such trees can survive in polluted environment too and even under the pressure of urbanization.

(2) Solid waste management is another very important project that should be undertaken by every society, colony or school. Segregation of waste into dry and wet types and then its proper disposal will be taught to all the people in the neighbouring area.

(3) To ban the plastic and make people aware about harmful effects of plastic is another very significant project.

(4) Fossil fuels are non-renewable and polluting. Therefore, their use should be reduced as far as possible. Therefore, using bicycle, or walking down for shorter distances or using public transport systems are the better alternatives. The awareness drive about these facts will be taken up as a project.

(5) To take care of stray animals, provide shelter, feeding endangered birds like sparrows and allowing them to survive with our support is also one of the essential act to conserve other species.

(6) Attempts will be made for bringing awareness among minds of everyone.

Such small acts can bring about major shift in the attitude of the people. This will certainly help in the environmental conservation.

***6) Write the factors affecting environment.**

Ans. (1) The biotic and abiotic factors affect the environment. Among abiotic factors, the physical and chemical factors can alter the conditions of the environment.

(2) Abiotic factors are either natural or man-made.

(3) The various interrelationships between different living organisms can also affect environment.

(4) The natural disasters such as earthquake, forest fires, cyclones, cloud bursting, drought, etc. change the environment.

(5) The human activities such as deforestation, urbanisation, constructions etc. cause permanent damage to the ecosystems. Due to man-made impact, there can be large scale changes in the environment.

***(7) Write the types and examples of biodiversity.**

OR

Explain the three different levels of biodiversity.

(Nov. '20)

Ans. Biodiversity is documented on the following three levels, viz. genetic diversity, species diversity and ecosystem diversity.

(1) **Genetic Diversity** : Diversity seen among the organisms of same species due to genetic differences is called genetic diversity. E.g. The individual human beings are different from each other. No two animals or plants are exactly alike.

(2) **Species Diversity** : The difference between the different species is the species diversity, e.g. All the species of plants, animals and microbes which are seen in any natural environment.

(3) **Ecosystem Diversity** : In one region there may be different ecosystems, such diversity in the ecosystems is called ecosystem diversity. Ecosystems are natural or artificial. Every region shows different types of ecosystems such as aquatic, terrestrial, desert or forest ecosystems. Each ecosystem has its own habitats with resident flora and fauna.

***(8) How the biodiversity can be conserved?**

Ans. Biodiversity can be conserved by the following ways :

(1) Protection of the rare species of plants and animals.

(2) Creating habitats for the animals and plants by establishing National Parks and Sanctuaries.

(3) Declaration of bioreserves, the areas which are protected through conservation.

(4) Conservation projects for protecting special species.

(5) Conservation of all flora and fauna.

(6) Strict observance of the acts and rules.

(7) Use of traditional knowledge and maintaining record of traditional knowledge.

***(9) What do we learn from the story of Jadav Molai Payeng?**

Ans. Jadav Molai Payeng is a common man who was just a simple forest worker. But he has conscience about plants and tree plantations. He single-handedly planted thousands of trees. He converted a barren patch of land into forest which is spread over 1360 acres. For these plantations he continuously worked. He has shown that a single determined person, can establish a new forest! We understand the values of hard work, sincerity and devotion to the nature through the story of Jadav Molai Payeng. Even a common man can contribute a lot for the conservation and protection of the environment by learning the story of Payeng.

***(10) Write the names of biodiversity hotspots.**

Ans. (1) In entire world, 34 highly sensitive biodiversity spots are reported.

(2) These hotspots occupied 15.7% area of the Earth.

(3) However, currently about 86% of the sensitive areas are already destroyed.

(4) Now about 2.3% area of the Earth still has such sensitive biodiversity spots.

(5) There are 1,50,000 plant species which are about 50% of the species in the world.

(6) In India, out of 135 species of animals, 85 species are found in the jungles of eastern region.

(7) There are about 1,500 endemic plant species in Western Ghats.

(8) About 50,000 plants species out of the total plants in the world are said to be endemic.

***(11) Which are the reasons for endangering many species of plants and animals? How can we save those diversity?**

Ans. (1) The animals and plants species are endangered majorly due to man-made causes.

(2) Some natural disasters like earthquakes, climate change, forest fires, drought and cyclones also affect the living organisms due to lack of food and water.

(3) In man-made causes, hunting and poaching are the main reasons.

(4) Also animal-human conflicts occur due to invasion of human settlements into the habitats of wild animals.

(5) Construction of dams, roads, and colonies destroy the habitats of wild life.

(6) Industrialization, urbanization and population explosion of humans are putting severe pressure on all the existing biodiversity.

(7) In order to save and protect the biodiversity, many scientists and naturalists come together. A stretch of land is protected by declaring it as the sanctuary or a national park by the Government. Even the locals can protect it as a sacred grove.

(8) Various acts and rules have been formulated to protect the organisms. The violators of such rules are punished accordingly.

(12) What is radioactive pollution? What are its effects?

Ans. (1) The radiations emitted either through the natural sources or through man-made sources cause radioactive pollution.

(2) The natural radiations is in the form of ultra violet and infrared radiations.

(3) Artificial or man-made radiations are X-rays and radiations from atomic energy plants.

(4) All radiations are highly hazardous for the living organisms. The impact of radiation is also for a very long time.

(5) It has brought about major accidental mishaps at Chernobyl, Windscale, and Three Miles Island. These disasters have affected thousands of people.

(6) Some other effects of radiations are as follows – (i) Due to higher radiations of X-rays, cancerous ulceration occurs. (ii) Radiations destroy the body tissues. (iii) Radiations cause mutations and thus genetic changes occur. (iv) There is adverse effect on the vision.

(13) Why is it said that pollution control is important?

(Use your brain power. Textbook page no. 40)

Ans. The quantity of pollutants and severity of their effects on the ecosystem have to be taken into consideration constantly. The different methods of pollution control have to be used for checking the hazardous effects of pollution on the living organisms. Especially the impact of pollution on health of human beings is assessed from time to time. The young children and senior citizens are affected to greater extent by the pollution. If the air and water required for the survival of the people is affected, then exercising the pollution control is to be done immediately. Thus, it is said that pollution control is important.

(14) Give one word for “The forest conserved in the name of God.”

Ans. Deorai.

Q. 7 Give scientific reasons :

***(1) Human beings have important place in environment.**

Ans. (1) Man came last on the earth during evolution of animals. But due to his intelligence, imagination, critical thinking and memory, he made progress in all fields.

(2) By virtue of these qualities he became the supreme.

(3) All the natural resources on the earth were very rapidly exploited by man.

(4) Under the pretext of technology and development he made degradation of almost all-natural ecosystems.

(5) He never obeys the rules of nature.

(6) Phenomena like pollution, urbanization, industrialization and deforestation are exclusively his creations.

(7) Hunting and poaching other animals were his contribution to the extinction of many other animals.

(8) Except man no other organism on the earth can change the ecosystems in such a drastic way.

Therefore, it is rightly said that human beings have important place in environment.

(2) Certain scavenging caterpillars, termites and insects found in the dung are important.

Ans. (1) Scavenging caterpillars and insects are decomposers. They seem to be worthless due to filthy surrounding in which they thrive. (2) But they carry out most important task of decomposition of complex organic substances into simple inorganic elements. (3) This recycling is possible only due to decomposers. (4) If they are not present, there will be huge accumulation of garbage. Therefore, these living organisms are important.

(3) Destroying trees is to destroy everything.

Ans. (1) When a single huge tree is felled, many living organisms which are dependent on it, are exterminated. (2) Many insects, fungi, birds, etc. lose their habitat. (3) Trees take up carbon dioxide from the atmosphere and release oxygen. These natural cycles are also hindered due to loss of trees. (4) Due to trees there is shade, cooler atmosphere and increase in the rainfall. When such trees are destroyed all the components in the ecosystem are destroyed too.

(4) There is no definite information about indeterminate species.

Ans. (1) Indeterminate species do not have substantial information about them. (2) The organisms belonging to such species appear to be endangered due to their some behavioural habits. (3) They are shy and do not come in open so that they can be observed keenly. (4) For example, animals like Giant squirrel also do not provide such information.

(5) Tigers from Sunderbans and Rhinos from Manas are under threat.

Ans. (1) Manas is in the area of Assam where there are many dams and indiscriminate use of water. (2) This area is also flood affected. Therefore, rhinos are under threat. (3) In Sunderbans, there are also problems such as deforestation, dams, excessive fishing and dug out trenches. (4) All of these cause dangers to the tiger population.

Q. 8 Write short notes :

***(1) Environmental Conservation.**

Ans. Due to natural and man-made causes, there are many environmental problems on the earth. These problems affect the existence of various living organisms. In order to save these organisms and maintain the environmental balance, there is need for environmental conservation. If this is not done then there will not be any quality of life for the resident humans. For environmental conservation, the Government has formulated acts and rules. UN has established UNEP for the conservation programs. The people's participation in the conservation movement is essential. From school age, the environmental values are inculcated in the young minds. Conservation of environment is the social responsibility of everyone. Judicial use of natural resources is also a way of environmental conservation.

***(2) Chipko Movement of Bishnoi.**

Ans. Chipko Movement of Bishnoi or Bishnoi Andolan :

Khejarli or Khejadli is a village in Rajasthan, where Bishnoi community is located. The name of the town is derived from Khejri trees.

The first event of Chipko Movement took place in Khejadli village in 1730 AD. In this village 363 Bishnois, led by Amrita Devi sacrificed their lives for protecting the trees of Khejri trees, which are considered as sacred by Bishnoi.

Amrita Devi said, "if a tree is saved even at the cost of one's head, it's worth it". She was killed with the axes that were brought to chop off the trees. Her three young daughters Asu, Ratna and Bhagubai also sacrificed their lives for trees.

83 Bishnoi villages came together and villagers sacrificed their lives after hearing about Amrita Devi's sacrifice. Three hundred and sixty-three Bishnois were killed as they opposed the king. After realizing the mistake, the king ordered stoppage of the felling of trees. Honouring the courage of the Bishnoi community, the ruler of Jodhpur, Maharaja Abhay Singh, apologized. He issued a royal decree to protect trees and wild life.

Chipko movement of 20th century in Uttar Pradesh also followed the same pattern of embracing the trees and saving them from cutting.

***(3) Biodiversity.**

Ans. Biodiversity means the diverse life forms that inhabit any area. Biodiversity is seen due to variety of life forms and different ecosystems that lodge these organisms. In nature there is biodiversity on the three different levels, viz. genetic diversity, species diversity and ecosystem diversity. This means that there is diversity in the individuals belonging to the same species due to genetic reasons, there is diversity among the different species of organisms and there is also a diversity in the ecosystems that are present in any region.

Due to development of mankind, the biodiversity is threatened. There are special efforts taken to restore the lost and threatened biodiversity. Some of these are establishing sanctuaries, National Parks, biodiversity hotspots and reserves etc. Certain endangered species are protected by carrying out conservation projects.

***(4) Sacred Groves.**

(Nov. '20)

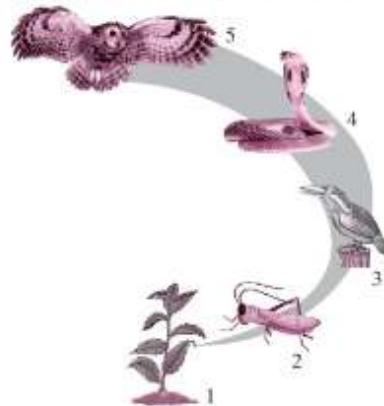
Ans. Sacred grove is the green patch of the forest which is conserved by local people in the name of God. It does not belong to forest department. It is like a sanctuary that is conserved by the common people and tribals in the area. It is rich in the biodiversity. It is conserved as there is a faith that God or deity reside in the sacred grove. Hence in local language, they are known as Deorai. Due to this reason, people do not fell the trees. Also hunting of any wild life is not done here. More than 13000 sacred groves have been reported in India. Most of these are in Western Ghats in Maharashtra, Karnataka and Kerala. Also, in remaining parts of India sacred groves are reported. Role of sacred grove is tremendous in conserving the biodiversity.

***(5) Disaster and its management :**

For the answer refer to Chapter 10.

Q. 9 Questions based on diagrams :

- (1) What is shown in the picture? Write name and trophic level of each component.**



Ans. In this picture, food chain having five trophic levels is shown.

- (1) Trophic level 1 = Producers : Green plant.**
 - (2) Trophic level 2 = Primary consumer (Herbivore) : Grasshopper.**
 - (3) Trophic level 3 = Secondary consumer (Carnivore) : Bird.**
 - (4) Trophic level 4 = Tertiary consumer (Carnivore) : Snake.**
 - (5) Trophic level 5 = Top or Apex consumer (Carnivore) : Owl.**
- (2) Attempts at various levels are performed for conserving environment. Which role would you like to perform. Give two actions each :**
- (a) Prevention (b) Control**
 - (c) Production (d) Awareness**
 - (e) Conservation. *(March '20)***

Ans. I like the role of control for environmental conservation. By control we can change the attitude of population. We can carry out significant project to explain about harmful effects of plastic.

(a) Prevention :

- (i) I will not allow anybody to cut down the trees.**
- (ii) I will take care of birds and animals.**

(b) Control :

- (i) I will control the use of water.**
- (ii) I will control the excessive use of plastic.**

(c) Production :

- (i) I will help in creating gardens.**
- (ii) I will help in growing medicinal plants.**

(d) Awareness :

I will work for important issues such as climate change by carrying out awareness campaigns.

(e) Conservation :

- (i) I will not waste food, clothing.
- (ii) I will help in foresting.

[This is an open ended question. Students can express their own view or role for environmental conservation.]

***(3) What are the meanings of the following symbols? Write your role accordingly. (July '19)**



(1)



(2)



(3)

Ans. (1) The first symbol is for giving the message, "Reduce, reuse and recycle". This is important mantra for the utilization of natural resources.

The second gives the message about 'Save water'.

The third advocates the use of solar energy.

(2) These symbols inculcate the importance of being eco-friendly. The first symbol is essential to maintain the natural resources by reusing and recycling them. As far as possible, one should reduce the excessive use of resources by preventing consumerism.

(3) Water problems persist in many major cities and villages. In villages it results in drought like conditions. It also reflects into loss of agricultural produce. Therefore, the message about saving water or to make judicious use of water should be spread far and wide.

(4) The solar energy is the renewable energy option which is very easily available in country like India. By using solar energy, we can replace the polluting and exhaustible fuels. Thereby, pollution will also be reduced.

Due to such symbols, important messages about environment conservation reach us and we can change ourselves into more ecofriendly persons.

(4) Enlist and discuss (Textbook page no. 43)

Find the meaning of given symbols in relation to environment conservation. Make a list of other such symbols.

Ans.



This symbol tells us to keep our wastes carefully. The garbage should not be strewn anywhere. But it should be properly managed. Waste if managed properly can be a wealth.



This symbol tells us to save electricity. If electricity is carefully used, we can save our natural resources. This message is given through this picture.



Use of bicycle means use of green energy. By riding on a bicycle we save on fuel and use our own muscular energy. It is the best ecofriendly, non polluting vehicle.

(5) Explain the meaning of following symbols A and B.

(A)



The symbol show types of green energy such as solar energy and wind energy. It also expresses that people should use such sources of energy for their use.

(B)



This symbol is giving the message "Save water". Sustainable use of water is necessary for our future.



The symbols of WWF and BNHS are shown here. BNHS stands for Bombay Natural History Society. This institute works for the conservation and documentation of flora and fauna.

WWF means World Wild Life Fund. Also known as World Wide Life Fund. This International Institute is looking after the welfare of wildlife through different conservation projects. WWF symbol shows Panda while BNHS symbol has Giant Hornbill.

(6) (a) Identify the following symbols and state their significance : *(March '19)*



Ans. i - for answer refer to Q. 9 (5) B.

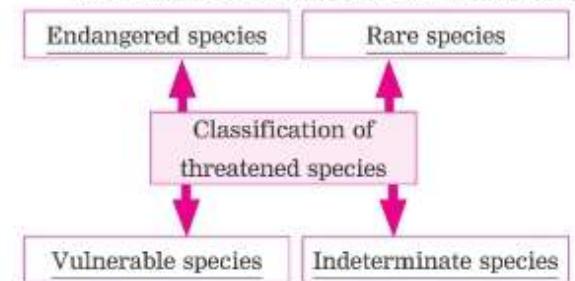
ii - for answer refer to Q. 9 (4).

(b) How can biodiversity be conserved?

Ans. For answer refer Q. 6 (8).

(7) Complete following concept chart :

(The answers are directly given and underlined.)



Q. 10 Complete the paragraph by choosing the appropriate words given in the brackets :

(conserving, pledge, biodiversity, judicious, wildlife, diversity, destruction)

I am aware that the on the Earth is for the existence of me, my family and the entire mankind. I am aware about the responsibility of and protecting the rich diversity. I am aware about the fast-declining number of , plants and animals. I am accepting the responsibility of use of natural resources and

management of I for adopting the following principles for happy and satisfactory life of all organisms on the Earth.

Ans. I am aware that the diversity on the Earth is for the existence of me, my family and the entire mankind. I am aware about the responsibility of conserving and protecting the rich diversity. I am aware about the fast declining number of wildlife, plants and animals. I am accepting the responsibility of judicious use of natural resources and management of biodiversity. I pledge for adopting the following principles for happy and satisfactory life of all organisms on the Earth.

Q. 11 Read the paragraph and answer the questions given below :

Our atmosphere is getting hotter, more turbulent, and more unpredictable because of the "boiling and churning" effect caused by the heat-trapping greenhouse gases within the upper layers of atmosphere. With increase of carbon, methane, or other greenhouse gas levels in the atmosphere, our local weather and global climate is further agitated, heated, and "boiled". The green house gases such as water vapour, carbon dioxide, methane, nitrous oxide, and ozone are causing great impact on life on earth. Due to global warming, the glaciers are melting, causing sea level rise, coastal submergence and frequent natural disasters. We have to rethink while taking the development projects and help to protect the existing life forms on the earth before its too late because climate change can exterminate us.

Questions and Answers :

(1) Why is there increased global warming?

Ans. Because the green house gases are emitted in more proportion, there is global warming due to trapping of solar heat.

(2) Which are main green house gases?

Ans. Carbon dioxide, methane, nitrous oxide and ozone are main green house gases.

(3) What is the chain of impacts caused due to global warming?

Ans. Global warming causes rise in temperature which results in melting of glaciers, sea level rise and coastal submergence.

(4) Why is life threatened on the earth due to global warming?

Ans. Global warming is causing climate change, which brings about frequent natural disasters, food and water insecurity and therefore life is threatened. Many species are already extinct.

(5) What can we do to reverse effects of climate change?

Ans. We have to control the emissions of green house gases, plant more trees and follow sustainable living practices.

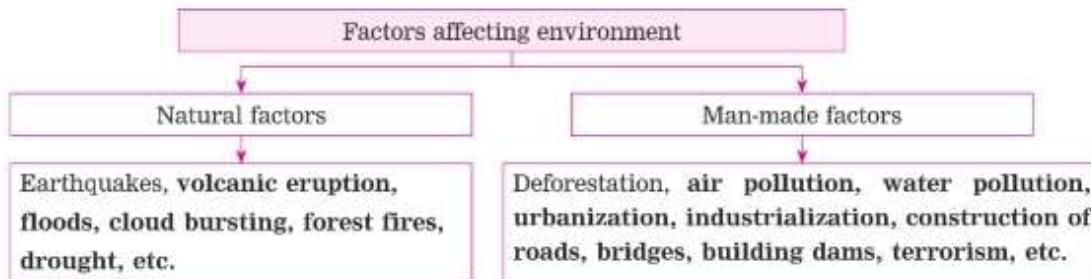
Q. 12 Activity-based Questions :

Q. 1. Questions based on the charts :

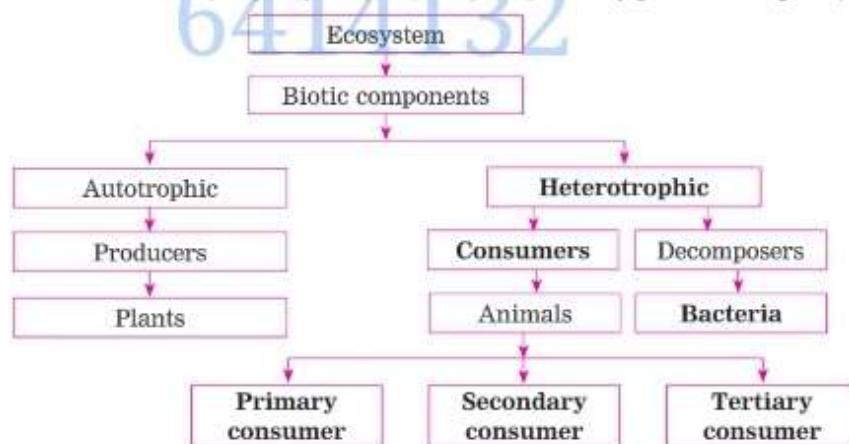
(1) Observe and fill the information : (Textbook page no. 38)

Observe the environment around you. Complete the following flow chart.

Ans. (The answers are directly given in bold print.)

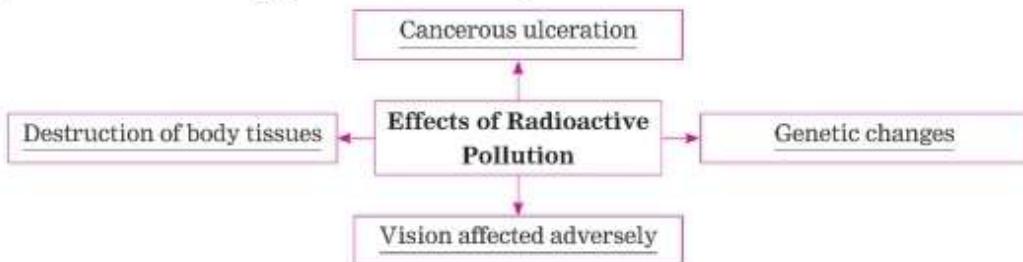


(2) Complete the flow chart : (July '19) (The answers are directly given in bold print.)



(3) Complete the following flow chart : (March '20)

Ans. (The answers are directly given and underlined.)



(4) Complete the Table :

Ans. (The answers are directly given and underlined.)

Endangered Heritage Places of the Country	Threatened/endangered species of an animal	Reasons
Western ghat	Asian Lion	Mining industry
Manas sanctuary	Rhino	Dams and indiscriminate use of water
Sunderbans sanctuary	Tiger	Deforestation, excessive fishing

(5) Complete the Chart : (Textbook page no. 39)

We have studied the air pollution, water pollution and soil pollution in detail in earlier classes. Based on that, complete the following chart.

Ans. (The answers are directly given in bold print.)

	Air pollution	Water pollution	Soil pollution
Components	Gases : CO ₂ , CO, Hydrocarbons, sulphur, NO _x , hydrogen sulphides, etc. Solid : dust, ash, carbon, lead, asbestos, etc.	Biotic components : Alage, Virus, Bacteria, Parasite Abiotic factors : Sand, soil, dust, floating particles, precipitates of salts, silver, lead, heavy metals, (Radioactive substances) Organic components : Weedicides, Pesticides, Sewage, etc.	Soil pollutants are different in different regions. E.g. Near field-inorganic components of insecticides and excess of fertilizers, heavy metals, and other toxic chemicals.
Source	Chemical industries and oil refineries. Thermal power stations, paper industries, cloth mills, cement manufacturing, Dynamites, stone crushers.	Industrial wastes, Domestic waste, sewage, chemicals discharged from industries, pesticides used in agriculture.	Industrial effluents, house-hold toxic materials, chemical pesticides, biomedical wastes, E-wastes, plastic waste.
Effect	Impact on human health. Serious effects on respiratory system, effect on plants and animals, acid rains, climate change.	Epidemics of water-borne diseases in humans. Mortality of aquatic animals. Eutrophication of the water bodies.	Soil erosion, retarded growth of plants and crops, Nutritional deficiency, etc.
Control Measure	Tall chimneys, improvements in the production methodology, equipment to control the pollution.	Measures to control the release of effluents. Laws against release of toxic effluents in the water bodies.	Recycling and reusing the polluting materials. Solid waste management.

(6) Complete the Chart : (Textbook page no. 40)

Now a day, we are observing the environmental degradation everywhere. Complete the flow chart given besides with the help of environment.

Ans. (The answers are directly given in bold print.)



(7) Think and Answer : (Textbook page no. 44) Attempts at various levels are performed for conserving environment. Role of the person is defined as per these levels. Some roles are given below. Which role would you like to perform? Why?

Control

1. Preventing the harm.
2. Stopping the harmful activities.
3. Changing the mindset.

Conservation

Conserving the available resources.

Production

1. Revival of harmed factors of environment.
2. Attempting innovation.

My Role in Environment

Preservation

1. Preserving whatever has been leftover.
2. Remedies to prevent further loss.
3. Preserving unknown regions.

Awareness

1. Education
2. Guidance
3. Awareness
4. Imitation
5. Organization
6. Participation

Prevention

1. Preventing possible harms.
2. Designing new plans.
3. Factors harmful to environment.

Ans. Students are expected to write this answer based on their own views.

Q. 2. Collect more information about locations of these hotspots present in the world.

(Textbook page no. 44)

Ans. Students should collect this information.

Q. 3. Where are such sacred groves in Maharashtra? Make a list and visit with your teachers. (Textbook page no. 43)

Ans. Sacred groves : Sacred groves form an important landscape feature in the deforested hill ranges of the Western Ghats. The felling of timber and the killing of animals in sacred groves is not allowed by the locals. It is considered as taboo.

In Maharashtra, sacred groves are found in tribal as well as non-tribal areas. The sacred groves in the western part are called Devrai or Devrahati, which means the abode of the gods. In eastern parts it is called Devegudi by the madiya tribal people.

In Maharashtra 2820 Devrais have been documented. Maruti, Vaghoba, Vira, Bhiroba, Khandoba and Shirkai are some deities to which sacred groves are dedicated.

In the sacred groves, the most commonly found plant species are Portia tree, Casuarina, Silk cotton tree, Indian laurel, Indian Elm, Bead tree, Indian butter tree, Turmeric and Japanese ginger. In Maharashtra, sacred groves are maximum in district of Sindhudurg, (More than 1500 out of total 2820) followed by Ratnagiri, then Pune and in district of Satara.

PROJECTS

*** (1)** Make a presentation on pollution of Ganga and Yamuna Rivers and effects of air pollution on Taj Mahal.

(2) Let's Discuss : (Textbook page no. 41)

Collect the information about Chipko Movement and discuss between two groups of your class about its importance in present situation.

(3) Collect more information on the organization of Greenpeace. (Textbook page no. 43)

Ans. Students are expected to write this answer to this question.

(4) There should be positive attitude of human being towards the environment for welfare of entire living world. For this purpose, following roles are important. You can be a conservator, organizer, guide, plant-friend, etc. Describe about the role you wish to perform and your plans for that role.

(Textbook page no. 42)

(5) Survey the plants and animals in your area. Maintain a record about their characteristics. (Textbook page no. 45)

Ans. Students can conduct such surveys with the help of elders.

(6) Internet is my friend !

(Collect the information Textbook page no. 41)

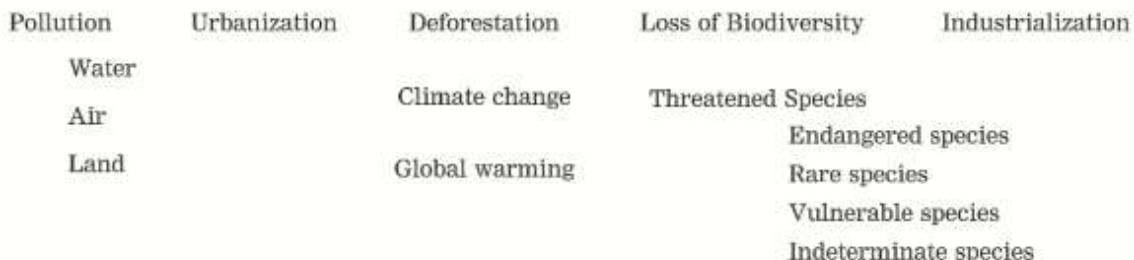
(1) Sound Pollution (Control and Prevention) Rule, 2000.

(2) Biomedical Waste (Management and Handling) Rule, 1998.

(3) E-waste (Management and Handling) Rule, 2011.

MEMORY MAP/CONCEPT MAP

Environmental Problems



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this QR Code for the test and its model answers.

CHAPTER OUTLINE

5.1 Energy and use of energy

5.2 Generation of electrical energy

5.3 Process of generation of electricity and environment

IMPORTANT POINTS

Can you recall? (Textbook page no. 47)

(1) What is Energy?

Ans. The capacity to do work is called energy.

(2) What are different types of Energy?

Ans. Potential energy and kinetic energy are the two types of energy.

(3) What are different forms of Energy?

Ans. Heat, light, electric energy, solar energy, chemical energy, nuclear energy, mechanical energy, etc. are different forms of energy.

5.1 Energy and use of energy :

1. Energy is a very basic and primary need. For various types of work, energy is needed in different forms. E.g. Mechanical energy, chemical energy, sound energy, light energy or heat energy.
2. Energy can be converted from one form to another by transformations. This fact is used by man to satisfy his energy needs.

Can you tell? (Textbook page no. 47)

(1) Where do we use electrical energy in our day-to-day life?

Ans. We use electric energy in various appliances such as bulbs and tubelights. Fans, iron, refrigerator, water pumps, cellphone chargers, television sets, tape recorders and computers.

(2) How is Electric energy produced ?

Ans. Electric energy is produced in the

generators. By using the principle of electromagnetic induction, the magnetic field around conducting wires is changed and this creates the potential difference. This results in the formation of electric energy.

5.2 Generation of electrical energy :

1. Production of electricity :

- (1) Michael Faraday invented the principle of electromagnetic induction. This principle is largely used in generation of electricity.
- (2) This principle is as follows : A potential difference is generated across the conductor whenever magnetic field around a conductor changes.
- (3) In two ways the field around a conductor is changed. (a) Keeping the conductor stationary and rotating the magnet. (b) Keeping the magnet stationary and changing the field around the conductor.
- (4) In both cases there is creation of potential difference across the conductor.
- (5) The electric generators are based on this principle. They generate the electrical power.
- (6) In commercial power generation plants → Large generators → Turbine having blades rotates the magnet → Flow of liquid or gas is directed on the turbine blades → The kinetic energy in the flow → Rotates the magnets in the electric generator → Electric energy is produced.

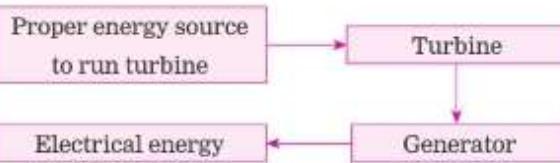


Fig. 5.1 : Flow chart showing generation of electrical energy

- (7) There are different types of power generating stations depending upon the type of energy source that is used to rotate the turbine.

2. Thermal energy based electric power station :

- (1) In thermal energy power plants the steam is used to rotate turbines.

Coal is burnt → Heat energy given to water → Water heated in a boiler → Water converted into steam of very high temperature and pressure → Steam in energy used to rotate turbines → Generator connected to turbines → Electric energy produced.

The steam is reused by converting it into water → Water recirculated to the boiler.

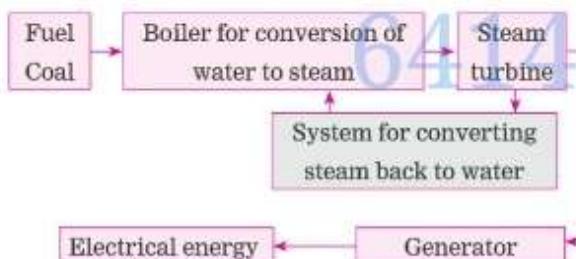


Fig. 5.2 : Flow chart showing generation of electrical energy using thermal energy

- (2) Such power plants are called thermal power plants because thermal energy is used here to generate electrical energy. The chemical energy in the coal is converted into electrical energy gradually through several steps

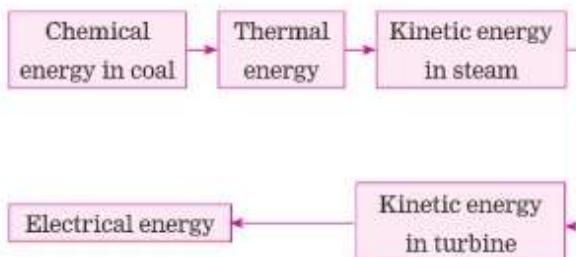


Fig. 5.3 : Flow chart showing energy transformation in thermal power plant

Let's Think : (Textbook page no. 49)

- (1) Why is the energy in the coal called chemical energy?

Ans. The atoms and molecules present in the coal are formed due to chemical bonds. The energy is stored in chemical bonds. When the coal is burnt, this energy is released. The chemical energy in coal is transformed into thermal energy.

- (2) Why steam is used to rotate the turbine?

Ans. When water is heated, it converts into steam. This steam is under high pressure and temperature. This force of steam rotates the turbines. The same steam is again condensed and converted back into water. The excess heat in turbine again makes this water turn into steam. In this way turbine rotates very effectively due to steam.

(3) Schematics of thermal power plant :

- Thermal power plant has two types of towers.
- In the power station, boiler, turbine, generator and the condenser are arranged.
- In the boiler, combustion of coal takes place. Gases produced are released in the atmosphere through very high chimney.
- Turbine is rotated by steam at high temperature and high pressure.
- The temperature and pressure of steam later decreases. This steam is then condensed to water by cooling it, in condensers.
- Condensation of the steam takes place due to transfer of heat energy in the steam to the water.
- The heat absorbed by the water is then released to atmosphere through vapour and heated air through cooling tower.
- Most of the electricity generation is done through thermal power plants in India. But there are certain problems in such electricity production.

(4) Problems caused due to thermal power plants :

(1) Gases like carbon dioxide, sulphur dioxide and nitrogen oxide, etc. soot particles are released due to such burning of coal causing air pollution.

This causes serious health problems. Especially the respiratory system is affected.

(2) The coal reserves are limited and exhaustible. Hence there would be problems about its availability.

3. Power plant based on Nuclear Energy :

(1) The energy released by fission of nuclei of Uranium or Plutonium atoms is used to generate the steam of high temperature and high pressure, which is used to rotate the generator for production of electricity.

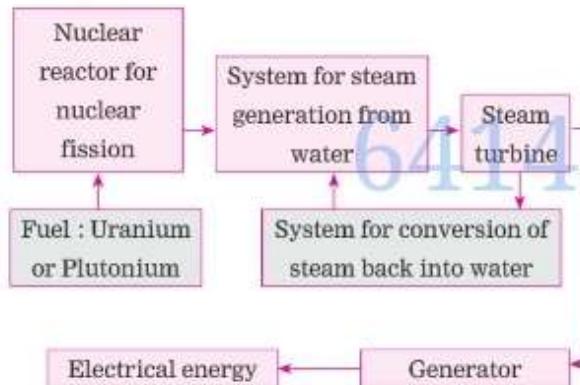


Fig. 5.4 : Flow chart showing nuclear power plant

(2) Energy in the atoms \rightarrow nuclear energy \rightarrow converted into thermal energy \rightarrow converted into kinetic energy of steam \rightarrow converted into kinetic energy of turbine \rightarrow converted into electrical energy

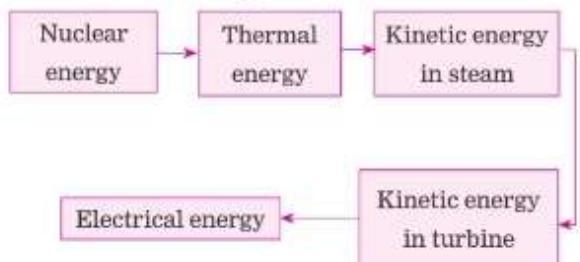


Fig. 5.5 : Flow chart showing energy transformation in nuclear power plant

Can you recall? (Textbook page no. 50)

• How does nuclear fission take place?

Ans. There are proton and neutron in the nucleus of an atom. During nuclear fission, the nucleus undergoes fission either due to natural radiations or due to bombardment of other neutrons on it. The fission liberates the energy which is known as nuclear energy or atomic energy.

(3) Formation of nuclear energy :

- (1) Upon bombardment by neutrons on atom of Uranium-235, absorption of neutron takes place. It converts Uranium-235 into its isotope Uranium-236.
- (2) Being extremely unstable, Uranium-236 transforms into Barium and Krypton atoms through a process of fission. This releases three neutrons and 200 MeV energy.
- (3) Three more Uranium-235 atoms undergo fission due to three neutrons generated in this process. Thus, more fission releases more energy.
- (4) Thus a chain reaction takes place in which the process of fission of Uranium-235 atoms continues.
- (5) In this way a controlled chain reaction is carried out to release thermal energy, which in turn is used for generating electric energy.

Advantages of nuclear energy	Problems of nuclear energy
1. Fossil fuel like coal is not used in a nuclear power plant. Hence air pollution does not occur.	1. Radioactive and harmful radiations are emitted after fission of nuclei occurs.

Advantages of nuclear energy	Problems of nuclear energy
2. If sufficient nuclear fuel is available, it becomes a good source of electrical energy.	2. The nuclear waste requires very safe disposal.
	3. Very fatal accidents can happen in power plant which emits very harmful radiations.

4. Power generation plant based on energy of natural gas :

- (1) Very high temperature and pressure generated by combustion of natural gas. This gas is used to run the turbine.

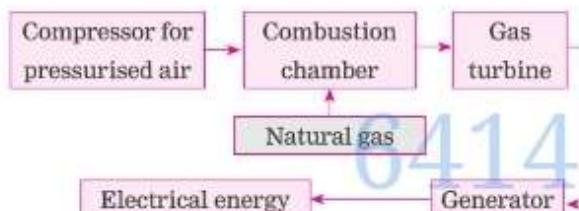


Fig. 5.6 : Flow chart showing arrangement in power plant based on energy of natural gas

- (2) In power generation plant based on energy of natural gas three main sections are present.
 (i) Compressor (ii) Combustion chamber
 (iii) Turbine
 (3) Into the combustion chamber pressurised air is introduced by a compressor → the natural gas burns due to air → high temperature and pressure → runs the turbine → Turbine drives generator → Electricity is produced.

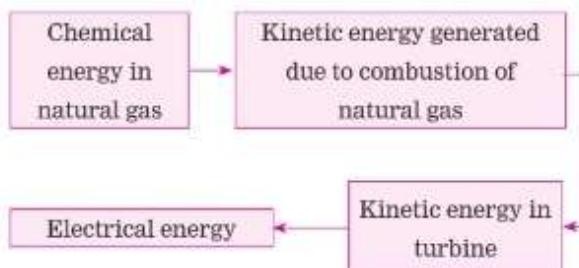


Fig. 5.7 : Flow chart showing transformation of energy in power plant using energy of natural gas

(4) Advantages of power generation plant, using natural gas :

- (i) More efficiency than coal power plants
 (ii) Less polluting as there is no sulphur in natural gas. Less pollution by burning of natural gas.

Use of energy is unavoidable in our daily life but controlled and careful use is essential.

5.3 Electric energy generation and environment :

1. Fossil fuels like coal, natural gas and nuclear fuels like uranium and plutonium are hazardous and are polluting. Thus, electrical energy obtained by burning these is not environment-friendly. Excessive use of these fuels cause environmental degradation.

2. Pollution :

- (1) Incomplete combustion of fuels → Carbon monoxide → Adverse effects on health
- (2) Burning of fossil fuels like coal, and natural gas → Emission of toxic gases and soot particles → Air pollution → Problems in respiratory system, like asthma
- (3) Burning of fuels → Increase in percentage of carbon dioxide in the air → Global warming and climate change
- (4) Burning of fuels like coal, diesel, petrol, etc. → Nitrogen dioxide → acid-rain

3. Non-renewable nature :

- (1) The formation of fossils fuels such as coal, hydrocarbons, crude oil and natural gases (LPG and CNG) took millions of years.
- (2) But their excessive use is depleting these fuels very rapidly. The coal reserves in the world are thought to last for next 200 years and the natural gas reserves for about 200–300 years.
- (3) Problems about nuclear energy are tremendous. It emits toxic materials. Disposal of nuclear waste is a difficult problem. Accident in nuclear power plant can be highly disastrous.

4. Towards the eco-friendly green energy :

Green energy is that energy in which there is no pollution during the generation.

(i) Energy from water reservoir, (ii) Energy from wind, (iii) Energy from sunlight, (iv) Energy from biofuels, etc. are eco-friendly alternatives of energy production.

The sources of such energy are perpetual and sustainable. These types of energy production are pollution-free and eco-friendly. The entire globe is inclining towards green energy.

(1) Hydroelectric Energy :

(1) Hydroelectric energy is a conventional type of energy.

(2) Flowing water → Kinetic energy + Water reservoir → Potential energy.

(3) Hydroelectric power plant → Stored water's potential energy → Fast flowing water → Converted into kinetic energy of water → Such speedy water from dam is brought → to the turbine at the bottom level → Kinetic energy of the flowing water → drives the turbine → turbine then drives the generator → electricity is generated.

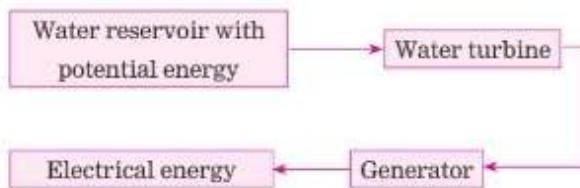


Fig. 5.8 : Flow chart showing different stages in hydroelectric power plant

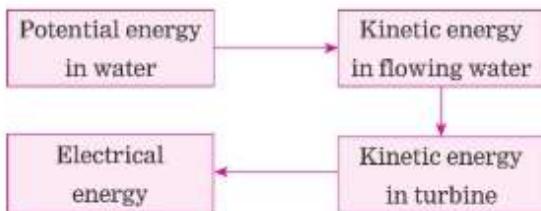


Fig. 5.9 : Flow chart showing energy transformation in hydroelectric power plant

Advantages of hydroelectric power generation	Problems with hydroelectric power generation
1. Since there is no combustion, there is no pollution.	1. Some villages or settlements are submerged.
2. Possible to generate electricity as and when required.	2. People are displaced and their rehabilitation is the major problem.
3. Water supply can also be achieved due to dam.	3. Fertile land, agricultural plots, forests and biodiversity is lost forever.
4. Rains replenish the stored reservoir of the water.	4. Obstruction of the flowing water leads to adverse effect on the resident aquatic organisms.

(2) Electricity generation using wind-energy :

(1) The kinetic energy of wind can be converted to electrical energy with the help of wind-turbine.

(2) Such kinetic energy of wind was used for lifting of water, for driving floor mill, etc. in olden times.

(3) When the wind strikes the blades of the turbine, the blades rotate.

(4) The axle of the turbine and electric generator are connected through a gear-box which increases the rotations per unit time.

(5) The rotating blades drive the turbine which in turn drives the generator and produces electricity.

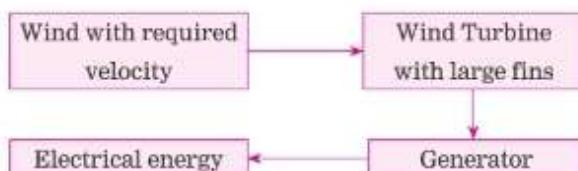


Fig. 5.10 : Flow chart showing stages on electric generator using wind energy

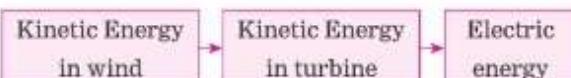


Fig. 5.11 : Flow chart showing transformation of energy in an electric generator using wind energy

Wind turbines can produce electricity from less than 1 kW to about 7 MW (7000 kW).

The installation of windmills to produce electricity from wind energy depends upon following factors :

- The wind velocity available at the site of installation,
- Geographical factors.

Appropriate for installation of wind turbines are done at a particular place.

Seashore is most suitable place for installations as here the wind velocity is more. Wind-energy is a clean energy source but due to wind velocity problems its use is limited.

(3) Electric Energy generation using solar energy :

Solar energy can be used to make electric energy in following two ways :

- Solar radiations are trapped directly into solar photovoltaic cells without using any transformer. Electrical energy is produced

from solar energy due to direct conversion occurring in photovoltaic cells.

- Initially solar energy is converted into thermal energy and later electricity is generated from thermal energy by driving turbine generator system.

(4) Solar photovoltaic cell :

- Solar photovoltaic effect is the conversion of solar energy directly into electrical energy.
- Such generated energy is DC in nature.
- A special type of material called semiconductor (e.g. silicon) is used in making solar cells.
- If a silicon solar cell's dimension = 1 cm^2
Then current = 30 mA and
potential difference = 0.5 V.
- Therefore, a silicon solar cell of dimension = 100 cm^2 will generate about $30 \text{ mA/cm}^2 \times 100 \text{ cm}^2 = 3000 \text{ mA} = 3 \text{ A}$ current and 0.5 V.
- The potential difference available from a solar cell is independent of its area.

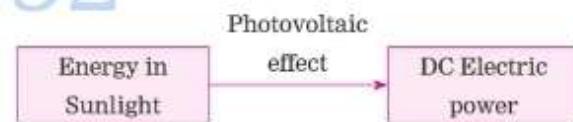


Fig. 5.12

(5) Connections of solar cells :

(a) Solar cells connected in series :

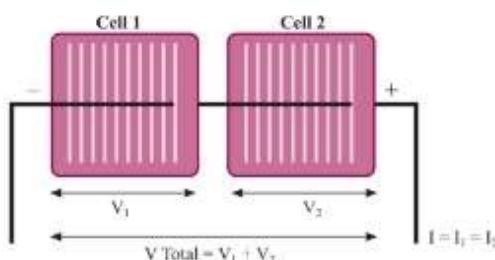


Fig. 5.13 : Solar cells connected in series

(b) Solar cells connected in parallel :

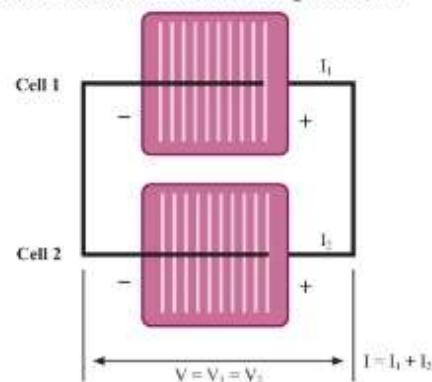


Fig. 5.14 : Solar cells connected in parallel

Solar cells in series	Solar cells in parallel
<p>(1) When two solar cells are connected in series, the potential difference obtained from both the cells is sum of the potential differences of individual solar cells.</p> <p>(2) The current generated from combination in series is equal to the current from an individual cell.</p> <p>(3) When solar cells are connected in series, currents from the individual cells cannot be added.</p>	<p>(1) When two solar cells are connected in parallel, the potential difference obtained from this combination is the same as the potential difference obtained from individual cell.</p> <p>(2) The potential differences cannot be added when the combination is in parallel.</p> <p>(3) The current generated from two cells in parallel is the summation of the currents from an individual cell.</p>

(6) Solar panel :

- Solar panels are formed by connecting many solar cells in series and in parallel.
- Desired potential difference and the current can be obtained by making solar panels by connecting solar cells in series and in parallel.
- The basic unit in solar electric plant → Solar cell → Solar panel → By joining in a series → String → Many strings joined in parallel → Solar array
- Calculators running on solar energy need marginal power, whereas power stations need power in MW capacity.
- The DC power is available from the solar cells. Therefore, it can be used in applications like electric LED (Light Emitting Diodes) and other appliances that work on DC power.
- Most of the domestic appliances as well as industrial equipment run on AC power.
- Therefore, DC solar power is converted to AC power with the help of an inverter.
- Solar energy is available only in presence of sunlight, therefore it is stored in batteries for later use.

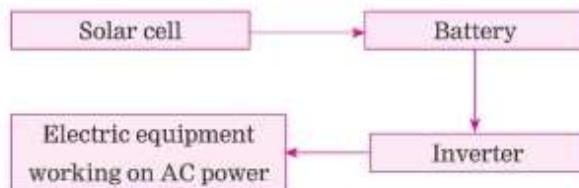


Fig. 5.15 : Flow chart showing conversion of energy generated by cells to AC form by using inverter

- (9) Many solar panels together generate energy that is needed.

- (10) The DC power generated → converted to AC power → with help of a transformer → voltage and current levels → energy obtained → fed into the electricity distribution network.

(7) Advantages of solar energy :

- Generation of energy without any fuel combustion and without any pollution.

(8) Problem of solar energy :

- Available only on sunny days and during day-time only.

(9) Solar Thermal power plant

- Solar radiation can be used to produce thermal energy.
- This solar thermal energy is used for electricity production.

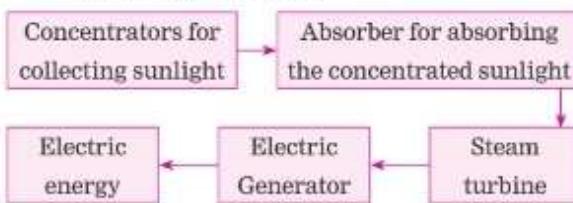


Fig. 5.16 : Flow chart showing different stages in solar thermal power plant

- Solar radiation is absorbed by many reflectors that reflect and concentrate it.
- This solar energy is converted into heat energy which is then used to make steam which drives turbines and generate electricity through generators.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- (1) Large are used in commercial power generation plants.
 - (a) machines
 - (b) generators
 - (c) turbines
 - (d) pannels
- (2) The principle of electromagnetic was invented by Michael Faraday.
 - (a) induction
 - (b) attraction
 - (c) repulsion
 - (d) expulsion
- (3) is used to rotate the magnet in the generator.
 - (a) Fan
 - (b) Generator
 - (c) Turbine
 - (d) Panels
- (4) In thermal power plants, the energy in the coal is converted into electrical energy through several steps.
 - (a) physical
 - (b) biological
 - (c) kinetic
 - (d) chemical
- (5) At in Andhra Pradesh power plant based on natural gas has been installed.
 - (a) Hyderabad
 - (b) Vishakhapatnam
 - (c) Samaralkota
 - (d) Kakinada
- (6) Burning of coal may cause serious health problems related to system.
 - (a) digestive
 - (b) respiratory
 - (c) nervous
 - (d) excretory
- (7) Incomplete combustion of fuels leads to formation of
 - (a) carbon dioxide
 - (b) carbon monoxide
 - (c) carbon tetrachloride
 - (d) All the above

(March '20)
- (8) Solar cells are made of a special type of material called semiconductor such as
 - (a) silicon
 - (b) uranium
 - (c) borosilicate
 - (d) hydrogen
- (9) of the following is eco-friendly energy resource.
 - (a) Coal
 - (b) Hydroelectric power
 - (c) Fossil fuel
 - (d) Atomic energy

- (10) Which is the most abundant and renewable energy?
 - (a) Thermal power
 - (b) Solar energy
 - (c) Fossil fuels
 - (d) Atomic power
- (11) What are the two technologies for harnessing solar energy?
 - (a) Solar photovoltaics and solar thermal
 - (b) Solar cooker and solar lamp
 - (c) Heat capturing and Heat conversation
 - (d) Active and passive technologies
- (12) Which of the following is used in solar cooker to harvest the solar energy?
 - (a) Solar panels
 - (b) Silicon cell
 - (c) Mirrors
 - (d) Glass lid
- (13) Which of the following is not the source of green energy?
 - (a) Wind
 - (b) Natural gas
 - (c) Sunlight
 - (d) Fossil fuel
- (14) The solar lamp uses the energy.
 - (a) Heat
 - (b) Wind
 - (c) Light
 - (d) Sound
- (15) Water reservoir possesses energy.
 - (a) nuclear
 - (b) thermal
 - (c) kinetic
 - (d) potential

(Nov. '20)

Ans. (1 – b); (2 – a); (3 – c); (4 – d); (5 – c); (6 – b); (7 – b); (8 – a); (9 – b); (10 – b); (11 – a); (12 – c); (13 – d); (14 – c); (15 – d).

Q. 2 State whether the following statements are true or false with proper explanation :

- (1) In thermal power plants, the turbines work on solar energy.
- (2) How to dispose the nuclear waste safely is a big challenge before the scientists.
- (3) The efficiency of power generation using coal plant is higher than that of power generation plant based on natural gas.
- (4) Energy obtained from nuclear fission is eco-friendly.
- (5) In hydroelectric power plant, the kinetic energy in water stored in dam is converted into potential energy of water.

- (6) The turbine is connected to electric generator, therefore the magnet rotates and electric energy is thus produced.
- (7) Use of energy is unavoidable in our daily life, but we must use it carefully and only in the required amount.
- (8) The machine which converts the potential energy of wind to electrical energy is called wind-turbine.
- (9) The potential difference available from a solar cell is independent of its area.
- (10) The power available from the solar cells is AC.
- Ans.** (1) **False.** (In thermal power plant, the turbines work on steam. The turbines working on solar energy are not used.)
- (2) **True.** (Nuclear waste disposal is the greatest problem. It produces highly toxic effects in any ecosystem. Therefore, disposing such radioactive substances becomes a major challenge.)
- (3) **False.** (The efficiency of power generation using natural gas plant is higher than that of power generation plant based on coal.)
- (4) **False.** (Energy obtained from nuclear fission is not eco-friendly, because if accidents happen it leads to hazardous accidents.)
- (5) **False.** (In hydroelectric power plant, the potential energy in water stored in dam is converted into kinetic energy of water. The forceful downpour of flowing water causes this kinetic energy.)
- (6) **True.** (The rotating wheels of turbine cause mechanical energy. This energy helps to produce electrical energy.)
- (7) **True.** (The energy supply for everyday use results into lot of pollution. This causes harmful effects in the surrounding environment. Therefore, energy should be used in minimal amount and with great care.)
- (8) **False.** (When wind blows, the kinetic energy is present in it. This kinetic energy is converted into electricity. The flowing wind never has a potential energy.)

(9) **True.** (The potential difference available from a solar cell is independent of its area. However, it is dependent on the way in which solar cells are connected.)

(10) **False.** (The power available from solar cells is always DC while the domestic appliances that we use work on AC.)

Q. 3 Match the columns :

(1) Column I	Column II
(1) Polluting energy	(a) Soot particles
(2) Eco-friendly energy	(b) Thermal energy

Ans. (1) Polluting energy – Thermal energy.
(2) Eco-friendly energy – Wind energy.

(2) Column I	Column II
(1) Pollutants	(a) Wind energy
(2) Hazard to ecosystem	(b) Thermal energy

Ans. (1) Pollutants – Soot particles.
(2) Hazard to ecosystem – Nuclear energy.

(3) Type of energy	Problem
(1) Nuclear energy	(a) Rehabilitation of displaced people
(2) Natural gas	(b) Rainy season and darkness (c) Limited reserves (d) Disposal of wastes

Ans. (1) Nuclear energy – Disposal of wastes.
(2) Natural gas – Limited reserves.

(4) Type of energy	Problem
(1) Solar energy	(a) Rehabilitation of displaced people
(2) Hydroelectric energy	(b) Rainy season and darkness (c) Limited reserves (d) Disposal of wastes

Ans. (1) Solar energy – Rainy season and darkness.
(2) Hydroelectric energy – Rehabilitation of displaced people.

Q. 4 Find the odd one out :

- (1) Kudankulam, Tarapur, Ravatbhabha, Anjanvel
- (2) Samaralkota, Kudankulam, Bavanaa, Kondapalli
- (3) Tehari, Koyana, Srishailam, Tarapur
- (4) Edible oil, crude oil, LPG, CNG
- (5) Hydroelectric energy, Solar energy, Nuclear energy, Wind energy

Ans. (1) **Anjanvel.** (All others are places having nuclear power plants.)

(2) **Kudankulam.** (All others are places having power plants based on natural gas.)

(3) **Tarapur.** (All others are places having hydroelectric projects.)

(4) **Edible oil.** (All others are fossil fuels.)

(5) **Nuclear energy.** (All others are eco-friendly green energy types.)

***Q. 5** Questions based on tables :

- Remake the table taking into account relation between entries in three columns :

I	II	III
Coal	Potential energy	Wind electricity plant
Uranium	Kinetic energy	Hydroelectric plant
Water reservoir	Nuclear energy	Thermal plant
Wind	Thermal energy	Nuclear power plant

Ans.

I	II	III
Coal	Thermal energy	Thermal plant
Uranium	Nuclear energy	Nuclear power plant
Water reservoir	Potential energy	Hydroelectric plant
Wind	Kinetic energy	Wind electricity plant

***Q. 6** Explain the difference :

(1) Conventional and Non-conventional Sources of energy.

Conventional Sources of energy	Non-conventional Sources of energy
1. Conventional sources of energy are largely polluting, they release lot of carbon through its emissions.	1. Non-conventional sources of energy are not polluting, They do not release carbon or other toxic gases.
2. Conventional sources of energy are not eco-friendly.	2. Non-conventional sources of energy are eco-friendly.
3. The fuels produced from the conventional sources of energy are comparatively costlier.	3. The energy obtained from the non-conventional sources of energy are comparatively cheaper.
4. Conventional energy power plants require less area and its management cost is also less.	4. Non-conventional energy power plants require more area and its management cost is also more.
5. Conventional source of energy are non-renewable.	5. Non-conventional source of energy are renewable.
6. Conventional sources of energy are in the form of limited reserves. After few years they will be completely over. e.g. Fossil fuels, coal, crude oil, diesel, petrol, natural gas, etc.	6. Non-conventional energy sources are in abundance on the earth. They are persistent and sustainable. Thus they will not get over. e.g. Solar energy, wind energy, etc.

(2) Thermal electricity generation and Solar thermal electricity generation.

Thermal electricity generation	Solar thermal electricity generation
<ol style="list-style-type: none">1. After burning the coal, the heat that is produced is used in the generation of thermal electricity.2. For producing heat, the coal is burnt in the boilers.3. The combustion of coal produces heat. This heat converts water into steam, which is under very high temperature and pressure. By its force the turbines move. The turbines in turn are connected to generator which rotates and produces energy.4. Thermal energy is polluting and not eco-friendly.5. The fuel here is coal, its reserves are limited.	<ol style="list-style-type: none">1. Solar radiations are used in solar thermal electricity production.2. For production of heat, many reflectors are used which reflect the radiations of the sun into the absorbent.3. Sun's heat convert the water into steam that rotates the turbine. The turbines then rotate the generators. This generates the electricity.4. Solar energy is not polluting, it is eco-friendly.5. The solar radiations are in abundance and are sustainable and persistent.

Q. 7 Explain with diagram step-by-step energy conversion in :

***(1) Thermal power plant :**

Ans. (See Fig. no. 5.3 from this chapter.)

In thermal power plant the turbines are rotated using steam. Here the coal is burnt. The heat energy liberated from this burning is used to heat the water in the boiler. This water produces steam of very high temperature and pressure. The kinetic energy in the steam rotates the turbines. The rotation of turbines produces its own mechanical kinetic energy. The generators connected to turbines produce electrical energy. The steam is condensed in a condenser and converted back into water. In this way in thermal power plant, thermal energy to kinetic energy, kinetic energy into mechanical energy and mechanical energy to electrical energy, are the conversions that take place.

***(2) Nuclear Power Plant :**

Ans. (See Fig. no. 5.5 from this chapter.)

In nuclear power plant, the energy is released by fission of nuclei of atoms like Uranium or Plutonium. This energy is used to generate the steam of high temperature and high pressure. The kinetic energy in the steam rotates the turbine. The turbine in turn drives the generator to produce electricity.

***(3) Hydroelectric power plant :**

Ans. (See Fig. no. 5.9 from this chapter.)

In hydroelectric plant the water stored in the reservoir is used as a source of potential energy. This water is made to fall at a great speed and hence there is production of kinetic energy in flowing water. This fast flowing water falling down from the reservoir is brought to the turbine at the lower levels. The kinetic energy of the flowing water in turn drives the turbine. The turbine then drives the generator and electrical energy is produced.

***(4) Solar thermal power plant :**

Ans. (See Fig. no. 5.16 from this chapter.)

Solar radiation is used to produce thermal energy. For this purpose, many reflectors are used which concentrate the solar radiation on absorbers.

The heat energy created due to solar radiations is used to make steam. The steam possesses kinetic energy. This kinetic energy drives turbine and generator. The electrical energy is thus created from this kinetic energy.

(5) Power plant based on natural gas :

Ans. (See Fig. no. 5.6 from this chapter.)

In a power plant based on natural gas, there are three main sections of the plant. There is combustion chamber with compressor in which the steam under

pressure is introduced. The natural gas burns in the presence of air in this combustion chamber. This results in a production of a gas which is at very high temperature and pressure. This generated gas from the chamber runs the turbine. The kinetic energy of the turbine drives the generator. The generator produces electrical energy.

(6) Power plant based on wind energy :

Ans. (See Fig. no. 5.11 from this chapter.)

Wind energy is used for moving turbines. The wind with specific speed is used to rotate the large fins of wind turbine. The kinetic energy in these fins is transferred to generator which then produces electrical energy.

Q. 8 Give scientific reasons :

***(1) The construction of turbine is different for different types of power plants.**

Ans. (1) Generators work on the principles of electromagnetic induction. (2) For this the generator must be rotated. (3) For this purpose, there is a turbine for each generator. (4) This rotation needs energy. The turbines are different according to the type of energy source that is used for its rotation. (5) Therefore, the construction of turbine is different for each power plant.

***(2) It is absolutely necessary to control the fission reaction in nuclear power plants.**

Ans. (1) Nuclear fission reaction is a type of chain reaction. (2) In nuclear power plants these reactions are closely controlled. (3) If these reactions are not managed properly, there can be more production of neutrons in an uncontrolled way. (4) Each released neutron further causes fission of 3 Uranium (U-235) atoms, such uncontrolled reactions can cause hazardous accidents, hence it is absolutely necessary to control the fission reaction in nuclear power plants.

***(3) Hydroelectric energy, solar energy and wind energy are called renewable energies.**

(July '19; March '20; Nov. '20)

Ans. (1) Hydroelectric energy, solar energy and wind energy is obtained respectively from flowing

water, solar radiations and flowing wind. (2) These sources, i.e. water reservoirs, sun and the wind are inexhaustible and sustainable. They will not be finished. (3) On the contrary, the conventional energy sources such as coal and fossil fuels have limited reserves. (4) They cannot be renewed and may get exhausted in future. Hydroelectric energy, solar energy and wind energy can be replenished and hence they are called renewable.

***(4) It is possible to produce energy from mW to MW using solar photovoltaic cells.**

Ans. (1) Solar panels can be constructed by connecting solar photovoltaic cells in either series or in parallel. (2) The combinations are done in such a way that it can give the desired potential difference and the current. (3) Solar strings are then made by joining solar panels in a series. (4) When solar strings are joined in parallel; they form solar array. (5) Therefore, by proper combinations, it becomes possible to produce energy from mW to MW using solar photovoltaic cells.

Q. 9 Explain the following sentences :

***(1) Energy obtained from fossil fuels is not green energy.**

Ans. Fossil fuels like petrol, diesel or natural gas when burnt, emit toxic gases and soot particles. Thus, fossil fuels cause air pollution. Burning of fossil fuels cause increased levels of carbon dioxide, carbon monoxide and nitrogen dioxide. The increased carbon dioxide emission results in global warming. Nitrogen oxide results later in acid-rain. Soot particles generated through burning of fuels cause respiratory problems like asthma.

Moreover, the fossil fuels are non-renewable and exhaustible fuels. They have to be explored from the deeper layers of the earth causing lots of environmental problems. Green energy is sustainable, renewable and abundant. It never creates any environmental problems and is non-polluting.

Thus, energy obtained from fossil fuels is not at all a green energy.

***(2) Saving energy is the need of the hour.**

Ans. In modern civilization, continuous energy supply is needed for the technology and development. The energy has become a basic need for man. Most of the energy used in India is obtained from thermal power plant. For this energy generation, various fuels are used. The coal and fossil fuels are limited. Due to over-exploitation, these reserves are getting fast depleted. Use of fossil fuels is also resulting in pollution and climate change. Nuclear energy can be very hazardous. Lot of research is being done in the field of green energy, but the tremendous human population always is in need of more energy. Therefore, each and every person should save the energy, as saving energy is the need of the hour.

Q. 10 Answer the following questions in detail :

***(1) Which fuel is used in thermal power plant? What are the problems associated with this type of power generation?**

Ans. (1) The fuel used in the thermal power plant is coal. Coal contains chemical energy. Upon burning it releases heat energy. This heat is used for generation of electricity in the thermal power plants.

(2) Problems associated with power generations by thermal power plant :

(a) **Air pollution :** Due to burning of coal, there is emission of carbon dioxide, carbon monoxide, sulphur dioxide and nitrogen dioxide gases. These are harmful and toxic to health.

(b) Soot particles emitted during combustion can cause severe respiratory problems such as asthma.

(c) The coal reserves in the world are limited. They will be finished in next few hundred years and will not be replenished later. The scarcity of coal would result in energy crisis.

***(2) Other than thermal power plant, which power plants use thermal energy for power generation? In what different ways is the thermal energy obtained?**

Ans. (1) The power plant based on natural gas and the nuclear power plants also used thermal energy for the power generation. Apart from these, solar energy is also used to produce heat and thereby create the power.

(2) In nuclear power plant, the energy is released by carrying out fission of nuclei of atoms like Uranium or Plutonium. This energy is used to generate the steam of high temperature and high pressure. The steam rotates the turbine. The kinetic energy in steam drives the turbine and turbine in turn drives the generator.

(3) The combustion of natural gas produces gas, which is used to run the turbine. This gas is under high pressure and high temperature. This is used to produce thermal energy.

(4) In solar thermal power plant, thermal energy is generated with the help of solar radiation. For this reflectors and absorbers are used for concentrating solar radiation and converting it into thermal energy.

***(3) What is meant by green energy? Which energy sources can be called green energy sources and why? Give examples.**

Ans. (1) Green energy means eco-friendly form of energy which does not cause environmental problems and are non-exhaustible, perpetual and sustainable.

(2) These sources of energy do not produce toxic gases or other pollutants, therefore they are safe.

(3) Examples of green energy : (i) Hydroelectric energy (ii) Wind energy (iii) Solar energy (iv) Energy obtained biofuels.

***(4) Give your opinion about whether hydroelectric plants are environment-friendly or not?**

Ans. (1) Hydroelectric plants are advantageous in some respect while in some aspects it does create problems.

(2) Hydroelectric power generation does not need burning of fuels. Therefore, there is no problem regarding combustion of fuels and release of toxic pollutants.

(3) Electricity can be obtained as and when required if there is enough water in the reservoir.

(4) Water is replenished every time when there is sufficient rainfall.

(5) All the above facts give an impression that hydroelectric power generation is eco-friendly but it is not.

(6) Many villages and settlements are submerged when a dam and reservoir is constructed. The displaced people are given re-settlement, but it causes lot of emotional trauma to people.

(7) Biodiversity is affected as forest lands is submerged. The river flow is obstructed by the dam which affects the aquatic organisms residing in such water.

(8) Due to excessive pressure of water on land, it is said that the region gets prone to earthquakes.

(5) What are the advantages of hydroelectric power generation? (March '19; Nov. '20)

Ans. (1) Hydroelectric energy does not cause pollution.

(2) Generation of hydroelectric energy does not involve burning of fossil fuel.

(3) If sufficient water storage is available then electricity generation can be done as per requirement.

(4) Rainwater can replenish the water storage and power generation can thus be done uninterrupted.

(6) How is nuclear fission reaction carried out in nuclear power plants?

Ans. (1) In nuclear power plants neutrons are bombarded on atom of Uranium - 235.

(2) This causes conversion of Uranium - 235 into its isotope U - 236.

(3) U - 236 is very unstable and thus forms atoms of Barium and Krypton by nuclear fission. This forms 3 neutrons and 200 MeV energy.

(4) In a similar way three more Uranium - 235 atoms are subjected to nuclear fission which then releases energy.

(5) The neutrons released are again used for further nuclear fission reactions. In this way nuclear fission reactions are carried out in controlled manner in nuclear power plants.

***(7) How can we get the required amount of energy by connecting solar panels?**

Ans. (1) The photovoltaic solar cells can be connected in a series or in parallel to make a solar panel.

(2) When solar cells are connected in a series, the potential difference of individual cells are added in the combination, however the currents from individual cells are not added.

(3) When solar cells are connected in parallel, the currents of the individual cells are added in the combination, but the potential differences from individual cells are not added.

(4) Through such connections the required potential difference and current can be obtained.

(5) Many such solar panels are connected in series and in parallel to generate required current and potential difference.

(6) When many solar panels connected in series they form a solar string. Many solar strings connected in parallel make a solar array. In such manner we can get the required amount of energy by connecting solar panels.

***(8) What are the advantages and limitations of solar energy?**

Ans. I. Advantages :

(1) While generating the power through solar radiations, no fuel is burnt.

(2) Solar energy generation thus does not create any type of pollution. The technology can be completely utilized in regions with abundant sunlight.

(3) Solar energy is eco-friendly, green energy.

II. Limitations :

(1) Sunlight is available only during day time. Thus solar cells can generate power only during day.

(2) In rainy season and in cloudy conditions, solar power generation suffers.

(3) The power present in the solar cells is DC while most of the domestic equipments work on AC.

*(9) Which type/types of power generation involve maximum number of steps of energy conversion? In which power generation is the number minimum?

Ans. The steps of energy conversion are maximum in the thermal power generation. They are minimum in wind energy generation.

(10) Use your brain power!

(Textbook page no. 54)

The schematic of hydroelectric plant is shown in Figure 5.17 on textbook page no. 54. Water from about middle of the total height of the dam is taken to the turbine, as shown by point B in the diagram.

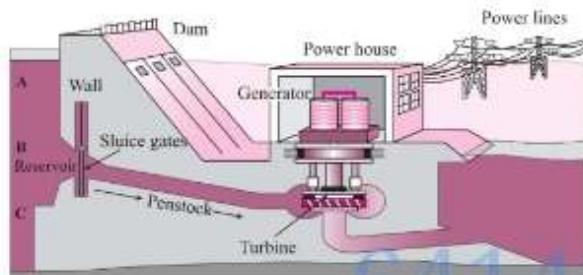


Fig. 5.17 : Schematic of Hydroelectric plant

(i) With reference to point B, potential energy of how much water reservoir in the dam will be converted into kinetic energy?

Ans. When the sluice gate at point B is opened, the water from reservoir will start flowing. The potential energy of the stored water will become kinetic energy of the quantity of water that is let out through the sluice gates.

(ii) What will be the effect on electricity generation, if the channel taking water to turbine starts at point A?

Ans. If the channel taking water to turbine starts at point A, then the water will flow with a greater speed. Since point A is at height, water will acquire speed. This will result into more efficient rotation of the blades of turbine. The electricity generation will thus become more efficient.

(iii) What will be the effect on electricity generation, if the channel taking water to turbine starts at point C?

Ans. If the channel taking water to turbine starts

at point C, it will affect the electricity generation adversely. Point C is on the lower height as compared to the channel that carries water to the turbine. The flow of the water thus will be affected resulting into improper rotation of blades of turbine. This will certainly affect the electricity generation.

(11) Draw schematic of power plant based on natural gas and answer the following questions :

(July '19)

(a) At which place natural gas power plant is situated in Maharashtra?

(b) How is pollution reduced in natural gas based power plant?

(c) Give two examples of eco-friendly electricity process.

Ans. (a) Natural gas power plant is situated at Anjanvel in Maharashtra.

(b) Natural gas does not contain sulphur. Burning of such natural gas does not produce pollution.

(c) Solar energy and wind energy are two examples of eco-friendly energy.

(For schematic representation of power plant based on natural gas refer to Fig. 5.25 in this chapter.)

Q. 11 Write short note on :

*Electrical energy generation and Environment.



Ans. The energy obtained through the fossil fuels as well as nuclear energy can cause degradation of the environment. If such energy sources are used, they can cause harm to the environment.

(1) The burning of fossil fuels cause air pollution. The incomplete combustion of fossil fuels cause release of carbon monoxide. Some more toxic gases and soot particles cause various respiratory diseases. The carbon dioxide produced is creating global warming and climate change. The nitrogen dioxide released through burning is responsible for acid rains.

(2) Fossil fuels are limited. They are getting fast depleted. It has taken millions of years for the fossil fuels to form. The exploration of such fuels also cause environmental degradation and marine pollution too.

(3) In production of nuclear energy, there is a great risk of accidents. The safe disposal of nuclear waste is also a problem.

(4) Hydroelectric power from water reservoirs, wind power from wind, solar energy from sun and electricity from biofuels are eco-friendly alternatives.

Q. 12 Complete the paragraph by choosing the appropriate words given in the brackets :

(*marginal, array, cell, panel, string, current, power station, potential difference*).

Many solar panels are connected in series and in parallel to generate required and Solar is the basic unit in solar electric plant. Many solar cells come together to form a solar Many solar panels connected in series form a solar , and, many solar strings connected in parallel form a solar As we can obtain as much electrical power as needed, they are used in applications which need power (e.g. calculators that run on solar energy) to of MW capacity.

Ans. Many solar panels are connected in series and in parallel to generate required current and potential difference. Solar cell is the basic unit in solar electric plant. Many solar cells come together to form a solar panel. Many solar panels connected in series form a solar string, and, many solar strings connected in parallel form a solar array. As we can obtain as much electrical power as needed, they are used in applications which need marginal power to power station of MW capacity.

Q. 13 Read the paragraph and answer the questions given below :

(1) Renewable energy is energy produced from sources that do not deplete or can be replenished within a human's life time. The most common examples include wind, solar, geothermal, biomass, and hydroelectric power. This is in contrast to non-renewable sources such as fossil fuels. Most renewable energy is derived directly or indirectly from the sun. Sunlight can be captured directly using solar technologies. The sun's heat drives

winds, whose energy is captured with turbines. Plants also rely on the sun to grow and their stored energy can be utilized for bioenergy. Not all renewable energy sources rely on the sun. For example, geothermal energy utilizes the Earth's internal heat, tidal energy relies on the gravitational pull of the moon, and hydroelectric power relies on the flow of water.

Questions and Answers :

(1) What is renewable energy ?

Ans. Renewable energy is energy that is produced from sources which will not get exhausted within a human's life time.

(2) Give the examples of renewable energy.

Ans. Wind, solar, geothermal, biomass and hydroelectric power are some examples of renewable energy.

(3) Why will energy from fossil fuel be over soon ?

Ans. Fossil fuels are exhaustible in their amount. We have been using these extensively in the past 100 years and hence it may get over soon. It is a non-renewable resource.

(4) Name the renewable sources of energy which are not dependent on sun. What are they dependent upon ?

Ans. Geothermal energy, tidal energy and hydroelectric power are renewable energy resources which are not dependent on sun. Geothermal energy utilizes the Earth's internal heat, tidal energy relies on the gravitational pull of the moon, and hydropower relies on the flow of water.

(5) Which type of energy do we mostly use in India?

Ans. The most used energy resource is coal, i.e. fossil fuel based energy followed by hydroelectric energy.

(2) Read the information given below and solve the questions based on it.

Electric energy is produced in various ways like hydroelectric, wind power, solar energy, bio-fuel, etc. These energy sources are inexhaustible, sustainable. Besides, it does not cause any environmental problem.

Questions and Answers :

(1) Above information is about which type of energy?

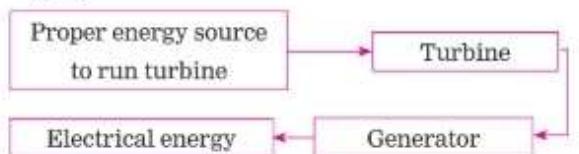
Ans. From the above information, we understand about green energy.

(2) Whether the fossil fuel is an example of this energy?

Ans. Fossil fuels are not green energy.

(3) Draw the flow chart of production of electric energy.

Ans.



Q. 14 Diagram based questions :

*(1) Energy transformation in solar thermal electric energy generation.

Ans. (See Fig. no. 5.16.)

*(2) One solar panel produces a potential difference of 18 V and current of 3A. Describe how you can obtain a potential difference of 72 Volts and current of 9 A with a solar array using solar panels. You can use sign of a battery for a solar panel.

Ans. Given Potential difference is 18 V and current is 3A. The requirement is potential difference of 72 V and current is 9A. Voltage remains the same if connected in parallel and gets added if they are connected in series. Current remains the same if connected in series but adds if connected in parallel.

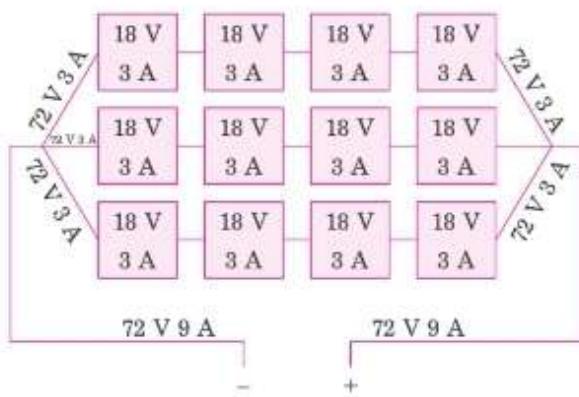


Fig. 5.18 : Solar array

(3) Observe the connections of cells shown in the following images :

(i) Which connection will give maximum potential difference?

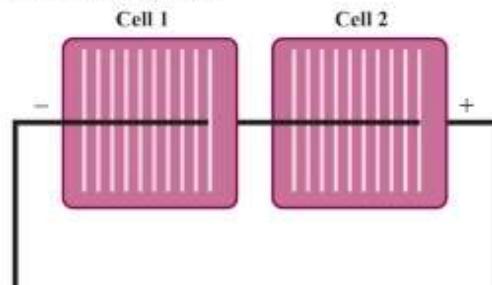


Fig. 5.19 (a)

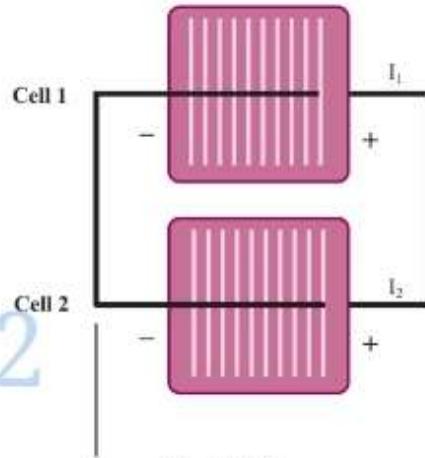


Fig. 5.19 (b)

Ans. The solar cells shown in the diagram 5.19 (a) are connected in series. This gives maximum potential difference.

(ii) Give one advantage and one disadvantage of this energy.

Ans. Advantage of Solar energy : Solar energy is eco-friendly which does not create pollution. It is boundless source.

Disadvantage of solar energy : Solar energy is available only when sun is in the sky. Therefore, it has to be stored in batteries.

(4) Answer the following questions :

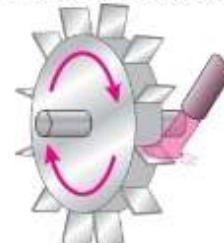


Fig. 5.20

(a) Write the name of the device shown in the above diagram.

Ans. Steam turbine is the device shown in the above diagram.

(b) Write briefly the work of this device.

Ans. Turbine is a device with the blades. When the flow of liquid or gases is directed on the blades of the turbine, they rotate. The rotation produces

kinetic energy. This turbine is then used to rotate the magnet in the electric generator. For this purpose, turbines are connected with the generators. The magnets rotate and produce electric energy by electromagnetic induction. The turbines working on steam are used in large commercial power generation plants.

*** (5) Draw a Schematic diagram of Solar thermal electric energy generation :**

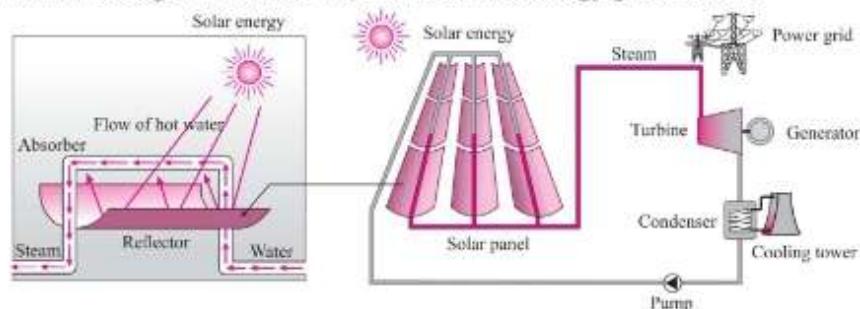


Fig. 5.21 : Solar thermal electric energy generation

(6) Label the given diagram of Electromagnetic induction :

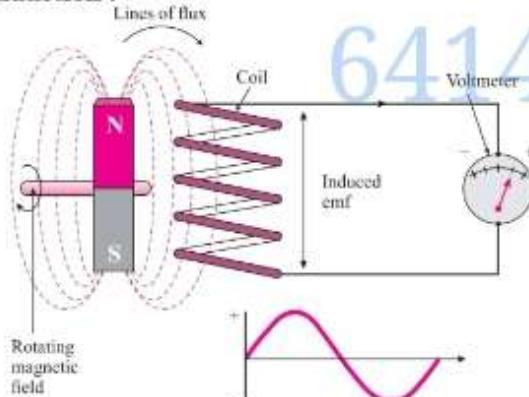


Fig. 5.22 : Electromagnetic induction

(7) Answer the questions with the help of picture.

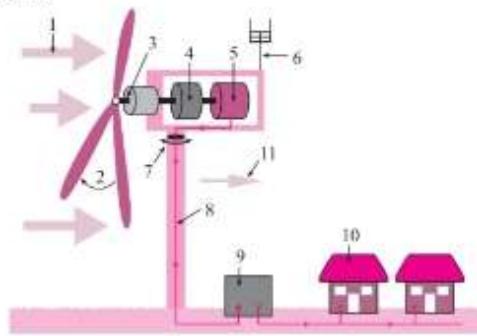


Fig. 5.23

(a) Which type of energy is produced?

(b) This power plant is based on which energy source.

(c) Is this power plant eco-friendly? How?

Ans. (a) In the picture, it is shown that using wind energy electricity is produced.

(b) The power plant shown here is based on kinetic energy of wind which is converted to electric energy by utilizing kinetic energy from rotating turbines.

(c) This power plant is eco-friendly because it does not cause pollution. Wind energy is green energy which is non-exhaustible and perpetual.

(8) Observe the figure and answer the questions given below.

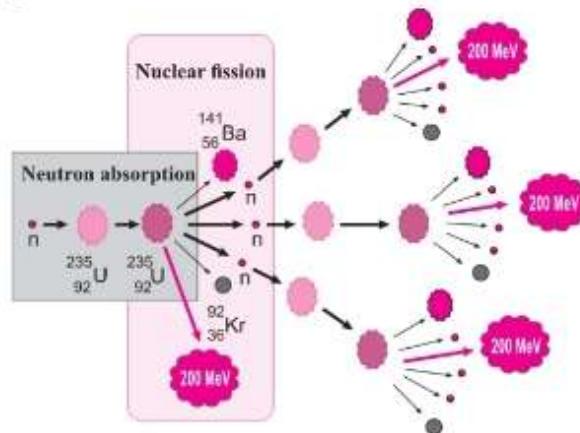


Fig. 5.24 : Nuclear fission

(a) Name the reaction.

Ans. The reaction shown in nuclear fission or chain reaction.

(b) Where is this reaction used?

Ans. This reaction is used in nuclear power plants where electricity is generated.

(c) Which element is used in it?

Ans. Uranium-235 is used in the nuclear fission reactions.

OR

Identify the process shown in figure and name it. *(March '19)*

Ans. The above figure shows nuclear fission chain reaction of Uranium - 236.

(9) Observe the diagram and answer the questions : *(March '19)*

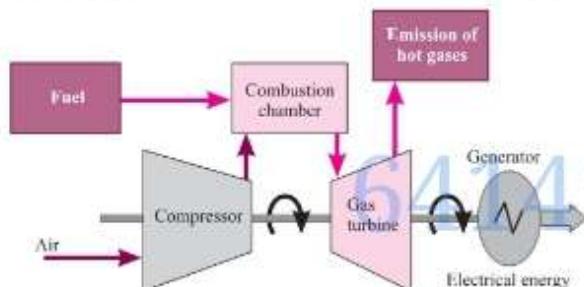


Fig. 5.25

(a) Which energy is generated from the power plant?

Ans. The diagram shows electricity generated from natural gas.

(b) State its source.

Ans. The energy is generated from natural gas.

(c) Which is more eco-friendly – Power generation from coal or Power generation from natural gas? Why?

Ans. Power generation from natural gas is more eco-friendly. Natural gas does not contain sulphur and hence its burning does not cause major pollution by forming sulphur dioxide. The efficiency of power generation by natural gas is also high.

(10) Write the names of apparatus that is used in thermal power plant.

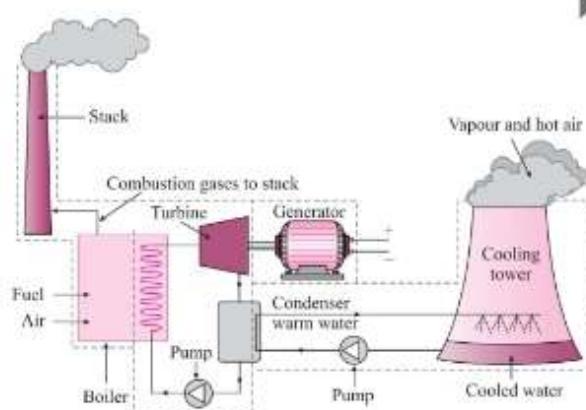


Fig. 5.26 : Thermal power plant

(11) Label correctly the diagram of Nuclear power plant :

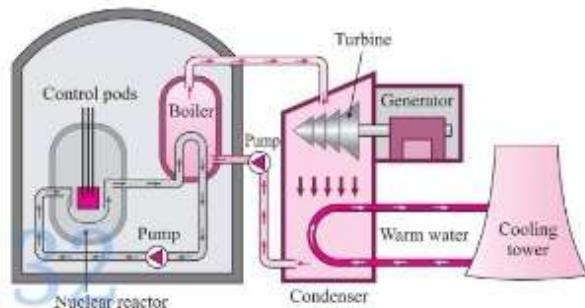


Fig. 5.27 : Nuclear power plant

(12) Label correctly the diagram of power plant based on natural gas :

(Refer to Fig. 5.25)

(13) Label correctly the structures seen in Windmill :

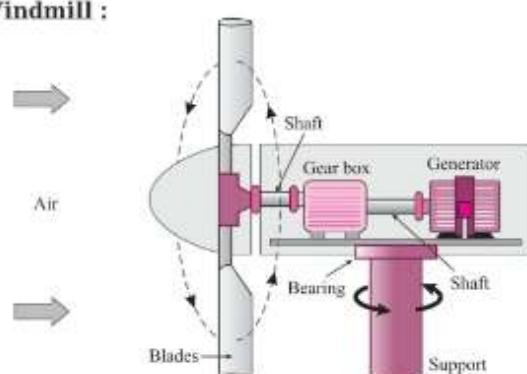


Fig. 5.28 : Windmill

(14) Sketch two ways in which solar cells can be connected. Also draw the diagrams to show the arrangement of solar cells to form solar panel and solar array.

(a) **Solar cells in series :** (Refer to Fig. 5.13)

(b) **Solar cells in parallel :**

(Refer to Fig. 5.14)

(c) **Solar panel :**

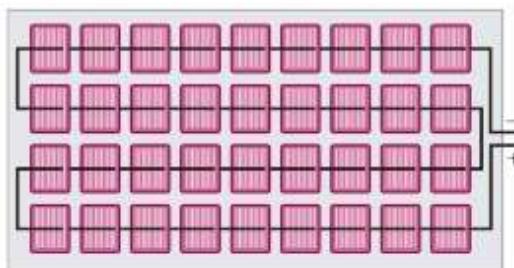


Fig. 5.29 : Solar panel

(d) **Solar array :**

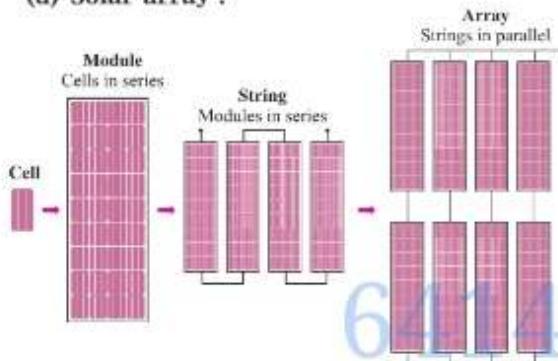


Fig. 5.30 : Solar array

(15) Observe the figure given below and answer the given questions :

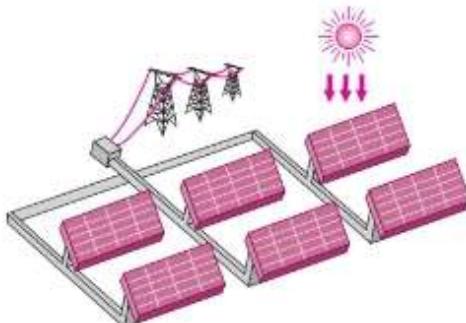


Fig. 5.31

(a) Identify the type of energy generation process shown in this picture.

(b) Name any four equipments which use this type of energy.

Ans. (a) In this figure solar energy is converted into electrical energy. Solar energy is also called clean energy.

(b) Solar energy is used in following equipment :

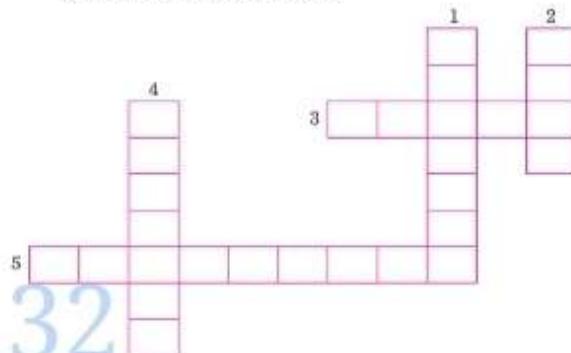
(i) Solar cooker (ii) Solar heater

(iii) Calculator (iv) Solar Photovoltaic cell.

Q. 15 Activity-based Questions :

* (1) **Solve the following crossword puzzle.**

- (1) Maximum energy generation in India is done using energy.
- (2) energy is a renewable source of energy.
- (3) Solar energy can be called energy.
- (4) energy of wind is used in windmills.
- (5) energy of water in dams is used for generation of electricity.



Ans. (1) Thermal (2) Wind (3) Clean (4) Kinetic
(5) Potential.

(2) **Make a table :** (Textbook page no. 47)

Make a table based on forms of energy and corresponding devices. (March '20)

Forms of energy	Devices based on this type of energy
(1) Electric	Electric iron, Geyser, Heater, Oven, Refrigerator, Fans, Lights, Elevator.
(2) Mechanical	Sewing machine, Car, Bicycle, Different machines.
(3) Thermal	Chulha, Furnace, Steam engine
(4) Solar	Solar cooker, Solar heater.

(3) **Let's Think :** (Textbook page no. 52)

Which electricity generation process is eco-friendly and which not?

Ans. Electricity generated through solar energy and wind energy are truly eco-friendly. Though it is said that hydroelectricity is non-polluting and eco-friendly,

it is not true. Hydroelectric project cause destruction of biodiversity and displacement of the local people. Thermal energy, nuclear energy and energy obtained through natural gas are not at all eco-friendly.

(4) Find out : (Textbook page no. 55)

What is lake tapping? Why it takes place?

Ans. A lake tap involves excavating a tunnel at the bottom of the lake. Dynamites are planted therein and blasted carefully. The water flows with greater

force through the tunnel after such blasting is done. This increased flow of water is then driven to the hydroelectric power generation plant for increased electricity production. This technique is done to establish waterways for hydropower, for making drinking water available, for irrigation water purposes and also for the landing of oil and gas pipes from offshore fields.

(5) Get information : (Textbook page no. 56)

Get information about major wind-power stations in India and their capacity. Make a table of their location, state and their power generation capacity in MW.

Location	State	Power generation capacity in MW
Muppandal, Kanyakumari	Tamil Nadu	7,684.31
Dhule, Satara, Sangli, Dhalgaon	Maharashtra	4,664.08
Bhuj	Gujarat	4,227.31
Dangiri Wind Farm Jaisalmer Wind Park	Rajasthan	4,123.35
Jogmatti BSES	Karnataka	3,082.45
Bhopal at Nagda Hills near Dewas	Madhya Pradesh	2,288.60
Tirumala hills	Andhra Pradesh	1,866.35
	Telangana	98.70
Kanjikode in Palakkad	Kerala	43.50
	Others	4.30
	Total	28,082.95

(6) Find out : (Textbook page no. 58)

Gather information about major solar photovoltaic power generating plants and their capacity in India.

List of solar power stations :

Name	Location	State	Capacity (MW)	Commissioned
Azure Power - Sabarkantha	Khadoda village	Gujarat	10	2011
Bitta Solar Power Plant (Adani Power)	Bitta, Kutch District	Gujarat	40	2012
Charanka Solar Park	Charanka village, Patan district	Gujarat	221	2012
CIAL Solar Power Project	Kochi	Kerala	13	2013
Dhirubhai Ambani Solar Park	Pokhran	Rajasthan	40	2012
Green Energy Development Corporation Ltd (GEDCOL)	Manamunda	Odisha	50	2014

Name	Location	State	Capacity (MW)	Commissioned
Green Infra Solar Energy Limited	Rajkot	Gujarat	10	2011
Kamuthi Solar Power Project	Kamuthi	Tamil Nadu	648	2016
Mithapur Solar Power Plant (Tata Power)	Mithapur	Gujarat	25	2012
Moser Baer	Patan	Gujarat	30	2011
Neyveli Solar Power Project	Neyveli	Tamil Nadu	130	2018
NTPC Limited	Kaniha	Odisha	10	2014
ReNew Power	Dichpally, Nizamabad	Telangana	143	2017
Tata Power	Patapur, Mulshi, and Osmanabad	Odisha, Maharashtra	1	2011
Waa Solar Power Plant (Madhav Power)	Surendranagar	Gujarat	10	2011
Welspun Energy Rajasthan Solar Project	Phalodhi	Rajasthan	50	2013

PROJECTS

(1) Let's Discuss : (Textbook page no. 47)

Make a list of the work that we do in our day-to-day life using energy. Which forms of energy do we use to do this work? Discuss with your friends.

(2) Compare : (Textbook page no. 51)

Observe the schematic of thermal power plant and the nuclear power plant. Discuss what are the similarities and differences between the two.

(3) Use of ICT : (Textbook page no. 49)

Prepare a presentation about thermal power plant using computerized presentation, animation, video, pictures, etc. Send it to others and upload on YouTube.

(4) Internet is my friend : (Textbook page no. 51)

Complete the following table for some important nuclear power plants in India.

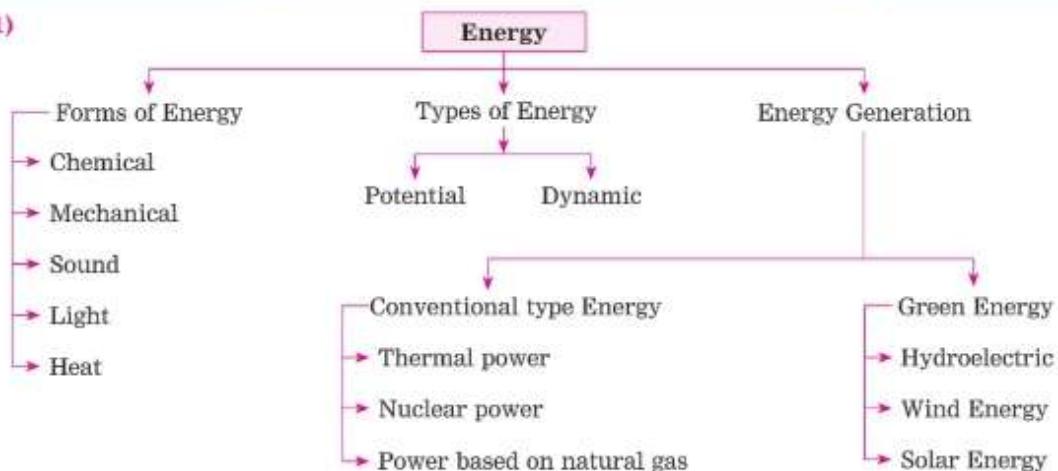
***(5) Gather information about solar light, solar water heating system and solar cooker.**

***(6) Gather information about a power plant near your locality by visiting the plant.**

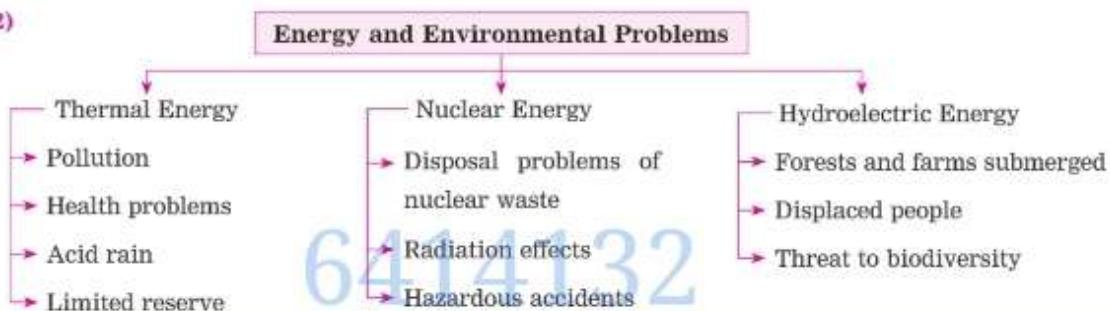
"Screenshot" does

MEMORY MAP/CONCEPT MAP

(1)



(2)



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this **QR Code** for the test and its model answers.



CHAPTER OUTLINE

6.1 History of animal classification

6.2 Systems of animal classification

6.3 Kingdom – Animalia

IMPORTANT POINTS

Can you recall? (Textbook page no. 61)

(1) Which criteria are used for classification of organisms?

Ans. The living organisms are classified according to their basic characteristics, such as presence or absence of nucleus, unicellular body or multicellular body, presence or absence of cell wall and the mode of nutrition in them.

(2) How are the plants classified?

Ans. The plants are classified according to the following basis : (1) Presence or absence of the organs. (2) Presence or absence of separate

conducting tissues for the conduction of food and water. (3) Presence or absence of seeds in plants. (4) Whether seeds are enclosed in fruits or not. (5) Number of cotyledons in seeds : one or two.

Classification :

1. There is great diversity among the animals on the earth. There are about 7 million species of different animals.
2. Depending upon the similarities and differences among these animals, they have been classified. Such systematic classification makes it easy to study the great diverse animal forms.

6.1 History of animal classification :**1. To summarize the history of classification**

Scientist/Taxonomist	Basis for classification	Method
Greek philosopher Aristotle Theophrastus, Pliny, John Ray, Linnaeus	Body size, habits and habitats	'Artificial method'
Dobzhansky and Meyer	Body organization, types of cells, chromosomes, bio-chemical properties	Natural system of classification
Carl Woese	Presence or absence of notochord	Method based on evolution Traditional method

2. Benefits of animal classification

- (1) By placing the animals in proper classified groups, their study becomes convenient.
- (2) By studying few animals from each group understanding the entire group becomes easy.
- (3) Animal classification leads to better understanding of animal evolution.

- (4) Identification of animals can be done with great accuracy.
- (5) The relationship of animals with other living organisms is better understood.
- (6) The habitat of each animal and it's exact role in the nature can be understood by learning animal classification.
- (7) Various adaptations of animals can be studied.

6.2 (A) Traditional method of animal classification :

- 1. Animal classification :** Formation of groups and sub-groups of animals by taking into account their similarities and differences is called animal classification.
- 2. The gross difference between non-chordates and chordates :**

Point of difference	Non-chordates	Chordates
Notochord	Absent	Present
Pharyngeal	Absent	Present
Gill slits		
Nerve cord	Ventral, solid and paired	Dorsal, hollow and single
Heart	Dorsally located	Ventrally located

3. Classification of Non-chordates into ten phyla :

- | | |
|---------------------------|---------------------|
| (1) Protozoa (Protista) | (2) Porifera |
| (3) Coelenterata/Cnidaria | (4) Platyhelminthes |
| (5) Aschelminthes | (6) Annelida |
| (7) Arthropoda | (8) Mollusca |
| (9) Echinodermata | (10) Hemichordata |

4. Chordates : All chordate animals belong to the single group which is called Chordata. Chordata has three subphyla, viz.

- (1) Urochordata
- (2) Cephalochordata
- (3) Vertebrata
- (4) Sub-phylum Vertebrata is further divided into following six classes as –
 - Cyclostomata
 - Pisces
 - Amphibia
 - Reptilia
 - Aves
 - Mammalia

5. Robert Whittaker has given five kingdom classification system. All the multicellular, heterotrophic organisms are included under kingdom Animalia or Animal kingdom.

According to this system the criteria for classification are as follows :

- | | |
|-----------------------|---------------------|
| (1) Body organization | (2) Body symmetry |
| (3) Body cavity | (4) Germinal layers |
| (5) Segmentation | |

6.2 (B) New (method) system of animal classification :

• Criteria for new system of classification :

- (1) Grades of organization :** Unicellular organisms have a single cell. But in multicellular animals there are many cells.

Grades of organization	Information	Examples
Protoplasmic grade organization	Body made up of only protoplasm.	Unicellular animals
Cellular grade organization	Many cells are present. But tissues are not formed.	Porifera
'Cell-tissue grade' organization	Cells performing similar function form the tissues. Tissues perform all body functions.	Cnidaria
'Tissue-Organ grade' organization	Tissues are organized to form some organs. But complete organ systems are not formed.	Flat worms
'Organ-system grade' organization	Different organs form organ system to perform specific functions in the body.	Human beings and all other higher animals.



(2) Body symmetry :

Body symmetry	Information	Examples
Asymmetrical	No imaginary axis can divide the body into two equal halves.	<i>Amoeba, Paramecium, some sponges</i>
Radial Symmetry	An imaginary cut passing through central axis in any plane of body, gives two equal halves. Thus, five different planes passing through central axis of body can divide the body into two equal halves.	Star fish and other echinoderms
Bilateral symmetry	Only one imaginary axis passing through the body divides it into two equal halves.	Insects, fishes, frog, birds, human.

(3) Germinal layers :

Condition of Germinal layers	Information	Examples
Diploblastic	Two germinal layers, ectoderm and endoderm present.	Coelenterata/Cnidaria
Triploblastic	Three germinal layers, ectoderm, mesoderm and endoderm present.	All other animals.

(4) Body cavity :

Condition of body cavity	Information	Examples
Eucoelomate	Body cavity present. During initial embryonic development period body cavity is formed from either mesoderm or gut.	All animal phyla from Annelida to higher phyla
Acoelomate	Absence of coelom.	Porifera, Cnidaria and Platyhelminthes.
Pseudocoelomate	Body cavity is present but it is not formed by the mesoderm or gut. Hence it is not true coelom.	Aschelminthes

(5) Segmentation : Segmentation is the phenomenon in which the body of animals is divided into segments which are small, similar units. Body with segments is segmented body. E.g. Phylum Annelida shows segmented bodied animals.

- For non-chordate phyla, refer to the chart.

6.3 Kingdom – Animalia

(1) Non-chordate animals :

Phylum	Body Symmetry	Germinal layers coelom	Habitat	Structure of body	Reproduction	Locomotion	Characteristics of phylum	Examples
Porifera	Asymmetrical	Acoelomate Cellular grade	Marine or fresh water Aquatic	Cylindrical, asymmetrical body. Many pores on body. Large osculum and smaller ostia.	<ul style="list-style-type: none"> • Asexual reproduction • Sexual reproduction • Capacity to regenerate 	<ul style="list-style-type: none"> • Sedentary • Attached to substratum. • Hence no locomotion. 	<ul style="list-style-type: none"> • Collar cells (Choanocytes - Spongin fibres, Spicules of CaCO_3 and Silica. 	<ul style="list-style-type: none"> • Sycon, Euspongia (Bath sponge) • Hyalonema, Euplectella.
Cnidaria or Coelenterata	Radially Symmetrical	Acoelomate Diploblastic	Mostly marine, few fresh water, Aquatic.	Cylindrical Polyp or Medusa	<ul style="list-style-type: none"> • Asexual • Sexual 	<ul style="list-style-type: none"> • Sedentary or free swimming 	<ul style="list-style-type: none"> • Cnidoblasts (Stinging cells) in tentacles. • Cnidoblasts inject toxin in body of prey. 	<ul style="list-style-type: none"> • Hydra, Sea-anemone, Portuguese man of war or Physalia, Jellyfish, Coral.
Platyhelminthes	Bilaterally Symmetrical	Acoelomate Triploblastic	Some free living, some parasitic, terrestrial or aquatic.	Slender, Leaf like flat bodies	<ul style="list-style-type: none"> • Bisexual animals • Sexual 	<ul style="list-style-type: none"> • Swimming 	<ul style="list-style-type: none"> • Flat body is a typical character. 	<ul style="list-style-type: none"> • Planaria, Liver fluke Tapeworm.
Aschelminthes	Bilaterally Symmetrical	Pseudocoelomate Triploblastic	Endoparasitic or free living	<ul style="list-style-type: none"> • Cylindrical, long thread like. • Unsegmented. 	<ul style="list-style-type: none"> • Unisexual animals • Sexual 	<ul style="list-style-type: none"> • Swimming 	<ul style="list-style-type: none"> • Non-segmented bodies with cuticle. 	<ul style="list-style-type: none"> • Ascaris (Round worm) • Filarial worm • Loa loa (Eye worm)
Annelida	Bilaterally Symmetrical	Coelomate Triploblastic	Free swimming, marine, terrestrial, few ectoparasitic.	Segmented body cylindrical	<ul style="list-style-type: none"> • Bisexual animals • Sexual 	<ul style="list-style-type: none"> • Setae, Parapodia and Suckers 	<ul style="list-style-type: none"> • Metameric segmentation • special cuticle over body. 	<ul style="list-style-type: none"> • Earthworm • Nereis, Leech.

Phylum	Body Symmetry	Germinial layers	Habitat	Structure of body	Reproduction	Locomotion	Characteristics of phylum	Examples
Arthropoda	Bilaterally symmetrical	Coelomate Triploblastic	Ranging from deepest oceans to highest mountains	Different types of body structures. Crabs and Prawns with hard exoskeleton, Worm like centipede and millipede, eight legged scorpion and spider and flying insects.	• Sexual metamorphosis seen, Egg, larvae, pupae and adult. • Unisexual animals	Swimming, creeping	Largest animal phylum. Chitinous exoskeleton, Jointed paired appendages, Segmented body.	Crab, prawn, spider, scorpion. All insects (cockroach, butterfly, ant), Centipede, Millipede.
Mollusca	Bilaterally symmetrical	Coelomate Triploblastic	Marine, fresh water or terrestrial	Soft bodies, slimy, some have shells e.g. Bivalves and Snail	• Unisexual animals • Sexual reproduction	Swimming, creeping by foot	Visceral Mass enclosed in mantle. Body divisions : Head, foot and visceral mass	Oyster, Bivalves, Snail, Octopus
Echinodermata	Bilaterally symmetrical during larval stage. Radially symmetrical adults.	Coelomate Triploblastic	Only marine	Skeleton of calcareous spines, radial animals	• Sexual regeneration capacity	Some sedentary, some swim, some creep by tube feet.	Second largest animal phylum	Star fish, Sea urchin, Brittle star, Sea cucumber.
Hemichordata	Bilaterally symmetrical	Coelomate Triploblastic	Only marine burrowing in sand.	Proboscis, collar and trunk. Notochord in proboscis.	• Sexual animals Unisexual or bisexual	Burrowing in sand.	Connecting link between the non-chordates and chordates • Presence of pharyngeal gill slits.	Balanoglossus Saccoglossus commonly called acron worms.

Classification of Subphylum : Vertebrata

Vertebrate Classes	Cyclostomata	Fishes	Amphibia	Reptilia	Aves	Mammalia
Habitat	Ectoparasitic, marine, aquatic.	Always aquatic, marine or freshwater.	Surviving on land as well as in water.	Mainly terrestrial.	Terrestrial, some can fly aerial.	Mainly terrestrial, few aquatic (whale), few aerial (bat).
Exoskeleton	Soft skin without any scales	Exoskeleton of scales, Endoskeleton of cartilage or bones	Exoskeleton absent. Skin soft and moist	Dry, scaly skin.	Exoskeleton of feathers	Exoskeleton of hair, fur, wool
Structure of body	Jawless mouth with sucker	Stream lined body	Head and trunk. No neck.	Head, neck and trunk.	Stream lined body, head, neck, trunk	Head, neck, torso, tail
Appendages	No paired appendages absent.	Paired and unpaired fins present	Two pairs of limbs, Digits without claws	Two weak pairs of limbs.	Forelimbs modified into wings. Digits with scales and claws.	Two pairs of limbs. Hand/legs, nails, hoofs.
Respiration	Gills	Gills	During tadpole/larval stage by gills, in adulthood by skin when in water and by lungs when on land.	Lungs	Lungs – aided by air sacs	Lungs – aided with diaphragm
Reproduction	Oviparous – lay eggs	Oviparous – lay eggs	Oviparous. Egg, larva (tadpole) Adult Metamorphosis	Oviparous Egg, young one, adult	Oviparous, parental care	Few oviparous – Majority viviparous. Birth to live young. Mammary glands secreting milk.
Thermoregulation	Cold-blooded	Cold-blooded	Cold-blooded	Cold-blooded	Warm blooded	Warm blooded
Examples :	Petromyzon Myxine	Scoliodon (shark) Pomfret, Bombay duck, Sea-horse, Electric ray.	Frog, Toad, Salamander.	Tortoise, Lizard, Snake.	Peacock, Parrot, Crow, Duck, Penguin.	Kangaroo, Dolphin, Bat, Dog, Cat, Human.

(2) Chordates :

Phylum - Chordata

Animals having a supporting notochord in their body are called Chordates.

Characters of phylum Chordata :

- (1) Presence of notochord in the body either throughout the life or at least in the developmental stage.
- (2) Presence of pharyngeal gill slits. (at least during developmental stage).
- (3) Presence of single, tubular and dorsal spinal cord.
- (4) Presence of ventrally situated heart.

Depending on the notochord, the Phylum chordata is classified into three subphyla.

Urochordata, Cephalochordata and Vertebrata/Craniata

A. Subphylum - Urochordata

- (1) Urochordates are animals having notochord only in tail region of larvae.

- (2) Marine, sedentary adults.

(3) Larvae are free swimming, they metamorphose into sedentary adults.

(4) Body is covered by test or tunic. This is a covering like a skin.

(5) Hermaphrodite animals.

Examples : *Herdmania, Doliolum, Oikopleura*, etc.

B. Subphylum - Cephalochordata

- (1) Notochord is present in entire body length.

(2) Small, fish-like, marine animals.

(3) Large pharynx having gill-slits.

(4) Unisexual animals. Example : *Amphioxus*.

C. Subphylum - Vertebrata/Craniata

For classification of Vertebrata refer to the chart.

- Vertebrata has been divided into six classes. This information has been given in the chart.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- (1) System of classification based on evolution was brought into practice by and
(a) Darwin, Mendel (b) Lamarck, De Vries
(c) Morgan, Mayor (d) Dobzansky, Meyer
- (2) Artificial method of animal classification was proposed by
(a) Aristotle (b) Darwin
(c) Lamarck (d) Whittaker
- (3) Animals attached to substratum are called animals.
(a) sessile (b) sedentary
(c) lame (d) motionless
- (4) In coelenterates, are useful for capturing the prey whereas inject the toxin in the body of prey.
(a) tentacles, cnidoblast (b) hands, legs
(c) flagella, sting (d) cilia, sting cells
- (5) Body of annelidan animals is long, cylindrical and segmented.

- (a) annular (b) metamerically

- (c) jointed (d) cuticular

- (6) is second largest phylum in animal kingdom.

- (a) Mollusca (b) Arthropoda

- (c) Porifera (d) Platyhelminthes

- (7) Endoskeleton of Cyclostomata animals is

- (a) bony (b) bony and cartilaginous

- (c) cartilaginous (d) none of the above

- (8) Body cavity between the body and internal organs is called

- (a) gastrocoel (b) enteron (c) coelom (d) cave

- (9) Larvae of metamorphose into adults after settling down at bottom of the sea.

- (a) Hemichordata (b) Urochordata

- (c) Cephalochordata (d) Cyclostomata

- (10) The body organization of unicellular organisms is of grade.

- (a) cellular (b) tissue

- (c) protoplasmic (d) organ

- (11) is a cold blooded animal.
 (a) Bat (b) Snake (c) Rabbit (d) Elephant
 (March '19)
- (12) Calcareous spines are present on the body of animal.
 (a) fish (b) snail (c) sponge (d) star fish
 (July '19)
- (13) Due to which similar characteristic honey bee and cockroach are included in the same phylum?
 (a) Wings (b) Three pair of legs
 (c) Jointed appendages (d) Antenna
- Ans.** (1-d); (2-a); (3-b); (4-a); (5-b); (6-a); (7-c); (8-c); (9-b); (10-c); (11-b); (12-d); (13-c).

***Q. 2** Answer the following questions by choosing correct option giving explanation :

- (1) Which special cells are present in the body of sponges (Porifera)?
 (1) Collar cells (2) Cnidoblasts
 (3) Germ cells (4) Ectodermal cells
- (2) Which of the following animals' body shows bilateral symmetry?
 (1) Starfish (2) Jellyfish
 (3) Earthworm (4) Sponge
- (3) Which of the following animals can regenerate its broken body part?
 (1) Cockroach (2) Frog
 (3) Sparrow (4) Starfish
- (4) Bat is included in which class?
 (1) Amphibia (2) Reptilia
 (3) Aves (4) Mammalia

Ans. (1) Collar cells

Explanation : Porifera animals are attached to the substratum. They do not show locomotion. For gathering and catching the food, they need to produce a current in the water. For this purpose, they have characteristic collar cells in their body. Germ cells and ectodermal cells are seen in all other phyla. Cnidoblasts are characteristic feature of coelenterates.

(2) Earthworm

Explanation : When an imaginary plane passing

through only one axis can divide the body into two equal halves, then it is called bilateral symmetry. Such symmetry is shown only by earthworm. Sponge body is asymmetrical while starfish and jellyfish are radially symmetrical.

(3) Starfish

Explanation : Cockroach, sparrow and frog cannot perform regeneration. Only echinoderms show power of regeneration. So only starfish can regenerate its broken part.

(4) Mammalia

Explanation : Bat gives birth to young ones and they also possess mammary glands. Amphibia, Reptilia and Aves do not show such features. Therefore, bat is included in Mammalia.

Q. 3 Write whether the following statements are true or false with proper explanation :

- (1) Greek philosopher Linnaeus was the first to perform the animal classification.
 (2) Heart if present in the non-chordates is on dorsal side of body.
 (3) Arthropoda animals bear numerous pores on their body.
 (4) Porifera animals have special type of collar cells.
 (5) Aschelminthes have acoelomate and bilaterally symmetrical body.
 (6) Planet Earth has highest number of animals from phylum Arthropoda.
 (7) Animals belonging to phylum Annelida perform locomotion with the help of tube-feet.
 (8) Herdmania has notochord in only tail region and hence it is called Urochordate.
 (9) Mammals breathe with the help of lungs.
 (10) Amphibians are warm blooded.
- Ans. (1) False.** (Greek philosopher Aristotle was the first to perform the animal classification.)
- (2) True.**
- (3) False.** (Porifera animals bear numerous pores on their body.)
- (4) True.**
- (5) False.** (Platyhelminthes have acoelomate and bilaterally symmetrical body. OR

Aschelminthes have pseudocoelomate and bilaterally symmetrical body.

- (6) **True.**
 (7) **False.** (Animals belonging to phylum Echinodermata perform locomotion with the help of tube-feet.)
 (8) **True.**
 (9) **True.**
 (10) **False.** (Amphibians are cold-blooded. OR Mammals are warm blooded.)

Q. 4 Match the columns :

(1) Phylum	Characteristics
(1) Mollusca	(a) Collar cells
(2) Hemichordata	(b) Mantle (c) Trunk (d) Cnidoblasts

Ans. (1) Mollusca – Mantle

(2) Hemichordata – Trunk.

(2) Phylum	Characteristics
(1) Porifera	(a) Tunic
(2) Coelenterata	(b) Collar cells (c) Tentacles bearing cnidoblasts (d) Mantle

Ans. (1) Porifera – Collar cells

(2) Coelenterata – Tentacles bearing cnidoblasts.

(3) Subphylum/Class	Characteristics
(1) Cyclostomata	(a) Collar cells
(2) Urochordata	(b) Sucker (c) Tunic (d) Chitinous exoskeleton

Ans. (1) Cyclostomata – Sucker

(2) Urochordata – Tunic.

Q. 5 Find the odd one out :

- (1) *Physalia*, *Hyalonema*, *Euplectella*, *Spongilla*
 (2) Planaria, Liverfluke, Filarial worm, Tapeworm
 (3) Star fish, Sea-urchin, *Nereis*, Sea-cucumber
 (4) Cockroach, Butterfly, Spider, Honey bee
 (5) *Amphioxus*, *Herdmania*, *Doliolum*, *Oikopleura*
 (6) Frog, Tortoise, Toad, Salamander
 (7) Tube feet, Setae, Parapodia, Sucker
 (8) Shark, Sting ray, Electric ray, Pomfret

Ans. (1) **Physalia.** (*Physalia* belongs to Coelenterata, all the remaining are poriferans.)

(2) **Filarial worm.** (Filarial worm is Aschelminthes remaining are Platyhelminthes.)

(3) **Nereis.** (*Nereis* belongs to Annelida all the remaining are Echinoderm animals.)

(4) **Spider.** (Spider is eight-legged Arachnid, remaining are insects.)

(5) **Amphioxus.** (*Amphioxus* is Cephalochordate all the remaining are Urochordates.)

(6) **Tortoise.** (Tortoise is a reptile, the remaining are amphibians.)

(7) **Tube feet.** (Tube feet are locomotory organs of Echinoderms, the remaining are locomotory organs of Annelids.)

(8) **Pomfret.** (Pomfret is a bony fish, all the remaining are cartilaginous fish.)

Q. 6 Find the correlation :

(1) Annelida : Earthworm :: Platyhelminthes :
 (March '20)

(2) Horse : Mammal :: Seahorse :

(3) Parapodia : Annelida :: Tube feet :

(4) Frog : Amphibia :: Turtle :

(5) Proboscis : Hemichordata :: Suctorial mouth :

(6) Bird from very cold regions : Penguin :: Aquatic Mammal from very cold regions :

Ans. (1) Planaria/Liverfluke (2) Pisces

(3) Echinodermata (4) Reptilia (5) Cyclostomata
 (6) Whale.

***Q. 7** Complete the chart :

(1)

Body cavity	Germ Layer	Phylum
Absent	Porifera
Absent	Triploblastic
Pseudocoelom	Aschelminthes
Present	Arthropoda

Ans.

Body cavity	Germ Layer	Phylum
Absent	Diploblastic	Porifera
Absent	Triploblastic	Platyhelminthes
Pseudocoelom	Triploblastic	Aschelminthes
Present	Triploblastic	Arthropoda

(2)

Type	Character	Examples
Cyclostomata
.....	Gill respiration
Amphibia
.....	Whale, Cat, Man
.....	Poikilotherms

Ans.

Type	Character	Examples
Cyclostomata	Jawless mouth with suckers	Petromyzon, Myxine
Pisces	Gill respiration	Pomfret, Sea horse, Shark
Amphibia	Moist skin without exoskeleton	Frog, Toad, Salamander
Mammalia	Mammary glands	Whale, Cat, Man
Reptilia	Poikilotherms	Tortoise, Lizard, Snake

Q. 8 Distinguish between :

(1) Butterfly and Bat.

Butterfly	Bat
1. Butterfly is classified as Non-chordate.	1. Bat is classified as a Chordate.
2. It is included in class Insecta of phylum Arthropoda.	2. It is included in class Mammalia of subphylum Vertebrata.
3. Butterfly has three pairs of legs and two pairs of chitinous wings.	3. Bat has one pair of legs and a pair of patagium which are used for flying. Patagium has bones.
4. Butterfly is a diurnal (active during day) insect.	4. Bat is a nocturnal (active at night) mammal.
5. Butterfly lays eggs which hatch into larva. Larva develops into pupa and pupa metamorphoses into an adult.	5. Bat is a viviparous animal that gives birth to live young ones. Young ones are fed by milk secreted by mammary glands.

(2) Non-chordates and Chordates.

Non-chordates	Chordates
1. Non-chordates are less evolved animals and are on the lower levels of evolution.	1. Chordates are more evolved animals and are on the higher levels of evolution.
2. Non-chordates do not have notochord.	2. Chordates have notochord at least in some stage of development.
3. In non-chordates, there are no pharyngeal gill slits.	3. In chordates, there are pharyngeal gill slits.
4. Nerve cord, if present is double and solid.	4. Nerve cord is single and hollow.
5. Nerve cord is located on the ventral side of the body.	5. Nerve cord is located on the dorsal side of the body.
6. Heart if present is on the dorsal side of the body.	6. Heart if present is on the ventral side of the body.

(3) **Phylum Platyhelminthes and Phylum Aschelminthes.** OR Write any two points of differences between flat worms and round worms.

Phylum Platyhelminthes (Flat worms)	Phylum Aschelminthes (Round worms)
1. Platyhelminth worms have slender and flat leaf or strip like body hence called flat worms.	1. Aschelminthes have long thread-like or Cylindrical body, hence called round worms.
2. Platyhelminthes are triploblastic and acoelomate.	2. Aschelminthes are triploblastic and pseudocoelomate.
3. Most of them are hermaphrodite or bisexual having both male and female reproductive systems in the same body.	3. They are unisexual with male and female sexes separate. There is sexual dimorphism.
Examples : Planaria, Liver fluke, Tapeworm, etc.	Examples : <i>Ascaris</i> (Intestinal worm), Filarial worm, <i>Loa loa</i> (Eye worm), etc.

(4) **Urochordata and Cephalochordata.**

Urochordata	Cephalochordata
1. Urochordates have notochord in the tail region of the adult body.	1. Cephalochordates have notochord in the entire length of the body.
2. These animals look like small sacs.	2. These animals look like small fish.
3. Usually urochordates are hermaphrodites.	3. Cephalochordates are unisexual.
4. Body of urochordate is covered over by skin-like test or tunic.	4. Body of cephalochordate is not covered in a test.
Examples : <i>Herdmania</i> , <i>Doliolum</i> , <i>Oikopleura</i> , etc.	Example : <i>Amphioxus</i> .

(5) **Cyclostomata and Pisces.**

Cyclostomata	Pisces
1. Cyclostomata are the poorly evolved first class of vertebrate animals.	1. Pisces are the better evolved class of vertebrates which is well adapted for aquatic living.
2. Cyclostomata have circular jawless mouth with suckers.	2. Pisces have mouth with upper and lower jaws. Teeth are present in the mouth.
3. Paired appendages are absent in cyclostomates.	3. Paired and unpaired fins present in all kinds of fishes.
4. Cyclostomes have soft skin which is without any scales.	4. Fishes have different types of scales on the body.
5. Endoskeleton is cartilaginous.	5. Endoskeleton may be cartilaginous, or it may be bony.
Examples : <i>Petromyzon</i> , <i>Myxine</i> , etc.	Examples : <i>Shark (Scoliodon)</i> , rays which are cartilaginous fishes and pomfret, makerel, sardines, rohu which are bony fishes.



(6) Amphibia and Reptilia.

Amphibia	Reptilia
<p>1. Amphibians can inhabit both land and water. They can survive on both environments by breathing there.</p> <p>2. The exoskeleton is absent in amphibians. The skin is soft, slimy and moist.</p> <p>3. Body is divided into head and trunk. Neck is absent.</p> <p>4. The digits do not have claws.</p> <p>5. The respiration is by skin when in water and by lungs when on land. The larvae breathe by gills.</p> <p>6. There is external fertilization at the time of sexual reproduction.</p> <p>7. The developmental stages are eggs and tadpole. Metamorphosis is seen in amphibians.</p> <p>Examples : Frog, Toad, Salamander, etc.</p>	<p>1. Reptilians are terrestrial animals. Though turtle and sea snakes can stay in water, they cannot breathe in water.</p> <p>2. The exoskeleton in the form of scales. Some animals have plates or scutes (e.g. tortoise and crocodile).</p> <p>3. Body is divided into head, neck and trunk.</p> <p>4. The digits have claws.</p> <p>5. The respiration is only by lungs.</p> <p>6. There is internal fertilization at the time of sexual reproduction.</p> <p>7. The developmental stages are eggs and juvenile. Metamorphosis is not seen in reptiles.</p> <p>Examples : Tortoise, Lizard, Snake, etc.</p>

(7) Aves and Mammalia. (March '20)

Aves	Mammalia
<p>1. Aves are totally adapted for the aerial mode of life.</p> <p>2. Body is spindle shaped. Body is divisible into head, neck and trunk. There are two pairs of limbs. The forelimbs are modified to form wings for flight.</p> <p>3. Digits have scales and claws.</p> <p>4. The exoskeleton is in the form of feathers.</p> <p>5. Jaws are modified into a beak.</p> <p>6. Birds are oviparous. The eggs hatch into nestlings.</p> <p>7. The incubation of eggs and feeding of nestlings is done by both parents.</p> <p>Examples : Crow, Sparrow, Peacock, Parrot, Pigeon, Duck, Penguin, etc.</p>	<p>1. Mammals are adapted for terrestrial life.</p> <p>2. Body is not spindle shaped. It is divisible into head, neck, trunk and tail. There are two pairs of limbs. They are adapted for walking or running on the ground.</p> <p>3. Digits have nails or hoofs. Few have claws.</p> <p>4. The exoskeleton is in the form of fur, hair, wool, etc.</p> <p>5. Jaws have teeth and they surround the mouth.</p> <p>6. Mammals are viviparous. They give birth to live young ones. (Exception : Platypus)</p> <p>7. Parental care is shown only by mother, who feeds the babies with milk from mammary glands.</p> <p>Examples : Cat, Dog, Tiger, Lion, Elephant, Human, Kangaroo, Dolphin, Bat, etc.</p>

Q. 9 Classification-based questions :

1. Identify me :

***(1) I am diploblastic and acelomate. Which phylum do I belong to?**

Ans. I am from phylum Cnidaria or Coelenterata.

***(2) My body is radially symmetrical. Water vascular system is present in my body. I am referred as fish though I am not. What is my name?**

Ans. Starfish. I am from Echinodermata phylum.

***(3) I live in your small intestine. Pseudocoelom is present in my thread like body. In which phylum will you include me?**

Ans. I am Ascaris. I am included in Aschelminthes.

***(4) Though I am multicellular, there are no tissues in my body. What is the name of my phylum?**

Ans. Sponge, Porifera.

(5) I am metamerically segmented, blood sucking, ectoparasite. I have suckers. Who am I and to what phylum do I belong to? OR

Who am I?

I have suckers. I am blood sucking.

Ans. Leech, Phylum Annelida.

(6) I have chitinous exoskeleton, I have four pairs of walking appendages. I can sting you.

Who am I? What phylum do I belong to?

Ans. Scorpion. Phylum Arthropoda.

***2. Write the characters of each of the following animals with the help of classification chart :**

(1) Bath sponge :

Ans. Classification :

Kingdom : Animalia

Subkingdom : Non-chordata

Phylum : Porifera

Characters :

- Multicellular organisms without cell wall
- Cellular grade organization.
- Asymmetrical body
- Acoelomate

Bath sponge is a marine animal. Blackish in colour and round in shape having porous body. It

has spongin fibres and spicules which serve as skeleton. Bath sponges have good water-holding capacity. It is sedentary animal which is fixed to some substratum in the aquatic environment. Reproduction is by budding. It also has a good regeneration capacity.

(2) Jellyfish :

Ans. Classification :

Kingdom : Animalia

Subkingdom : Non-chordata

Phylum : Cnidaria or Coelenterata

Characters :

- Multicellular organisms without cell wall
- Tissue grade organization
- Radially symmetrical
- Diploblastic and Acoelomate

Jellyfish or Aurelia is a coelenterate. Its body is medusa. It appears as a transparent balloon seen floating in the marine waters. Since it has appearance like a jelly, it is known commonly as jellyfish. There are tentacles provided with cnidoblasts or stinging cells. Tentacles are used for catching the prey. Cnidoblasts are used to secrete a toxin which paralyses the prey.

(3) Grasshopper :

Ans. Classification :

Kingdom : Animalia

Subkingdom : Non-chordata

Phylum : Arthropoda

Class : Insecta

Characters :

- Multicellular organisms without cell wall
- Organ-system grade organization
- Bilaterally symmetrical
- Triploblastic and Eucoelomate.

Grasshopper is an insect included under class insecta of phylum arthropoda because it has jointed appendages. There are three pairs of legs and two pairs of wings. It is a terrestrial insect which is well adapted to the surrounding environment by showing camouflage. It has chitinous exoskeleton. The respiration is by tracheae.

**(4) Rohu :****Ans. Classification :****Kingdom : Animalia****Phylum : Chordata****Class : Pisces****Subclass : Teleostei (Bony fish)****Characters :**

- Multicellular organisms without cell wall
- Organ-system grade organization
- Bilaterally symmetrical
- Triploblastic and Eucoelomate.

Rohu is a fresh water bony fish. It is a chordate having a vertebral column, hence included under subphylum vertebrata. The body is well adapted for aquatic mode of life. The shape of the body is streamlined. The exoskeleton is of scales. The gills are present which are used for respiration. The endoskeleton is of bones, hence called bony fish. There are paired fins and a unpaired caudal fin which is used in steering and changing the direction during swimming.

(5) Frog :**Ans. Classification :****Kingdom : Animalia****Phylum : Chordata****Class : Amphibia****Characters :**

- Multicellular organisms without cell wall
- Organ-system grade organization
- Bilaterally symmetrical
- Triploblastic and Eucoelomate.

The frog is a true amphibian that can live in water as well as on land. When on land it respires with the help of lungs while in water it uses its skin for breathing. It does not have exoskeleton. The skin is soft, slimy and moist. It is suitably coloured and hence the frog can camouflage in the surroundings. Body is divisible into head and trunk. Two pairs of limbs are seen. The forelimbs are short and used for support during locomotion. The hind limbs are long and strong, used for jumping when on land and for swimming when in water.

The eyes are large and protruding. Since the neck is absent, such eyes help in looking around. The tympanum is present.

(6) Lizard :**Ans. Classification :****Kingdom : Animalia****Phylum : Chordata****Class : Reptilia****Characters :**

- Multicellular organisms without cell wall
- Organ-system grade organization
- Bilaterally symmetrical
- Triploblastic and Eucoelomate.

The lizard is a cold-blooded reptile. The limbs are weak and do not support the body weight, hence lizard is seen creeping. But the feet are provided with pads and suckers due to which lizards are well-adapted to climb on the vertical walls. The exoskeleton has fine scales. The body is divisible into head, neck and trunk. The capacity to regenerate is developed in lizards, hence it can produce the lost tail or limbs. The mode of reproduction is egg laying. It feeds on insects with the help of long and sticky tongue.

(7) Penguin :**Ans. Classification :****Kingdom : Animalia****Phylum : Chordata****Class : Aves****Characters :**

- Multicellular organisms without cell wall
- Organ-system grade organization
- Bilaterally symmetrical
- Triploblastic and Eucoelomate.

Penguin is a flightless bird inhabitant of cold snow-clad regions. It has exoskeleton of feathers. The body is well adapted to survive in cold regions.

It is a warm-blooded bird. The forelimbs are modified into wings. But due to excessive body weight, the penguins are not seen flying. It can wade in the water with modified hind limbs.

(8) Elephant :**Ans. Classification :****Kingdom : Animalia****Phylum : Chordata****Class : Mammalia**

Characters :

- Multicellular organisms without cell wall
- Organ-system grade organization
- Bilaterally symmetrical
- Triploblastic and Eucoelomate.

Elephant is the terrestrial, herbivorous mammal adapted to survive in hot and humid tropical forests. It is a mammal and hence shows viviparity and milk secretion. The body is divisible into head, neck, trunk, and tail. The proboscis is a characteristic feature of the elephant which is actually modified nose.

3. Characters of a phylum are given below. Read them carefully and answer the questions :

(a) Spines of calcium carbonate are present on the body. (b) These animals are exclusively marine. (c) They perform the locomotion with the help of tube feet. (d) Their skeleton is made up of calcareous plates or spicules.

(i) Animals of which phylum show the above character?

Ans. Animals belonging to phylum Echinodermata show the above characters.

(ii) Give an example from that phylum.

Ans. Starfish, brittlestar, sea urchin.

(iii) These animals can be classified with the help of which criteria of new system of animals classification.

Ans. Animals are classified on the basis of criteria such as body organization, body symmetry, body cavity, etc.

4. Identify my class/phylum and give one example of it : *(March '19)*

(a) I have mammary glands and exoskeleton in the form of hair.

(b) We form the highest number of animals on the planet. We have bilateral symmetry and our exoskeleton is in the form of chitin.

(c) I live in your small intestine, my body is long and thread like and pseudocoelomate.

Ans. (a) Class : Mammalia, Example : Cat, Dog, Man.

- (b) Phylum : Arthropoda, Example : Prawn, Crab.**
(c) Phylum : Aschelminthes, Example : Ascaris or round worm, Filarial worm.

5. Tell me who am I? What is my class/phylum?

1. My body is divided into proboscis, collar and trunk. I am marine animal.

Ans. Balanoglossus; Phylum : Hemichordata.

2. I stay inside two shells. My body is divided into head, foot and visceral mass.

Ans. Bivalve or Oyster; Phylum : Mollusca.

3. I am male as well as female. I am endoparasite having a coelomate and bilaterally symmetrical and flattened body.

Ans. Liver fluke or tape worm; Phylum : Platyhelminthes.

4. I am sedentary marine animal drinking water all the time through numerous pores on the body.

Ans. Sponge; Phylum : Porifera.

5. I am venomous, eight legged creature having chitinous exoskeleton.

Ans. Scorpion; Phylum : Arthropoda.

6. My body is covered by tunic. As a larva I swim but as an adult I settle down.

Ans. Doliolum or Salpa; Phylum : Chordata subphylum : Urochordata.

***6. Give scientific classification of shark upto class.**

Ans. Kingdom : Animalia

Phylum : Chordata

Subphylum : Vertebrata

Class : Pisces

Subclass : Elasmobranchii (Cartilaginous)

Example : Scientific name : *Scoliodon sorrikowah*. Common name : Shark

7. Identify the class of given animals and write one characteristic of each animal :

(1) Kangaroo (2) Penguin (3) Crocodile (4) Frog (5) Sea-horse. *(July '19)*

Ans. (1) Kangaroo : Class Mammalia. It is a marsupial animal with pouch for development of offspring. Long hind limbs for jumping.

(2) Penguin : Class Aves. It is flightless bird. Body covered with thick feathery coat. Oviparous mode.

(3) Crocodile : Class Reptilia. It is a large animal seen near waterbodies. Can swim in water but cannot respire in water. Body covered with exoskeleton of scaly plates. Limbs very weak in comparison with huge bodies.

(4) Frog : Class Amphibia. Shows aquatic as well as terrestrial mode. Can breathe with lungs and skin. No exoskeleton and skin is slimy.

(5) Sea horse : Class Pisces. Bony fish. Highly modified body structure showing brood pouch for development of offspring gills for respiration, fins for swimming.

***Q. 10 Give scientific reasons :**

(1) Our body irritates if it comes in contact with jellyfish.

Ans. (1) Jellyfish is a coelenterate that has cnidoblasts bearing tentacles. (2) These cnidoblasts inject toxins to paralyse the prey at the time of feeding. (3) When jellyfish comes in contact with our body, this toxin is released causing reaction to our skin. (4) Therefore, our body gets irritation when we come in contact with jellyfish.

(2) Balanoglossus is connecting link between non-chordates and chordates. *OR*

How is Balanoglossus connecting link between chordates and non-chordates? (Nov. '20)

Ans. (1) Balanoglossus shows some characters of non-chordates. (2) It also has notochord as in case of chordates. (3) Since it shares the characters of non-chordates and chordates, from the view point of evolution, it is called connecting link between them.

(3) All vertebrates are chordates but all chordates are not vertebrates.

Ans. (1) All chordates possess notochord in some period of their development. (2) All vertebrates also have notochord during embryonic life, which is later replaced by vertebral column. (3) Therefore all vertebrates are chordates. (4) But some chordates like Urochordata and Cephalochordata do not possess vertebral column and hence they are not vertebrates.

(4) Though tortoise lives on land as well as in water, it cannot be included in class-Amphibia.

Ans. (1) When tortoise lives on the land, it

respires with the help of lungs. (2) When in water, it puts out its nares (nasal openings) out of the water and breathes air. (3) It cannot take up oxygen dissolved in water. In both the habitats it respires with the help of lungs. In case of true amphibians, this is not the case. (4) They can breathe in water with the help of skin and on land with the help of lungs. (5) Tortoise also has exo-skeleton which is lacking in Amphibia. Therefore, tortoise cannot be included in class Amphibia.

(5) Body temperature of reptiles is not constant.

Ans. (1) Reptiles are cold-blooded animals. (2) The thermoregulatory system is not there in their bodies. (3) Their body temperatures, fluctuate as per the environmental temperatures. (4) Therefore, the body temperature is not maintained at constant level in reptiles.

Q. 11 Answer the following questions :

***(1) Write in brief about progressive changes in animal classification.**

Ans. There were different methods of classification of animals.

(1) The first classification method was given by the Greek philosopher Aristotle. He took into account the criteria like body size, habits and habitats of the animals. This method was called artificial method of classification.

(2) The same artificial method was used by other scientists such as Theophrastus, Pliny, John Ray, Linnaeus, etc.

(3) Further due to advances in science the references were changed and there were some new methods of classification proposed.

(4) The system of classification called 'Natural system of classification' was then proposed. This system of classification was based on criteria such as body organization, types of cells, chromosomes, bio-chemical properties, etc.

(5) Later, Dobzhansky and Meyer gave the system of classification based on evolution.

(6) In 1977, Carl Woese has also proposed the three domain system of animal classification.

(2) State any four benefits of animal classification. *(March '19)*

Ans. For answer refer to Q. 12 (1).

*(3) What is the exact difference between grades of organization and symmetry? Explain with examples.

Ans. I. Grades of organization :

(1) The grades of organization mean the way an organism has different body formation.

(2) Unicellular organisms like amoeba have a single cell in the body and hence the organization in its body is called protoplasmic grade of organization.

(3) Some organisms have only cells in their body which is called cellular grade of organization. e.g. Poriferans.

(4) Some have tissues e.g. Coelenterates. They are said to have tissue grade organization. Some have organs, they are said to have organization-organ grade. e.g. Platyhelminthes. All other higher animals have organ-system grade organization.

II. Symmetry :

(1) Symmetry on the other hand shows the base of the body formation.

(2) The symmetry can be understood by taking an imaginary cut through the animal body.

(3) Based on the symmetry there can be three types.

(4) In asymmetric animals, there is no symmetry in any plane. e.g. Amoeba.

(5) The bilateral symmetry is the one in which an imaginary axis can pass through only one median plane to divide the body into two equal halves. Most of the animals have bilateral symmetry and hence their organs are arranged in symmetric way on both the sides.

(6) The imaginary cut passing through the central axis but any plane of body can give more than one equal half. The organs of such animals are arranged in a radius of an imaginary circle. e.g. Cnidarians and some echinoderms.

Both grades of organization and symmetry are the bases for classifying animals into different phyla.

(4) Into which phyla is Non-chordata divided? In which three subphyla are Chordates divided?

Ans. I. The phyla of Non-chordata :

- (1) Protozoa (2) Porifera (3) Coelenterata or Cnidaria (4) Platyhelminthes (5) Aschelminthes (6) Annelida (7) Arthropoda (8) Mollusca (9) Echinodermata (10) Hemichordata

II. The subphyla of Chordata :

- (1) Urochordata (2) Cephalochordata

- (3) Vertebrata

*(5) To which phylum does Cockroach belong?

Justify your answer with scientific reasons.

Ans. (1) Cockroach belongs to the phylum Arthropoda and class Insecta.

(2) Scientific reasons for placement of Cockroach in the phylum Arthropoda :

- (a) The body is covered by chitinous exoskeleton.
- (b) Jointed appendages present, three pairs of walking legs and two pairs of membranous wings.
- (c) Body is eucoelomate, triploblastic, bilaterally segmented and segmented.
- (d) Respiration by spiracles and tracheal tubes.

*(6) Write four distinguishing characters of phylum - Echinodermata.

Ans. Distinguishing characters of Echinodermata :

(1) Marine organisms with skeleton made up of calcareous spines. Calcareous material on the body hence the name is Echiodermata. Some are sedentary while some are free swimming.

(2) Body is triploblastic, eucoelomate and radially symmetrical when adult. The larvae are bilateral symmetrical.

(3) Locomotion with the help of tube-feet which are also used for capturing the prey.

(4) Echinoderms have regeneration capability. Hence they can restore their lost parts.

- (5) Most of them are unisexual.

(6) Examples : Starfish, sea-urchin, brittle star, sea-cucumber, etc.

(7) Write the characteristics of chordates.

Ans. Characteristics of Chordates :

(1) All chordates possess notochord and pharyngeal gill slits in at least during some developmental stage.

(2) Presence of single, tubular and dorsally located spinal cord and ventrally located heart.

(8) Write the characteristics of vertebrates.

Ans. Characteristics of vertebrates :

(1) In vertebrates, notochord is replaced by vertebral column.

(2) Development of head is complete.

(3) Well-developed cranium which protects the brain.

(4) Presence of endoskeleton which is either cartilaginous or bony.

(5) Presence of jaws as in Gnathostomata or absence of jaws as in Aganatha.

(9) Use your brain power :

(Textbook page no. 74)

(A) Animals like ghariyal and crocodile live in water as well as on land. Are they amphibians or reptiles?

Ans. Ghariyal and crocodile are reptiles. They can swim in water and crawl on land. But they can respire only with the help of lungs. Their breathing is through nostrils. Even when in water, they have to inhale and exhale by coming up to the surface of water for air. Amphibians can breathe through the skin when in water and by lungs when on land. They also have hard exoskeleton which amphibians do not have. Hence, ghariyal and crocodile are not amphibians, but they are reptiles.

(B) Animals like whale, walrus live in water (ocean). Are they included in Pisces or Mammalia?

Ans. Whale and walrus are aquatic and marine mammals. They do not belong to class Pisces. They do not have gills to breathe in dissolved oxygen in water. Neither they have scales on the body nor can they lay eggs. Whales and walrus have mammary glands like all other mammals. They give birth to live young one. They breathe only with the help of lungs by putting their nostrils out of the water at surface. Hence they are included in Mammalia.

Q. 12 Write short notes :

(1) Benefits of classification.

Ans. (1) Studying the different animals becomes easy when they are placed under different groups.

(2) When few representative animals of the particular group are studied then the idea about other animals belonging to that group also becomes clear.

(3) The animal evolution becomes easier to follow after studying classification.

(4) The identification of animals can be done accurately.

(5) Relationship of the different animals with each other and with other groups can be understood clearly.

(6) Habitat of each animal and its role in nature is understood by classification.

(7) Various adaptations are understood by learning classification.

(2) Germinal layers.

Ans. (1) During the initial embryonic period of any multicellular animal there is formation of germinal layers or germ layer.

(2) These germ layers give rise to new tissues in the developing animal.

(3) The primitive animals were diploblastic i.e. they have only two germ layers called ectoderm and endoderm.

(4) The higher animals are triploblastic, having three germ layers; ectoderm, mesoderm and endoderm.

(5) Cnidarians are diploblastic while all other animals are triploblastic.

(3) Coelom.

Ans. (1) Coelom means body cavity. It is situated between the body wall and the internal organs of the body.

(2) The coelom is formed during early embryonic life in case of multicellular animals. It is formed from either mesoderm or gut.

(3) Coelom when present in the body, those animals are called eucoelomate. Phylum Annelida onwards are eucoelomate animals. They are animals with true body cavity.

(4) Those animals in which coelom are absent are called acoelomate animals. Porifera, Cnidaria and Platyhelminthes are acoelomate animals.

(5) When coelom is not formed from mesoderm or gut, but formed from other tissues, it is called pseudocoelom. Only Aschelminthes animals have such coelom and hence they are called pseudocoelomate.

(4) Notochord.

Ans. (1) Notochord is an important feature of Chordates.

(2) Notochord is supporting rod like structure.

(3) This structure is present on the dorsal side of the animals.

(4) It keeps the nervous tissue separated from the rest of the tissues.

(5) In Hemichordates, the notochord is present in the proboscis.

(6) In Urochordates, the notochord is present in the tail region of the free swimming larvae.

(7) In Cephalochordates, the notochord lies throughout the length of the body.

(8) In vertebrates, notochord is replaced by the vertebral column.

Q. 13 Complete the paragraph by choosing the appropriate words given in the brackets :

(1) (Linnaeus, Dobzhansky, Carl Woese, Theophrastus, Artificial method, Aristotle, Natural system, Traditional system)

Time to time, different scientists have tried to classify the animals. Greek philosopher was the first to perform the animal classification. Aristotle classified the animals, according to the criteria like body size, habits and habitats. Classification proposed by Aristotle is known as Besides Aristotle, artificial method of classification was followed by, Pliny, John Ray and Later on, '..... of classification' was followed. Natural system of classification was based on various other criteria. By the time, system of classification based on evolution was also brought into practice. It was used

by and Meyer. Recently, has also proposed the animal classification.

Ans. Time to time, different scientists have tried to classify the animals. Greek philosopher Aristotle was the first to perform the animal classification. Aristotle classified the animals, according to the criteria like body size, habits and habitats. Classification proposed by Aristotle is known as 'Artificial method'. Besides Aristotle, artificial method of classification was followed by Theophrastus, Pliny, John Ray and Linnaeus. Later on, 'Natural system of classification' was followed. Natural system of classification was based on various other criteria. By the time, system of classification based on evolution was also brought into practice. It was used by Dobzansky and Meyer. Recently, Carl Woese has also proposed the animal classification.

(2) (neck, lungs, skin, exoskeleton, amphibian, metamorphose, aquatic, gills)

Class Amphibia consist of animals which are strictly only during their larval stages. At that time they breathe through their Tadpoles are such stages which later to form adult frog. Adult frog respires with the help of when in water and with when on land. Thus, it is a true For performing cutaneous respiration, i.e. respiration through skin, they lack in any form. The skin is also kept moist by staying near the water bodies. Amphibians do not have a but eyes are bulging and prominent, this solves the problems of vision.

Ans. Class Amphibia consist of animals which are strictly aquatic only during their larval stages. At that time they breathe through their gills. Tadpoles are such stages which later metamorphose to form adult frog. Adult frog respires with the help of skin when in water and with lungs when on land. Thus, it is a true amphibian. For performing cutaneous respiration, i.e. respiration through skin, they lack exoskeleton in any form. The skin is also kept moist by staying near the water bodies. Amphibians do not have a neck but eyes are bulging and prominent, this solves the problems of vision.

Q. 14 Paragraph based questions :

- Read the paragraph and answer the questions given below :

Locomotion is considered as an important characteristics of the animals. However, animals belonging to Porifera are said to be sedentary. Every other phylum has typical locomotory organs. E.g. Nereis crawls with the help of parapodia, whereas earthworm buries in soil by setae. Spiders have four pairs of walking legs, crab has five while all insects have three pairs of walking legs. The walking legs are also called appendages. Starfish moves with the help of tube feet. Snails and bivalves use muscular foot for locomotion. Birds flying with their spread out wings and fish swimming with their fins, both have spindle-shaped body tapering at both the ends. While flying or swimming such body offers least resistance during locomotion. Mammals have two pairs of limbs while animals like snakes are limbless. Other animals belonging to the class of snakes also have very weak limbs which make them creep on the ground.

Questions and Answers :

- (1) What are the locomotory organs in phylum Annelida ?

Ans. Annelidans have parapodia and setae as the locomotory organs.

- (2) Which phylum has a characteristic of jointed appendages ?

Ans. Phylum Arthropoda has a characteristic of jointed appendages.

- (3) Which the locomotory organ of animals belong to Phylum Mollusca ?

Ans. Animals belonging to Phylum Mollusca have strong muscular foot which is used for locomotion.

- (4) Which class of animals show weak legs ?

Ans. Class Reptilia belonging to subphylum vertebrata show weak legs.

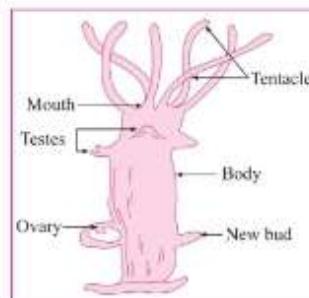
- (5) In which class of animals the forelimbs are modified ?

Ans. Class Aves belonging to subphylum vertebrata have wings which are modified forelimbs.

Q. 15 Diagram-based questions :

1. Sketch, label and classify the following organisms :

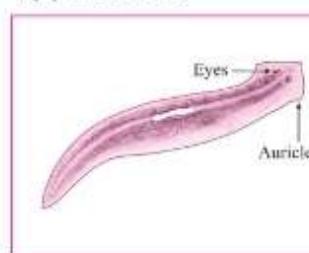
*(1) Hydra :

	Classification : Kingdom : Animalia Division : Non-chordata Phylum : Coelenterata Example : Hydra
--	--

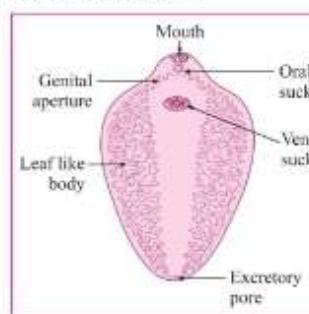
*(2) Jellyfish :

	Classification : Kingdom : Animalia Division : Non-chordata Phylum : Coelenterata Example : Jellyfish
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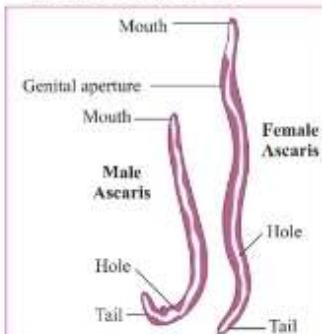
*(3) Planaria :

	Classification : Kingdom : Animalia Division : Non-chordata Phylum : Platyhelminthes Example : Planaria
--	--

(4) Liverfluke :

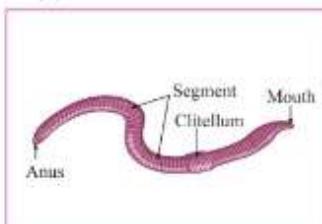
	Classification : Kingdom : Animalia Division : Non-chordata Phylum : Platyhelminthes Example : Liverfluke
--	--

* (5) Round worm :



Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Aschelminthes
Example : Ascaris (Round worm)

* (6) Earthworm :



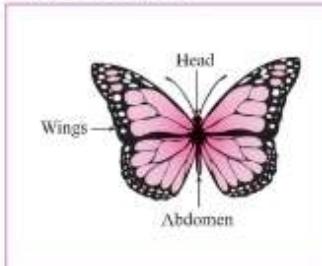
Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Annelida
Example : Earthworm

(7) Leech :



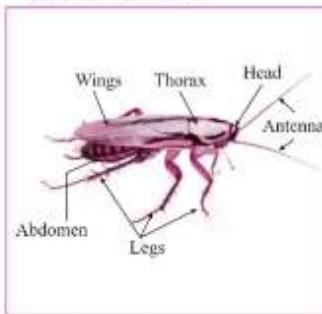
Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Annelida
Example : Leech

* (8) Butterfly :



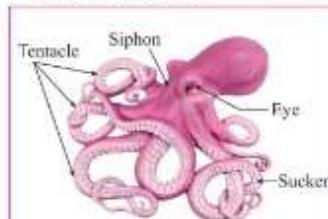
Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Arthropoda
Class : Insecta
Example : Butterfly

(9) Cockroach :



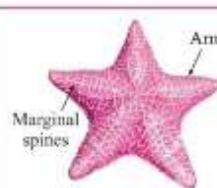
Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Arthropoda
Class : Insecta
Example : Cockroach

* (10) Octopus :



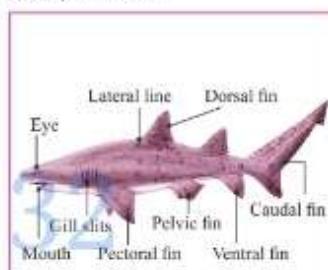
Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Mollusca
Example : Octopus

* (11) Starfish :



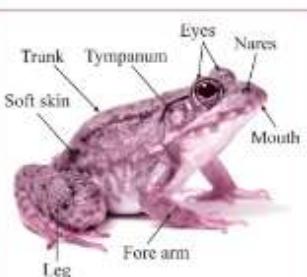
Classification :
Kingdom : Animalia
Division : Non-chordata
Phylum : Echinodermata
Example : Star fish

* (12) Shark :



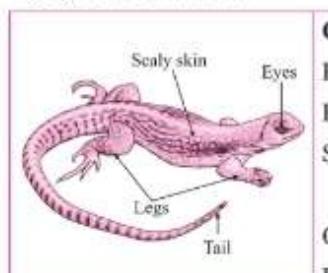
Classification :
Kingdom : Animalia
Phylum : Chordata
Sub Phylum : Vertebrata
Class : Pisces
Example : Scoliodon (Shark)

* (13) Frog :



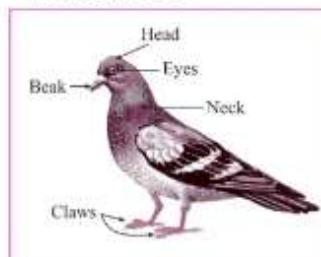
Classification :
Kingdom : Animalia
Phylum : Chordata
Sub Phylum : Vertebrata
Class : Amphibia
Example : Frog

* (14) Wall Lizard :



Classification :
Kingdom : Animalia
Phylum : Chordata
Sub Phylum : Vertebrata
Class : Reptilia
Example : Wall Lizard

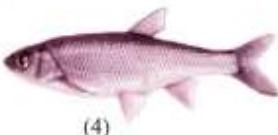
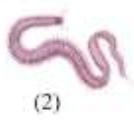
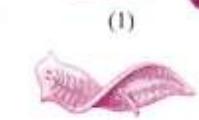
*** (15) Pigeon :**



Classification :

Kingdom : Animalia
Phylum : Chordata
Sub Phylum :
Vertebrata
Class : Aves
Example : Pigeon

*** 2. Label the following Animals :**

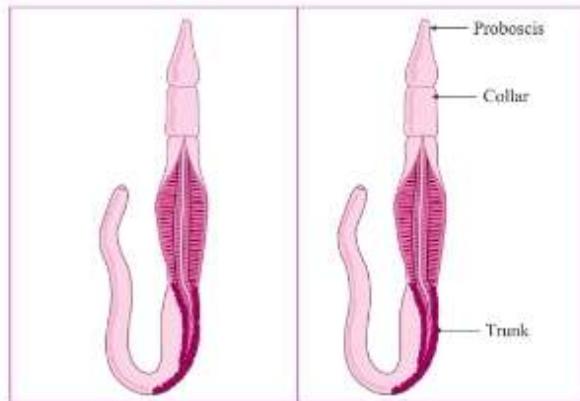


Ans. (1) Jellyfish (2) Nereis (3) Flat worm / Planaria (4) Bony fish.

3. Identify the animal given in the figure and label the figure :

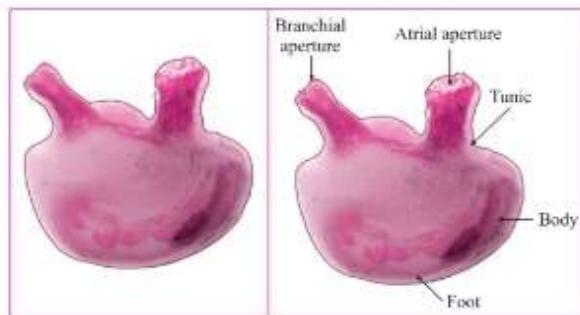
(1)

Ans. Balanoglossus



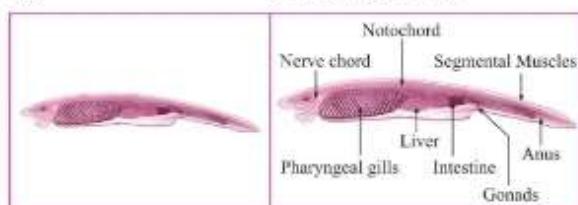
(2)

Ans. Herdmania



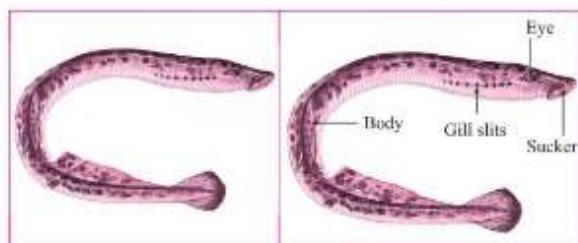
(3)

Ans. Amphioxus



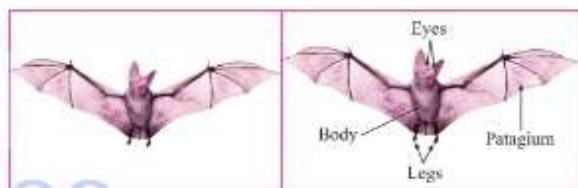
(4)

Ans. Petromyzon



(5)

Ans. Bat



4. Identify the class of the animal shown in the figure and write any two characteristics.



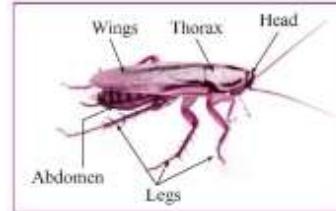
Ans. (1) The animal shown in the figure is bat, belonging to class Mammalia of Subphylum Vertebrata, Phylum Chordata.

(2) Characteristics :

(i) Body is divided into head, neck, torso and tail. Patagium present for the flying mode. Nocturnal in habit. It is warm blooded.

(ii) Gives birth to live young ones. Mammary glands present for nourishing young ones.

5. Observe the following diagram. Write the answer of the following questions : (March '20)



(a) To which phylum does the animal included in the diagram belong?

(b) What is the exoskeleton made up?

(c) What is the symmetry?

Ans. (a) This animal is cockroach. It belongs to phylum Arthropoda and class Insecta.

(b) Its exoskeleton is made up of chitin.

(c) It has bilateral symmetry.

6. Observe the figure and answer the following questions :



(a) To which phylum these organisms belong?

(b) Name the substance with which their body is covered.

(c) Name their organs of locomotion.

Ans. (a) The starfish and the sea urchin shown in the figure belong to phylum Echinodermata.

(b) The body of echinoderm animal is covered with calcareous spines or ossicles/plates.

This is the substance covering the body is mostly calcium salts and compounds.

(c) Their locomotory organs are tube feet.

7. Name the locomotory organ of animal shown in the given figure : (Nov. '20)



Ans. Tube feet.

8. Observe the figures given below and answer the given questions :



(a) In which phylum are these animals included?

(b) Which substance forms the outer layer of their exoskeleton?

(c) What are their locomotory organs?

Ans. (a) These animals are included in phylum Arthropoda.

(b) The outer layer of their exoskeleton is covered by chitinous substance.

(c) Their locomotory organs are jointed paired appendages.

9. Identify the phylum of the given animal and write any two characteristics of this phylum.



Ans. This animal is **Sycon** sponge and its phylum in Porifera.

Characteristics of phylum Porifera

(a) Asymmetrical body.

(b) Many pores on body. Large osculum and smaller ostia.

10. (a) Identify the animal given here.

(b) Write the phylum to which it belongs.

(c) Identify the pointed parts; p, q, r and s.



Ans. (a) The given animal is Octopus.

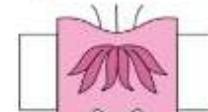
(b) It belongs to the phylum Mollusca.

(c) p = eye, q = sucker, s = siphon and r = tentacle.

11. Identify and explain from the given figure different types of symmetry. (Nov. '20)



(a)



(b)



(c)

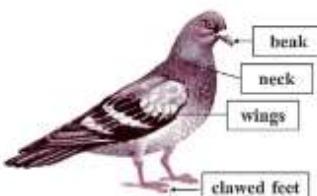
Ans. (a) **Asymmetrical body** : In asymmetrical body, there is no imaginary axis that can pass through body and divide it into two equal halves, e.g. Amoeba.

(b) **Radial symmetry** : In this type of body, if imaginary cut passes through central axis, in any plane of body, then it can give two equal halves.

(c) **Bilateral symmetry** : In such type of symmetry, there is only one imaginary axis that can pass through the body dividing it into two equal halves.

12. Label the figure.

(Answers are given directly in bold.)



13. Complete the following chart :

(Answers are given directly in bold.)

Type	Examples
(A) Pisces	Pomfret, Rohu
(B) Amphibians	Salamander, Toad
(C) Mammalians	Cat, Whale
(D) Reptilians	Crocodile, Snake

14. Observe the following figure and answer the following :



- (a) Due to which common characteristic the animals shown in the figure belong to the same phylum?

- (b) The exoskeleton of these animals is made up of which chemical?

(c) Give another two examples of this phylum.

- (b) The exoskeleton of these animals is made up of chitin.

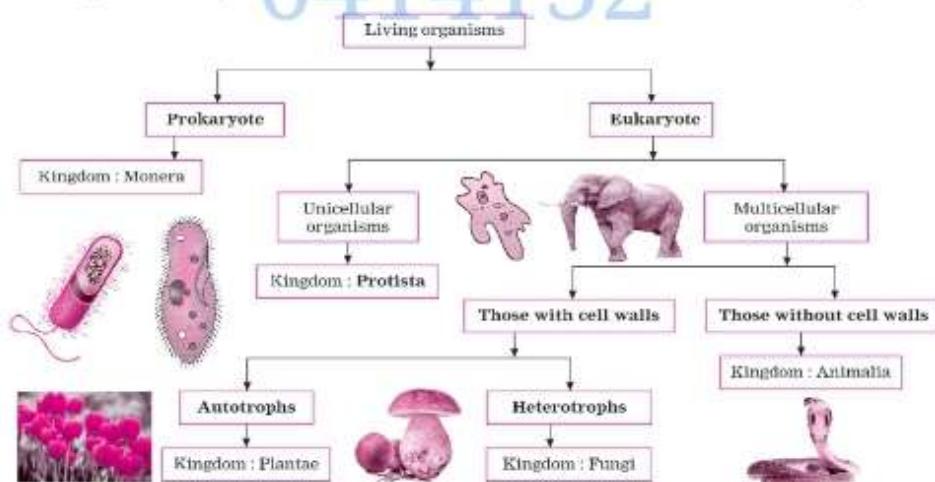
(c) Crab, Spider.

Q. 16 Complete the following charts :

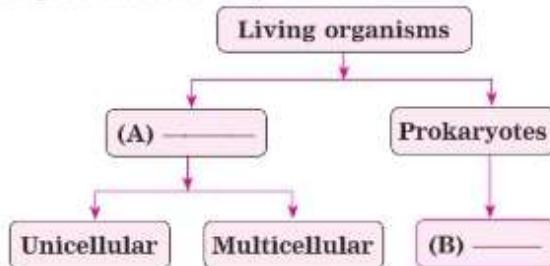
(1) Complete the chart by taking into consideration the criteria for classification :

(Answers are given directly in bold.)

Ans.



(2) Complete the following flow chart.



Ans. (A) Eukaryotes (B) Monera.

Q. 17 Activity-based Questions :

Q. 1. Observe : (Textbook page no. 65)

Label the body organization of human which has been shown in the following figure :

(March '20)

(Answers are given directly in bold.)

Ans.

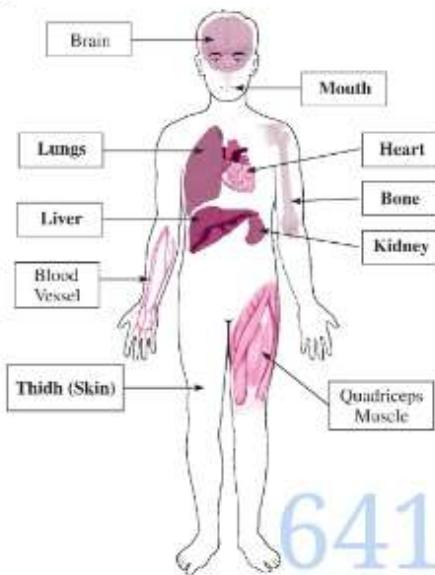


Fig. 6.16 : Organ-System grade of organization

Q. 2. Get Information :

(1) Why is earthworm called as friend of farmers?

(Get Information : Textbook page no. 69)

Ans. Earthworms move through the soil in the farms and fields. They feed on the detritus in the soil. They also help in decomposition of the organic matter. When the soil is loosened due to their activities, the roots of the crops grow well. They enrich the soil by their excreta which act as fertilizers. All these facts make earthworm, a farmer's friend.

(2) In what way the leech is used in ayurvedic system of treatment?

(Get Information : Textbook page no. 69)

Ans. Leeches are blood sucking ectoparasite. In Ayurveda leech is used to remove impure blood and blood clots. Such blood is sucked up by leeches and then the patient gets some relief. In the leech body there is a substance called hirudine which prevent

blood clotting as it sucks up the blood. This hirudine is also used for medicinal purpose.

(3) What is chitin?

(Find out : Textbook page no. 70)

Ans. Chitin is a type of polysaccharide. Its chemical formula is $(C_8H_{13}O_6N)_n$. It is a long-chain polymer of N-acetylglucosamine, which is actually a derivative of glucose. It is a primary component of cell walls in fungi, the exoskeletons of arthropods, such as crustaceans and insects. In many medicines chitin is used. The industrial processes and the biotechnological experiments also use chitin.

(4) Let's Think : (Textbook page no. 70)

(i) What types of benefit and harm occur to human from animals of phylum- Arthropoda?

Ans. Some insects are very useful for us. We get many products from them. e.g. Honey bee, Lac insect, Silk worm, are the insects that provide us with honey and wax, lac and silk respectively. The culture experiments are done on these insects for large scale production of these substances. Butterflies help in the pollination of crops and are thus helpful for the farmers and gardeners. Lady bug beetle is an insect which acts as a natural pest control as it attacks the other harmful insect pests. In biological pest control methods it is widely used. Some insects, on the contrary are very harmful. Mosquito, bed bugs, lice are blood sucking parasites which can spread the diseases. Mosquito is a vector for dengue, filariasis and malaria. Some are biting insects that can cause wounds, some cause allergies of various kinds. The grains and crops are destroyed to great extent by the insects. In this way the insects belonging to the phylum Arthropods are harmful to health, wealth and peace of mind too.

(ii) Which are the animals from phylum Arthropoda those have shortest and longest life span?

Ans. The shortest life span : May fly - About 24 hours. The longest life span : Lobster (*Homarus americanus*) - About 100 years.

(iii) Why has it been said that only insects directly compete with humans for food?

Ans. The standing crop in the fields can be totally ruined by insects. The locust can damage the crops

when they attack in thousands at a time. The grains are also infested by variety of insects like ants, weevils, beetles, etc. Therefore, we can say that only insects compete with humans for food.

PROJECTS

(1) How does the infection of tapeworm in man, liverfluke in grazing animals like goat and sheep occur and what are their preventive measures?

(Collect the Information, Internet is my friend : Textbook page no. 69)

(2) How does the infection of round worms like Ascaris, filarial worm and plant nematodes occur and what are their preventive measures and treatment?

(Collect the Information, Internet is my friend : Textbook page no. 69)

(3) **Books are my friend :** Collect the information about pearl production from bivalves by reading appropriate books.

(Textbook page no. 70)

(4) **Books are my friend :** The Animal Kingdom : Libbie Hyman and some other similar books.
(Textbook page no. 75)

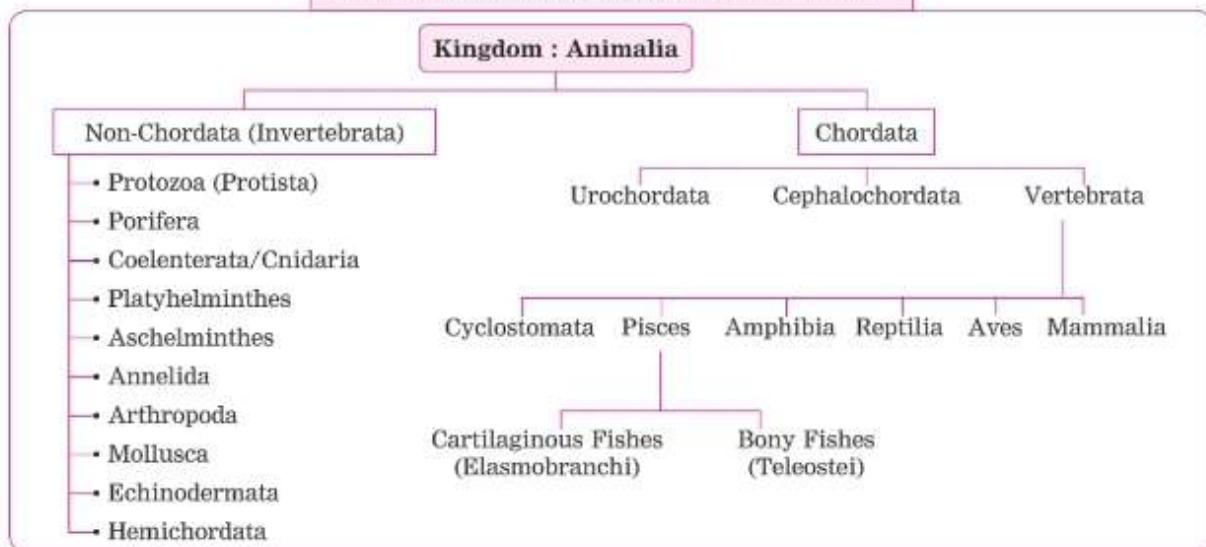
(5) **Use of Information Technology :**

(Textbook page no. 75)

Prepare the presentation of animal classification using video clips downloaded from internet.

*(6) In each week, on a specific day of your convenience, observe the animals present around your school and residence. Perform this activity for six months. Keep date-wise record of your observations. After the observation period of six months, analyse your observations with respect to seasons. With the help of your teacher, classify the reported animals.

MEMORY MAP/CONCEPT MAP



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this QR Code for the test and its model answers.



Introduction to Microbiology

CHAPTER AT A GLANCE

7.1 Applied Microbiology

7.2 Industrial Microbiology

7.3 Products

IMPORTANT POINTS

Can you recall? (Textbook page no. 77)

(1) Which different microbes are useful to us?

Ans. Many microbes are useful to us, such as bacteria which are used for making curds from milk, yeast used to ferment the batter of bread, bacteria used for making other milk products, bacteria and fungi used for making antibiotics. The bacteria are even used for pollution control.

(2) Which different products can be produced with the help of Microbes?

Ans. Milk products, cheese, cocoa, pickles made from vegetables, wine and other beverages, bread, probiotic substances and cattle feed are produced with the help of microbes.



7.1 Applied Microbiology :

Study of the enzymes related to some prokaryotes and eukaryotic microbes, proteins, applied genetics, molecular biology, etc. comes under applied microbiology.

7.2 Industrial Microbiology :

When microbiology is used for commercial, economic, social purpose and environment related processes, then it is called industrial microbiology.

Can you recall? (Textbook page no. 77)

• We use the fermentation process while making yoghurt from milk. Which microbes are useful for this process?

Ans. When the milk is converted into yoghurt, a small quantity of *Lactobacilli* culture is

introduced into the warm milk. These bacteria bring about change in the constituents of the milk by fermentation and coagulation. This way yoghurt is produced.

7.3 Products :

Products

Dairy Products

- (1) Yoghurt
- (2) Butter
- (3) Cheese
- (4) Probiotics

Food Products

- (1) Bread
- (2) Vinegar
- (3) Beverages
- (4) Soya Sauce

Others

- (1) Microbial enzymes
- (2) Antibiotics
- (3) Microbial bio-fuels
- (4) Biogas
- (5) Composting

Processes

- (1) Microbial pollution control
- (2) Landfilling
- (3) Sewage treatment
- (4) Clean technology

1. Dairy Products :

- (1) Cheese, butter, cream, kefir, yoghurt, etc. are some important milk products.
- (2) While making these products water content and acidity of the milk is changed. Due to this, texture, taste, aroma and flavour are improved.
- (3) For milk products usually *Lactobacilli* bacteria are used.
- (4) Cheese is produced by using fungi.

2. Basic process for production of milk products :

- (1) Initial pasteurization of milk.
- (2) Later fermentation using *Lactobacilli*.

- (3) Lactose sugar → into Lactic acid.
- (4) Lactic acid coagulates the milk proteins.
- (5) Compounds with taste and flavour are formed, such as Diacetyl having buttery flavour.

3. Yoghurt production :

- Method of industrial production of yoghurt :**
- (1) Condensed milk powder mixed with milk for more proteins → Milk is then boiled → Cooled a little.
 - (2) *Streptococcus thermophilus* and *Lactobacillus delbrueckii* bacterial strains added to it in 1 : 1 proportion.
 - (3) *Streptococcus* → Formation of lactic acid → makes the proteins to gel out → Yoghurt becomes dense.
 - (4) *Lactobacilli* → Formation of Acetaldehyde like compounds → Give characteristic taste to yoghurt.
 - (5) Yoghurt mixed with various fruit juices → Impart different flavours. E.g. Strawberry yoghurt, banana yoghurt.
 - (6) Pasteurization → Increases shelf life of yoghurt and its probiotic properties.

4. Butter :

Butter is of two types : Sweet cream and cultured. For large scale production of cultured butter, microbes are used.

5. Cheese production :

Method for cheese production :

- (1) Cheese is produced from cow milk in the entire world. Initially, chemical and microbiological tests of milk done.
- (2) *Lactobacillus lactis*, *Lactobacillus cremoris*, and *Streptococcus thermophilus* + colours added to the milk.
- (3) Milk turns sour → whey (water in yoghurt) is removed to make milk dense.
- (4) Protease enzyme from fungi is used at present to produce vegetarian cheese.
- (5) Previously, rennet enzyme, from alimentary canal of cattle was used.
- (6) Whey is completely separated from yoghurt.

- (7) To summarise, the steps of process of cheese formation :

cutting the solid yoghurt into pieces → washing → rubbing → salting → mixing of essential microbes + pigments + flavours → Cheese is pressed and cut into pieces → stored for ripening.

Let's think : (Textbook page no. 78)

- (1) Which different types of cheese are used in western food like pizza, burger, sandwich, etc.?

Ans. Mozzarella cheese is used for pizza. Cheddar and Swiss, Blue cheese etc. are used for burgers. Sandwich and other western foods use different types of cheese. E.g. Goat, Cheese, Camembert, Cotija, Chèvre, Feta, Emmental, Gouda, Taleggio, Parmigiano, Reggiano, Manchego and Monterey, Parmesan are some of the cheese consumed world-wide especially in Europe and America.

- (2) What is the difference between those types of cheese?

Ans. A type of cheese depends upon the milk, the acidity of that cheese, taste, texture, the colours and flavours added, the calcium content present in it etc. Some cheeses are very soft like cream cheese, while some are very hard e.g. Parmesan cheese.

Can you tell? (Textbook page no. 79)

- What for probiotic food is famous?

Ans. In Probiotic food, *Lactobacilli* bacteria are added. This addition increases the nutritional value of the food. The harmful bacteria, *Clostridium* are destroyed due to probiotics. They also increase the intestinal flora of bacteria that synthesise the vitamins inside the human intestine. The disease resisting power is also increased due to probiotics.

6. Probiotics :

- (1) Milk products containing active bacteria such as *Lactobacillus acidophilus*, *Lactobacillus casei*, *Bifidobacterium bifidum*, etc. form probiotics.
- (2) **Probiotic products :** Yoghurt, kefir, sauerkraut (pickle of cabbage) and other pickles, dark chocolate, miso soup, oils, corn syrup, artificial sweeteners, sea food microalgae e.g. *Spirulina*, *Chlorella*, Blue green algae, etc. are probiotic products.
- (3) **Benefits of probiotics :**
 - Probiotics improve resistance to fight against diseases.
 - Some harmful substances are formed during metabolic activities. Their bad effects are lowered due to probiotics.
 - Due to antibiotic treatment, useful bacteria become inactive. Probiotics revitalize them by making them active again.
 - Probiotics are used for treatment of diarrhoea.
 - In poultry treatment too, probiotics are used.

7. Bread :

- (1) Bread is made from flour obtained from cereals.
- (2) The dough is made by mixing together, the baker's yeast - *Saccharomyces cerevisiae*, water, salt and other necessary materials.
- (3) The yeast helps in the fermentation and brings about the conversion of sugar into CO_2 and ethanol.
- (4) **Yeast is of two types :** (a) Compressed yeast containing carbohydrates, fats, proteins, various vitamins, and minerals. This is used in commercial bakery industry. (b) Dry, granular yeast used for domestic use.

8. Vinegar Production :

- Vinegar is 4% acetic acid (CH_3COOH).
- (1) **Uses of vinegar :**
 - Impart sour taste to food materials.

- Preservation of pickles, sauce, ketchup, chutneys, etc.
- By fermentation of fruit juices, maple syrup, sugar molasses, starch of the roots, etc. with the help of yeast *Saccharomyces cerevisiae* ethanol is obtained.

(2) Preparation of vinegar :

- Ethanol + *Acetobacter* and *Glucanobacter* mixture \rightarrow microbial degradation \rightarrow Acetic acid and other by-products \rightarrow rarefaction of mixture \rightarrow Separation of Acetic acid \rightarrow Acetic acid bleached with potassium ferrocyanide \rightarrow Pasteurization \rightarrow very small quantity of SO_2 gas is mixed \rightarrow Vinegar is produced.

(3) Soya sauce :

- Fungus *Aspergillus oryzae* is used to ferment the mixture of flour of wheat or rice and soyabean to produce soya sauce.

9. Production of beverages :

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Coffee, cocoa, wine and cider are the beverages that are produced from *Coffea arabica*, *Theobroma cacao*, grapes and apples respectively. For this production various microbes are used.

Can you tell? (Textbook page no. 80)

(1) Which functions are performed by enzymes secreted in human digestive system?

Ans. Different enzymes secreted by the glands associated with the digestive system, help in the digestion of the food. The complex food components are broken down to simple absorbable substances due to the enzymatic action.

(2) Give names of some such enzymes.

Ans. The pepsin and renin secreted by the stomach; amylase, trypsin and lipase secreted by the pancreas and peptidases and other enzymes secreted by the intestinal glands in the small intestine are the enzymes which bring about catalytic activity and help in the digestion.

10. Microbial Enzymes :

- (1) Microbial enzymes work at the low temperature, pH and pressure.
- (2) Energy is saved in the processes using microbial enzymes.
- (3) There is no need of erosion-proof instruments for the processes.
- (4) Only specific processes are carried out by the enzymes.
- (5) Unnecessary by-products are not formed during the reactions.
- (6) Expenses on purification are reduced. They can be reused.
- (7) Elimination and decomposition of waste material is avoided.

- Some examples of microbial enzymes are :

- | | |
|--------------------|-----------------|
| 1. oxidoreductases | 2. transferases |
| 3. hydrolases | 4. lyases |
| 5. isomerase | 6. ligases |

- Industries that use microbial enzymes :

- 1. Detergents : Used in cleaning process to remove dirt at low temperature.
- 2. Obtaining glucose and fructose syrup from corn flour using enzymes of bacilli and *Streptomyces*.
- 3. Industries for cheese manufacture, plant extracts, textile, leather, paper, etc.

11. L-glutamic acid, citric acid, gluconic acid, lactic acid and itaconic acid are such amino acids which are prepared by action of certain microbes on some plant sources.

12. Xanthan gum :

- (1) *Xanthomonas* species is used to make Xanthan gum by fermentation of starch and molasses.
- (2) It is used in the production of pigments, fertilizers, weedicides, textile pigments, tooth pastes, high quality paper, etc.

13. Substances obtained by microbial processing are as follows :

- (1) Citric, Malic and Lactic acid
- (2) Glutamic acid, Lysine, Tryptophan
- (3) Nycin and natamycin

- (4) Ascorbic acid (Vit. C), B₁₂, B₂
 - (5) Beta carotene, lycopenes, xanthenes, lutein
 - (6) Polysaccharides, glycolipids
 - (7) Vanillin, Ethyl butyrate (fruit flavour), peppermint flavour, essence of various fruits and flowers
 - (8) Xylitol, aspartame
- Their functions are respectively as follows :
- (1) To make the medium acidic
 - (2) For binding the proteins
 - (3) Microbial restrictor
 - (4) Antioxidants, vitamins.
 - (5) Edible colours
 - (6) Emulsifiers
 - (7) Essence
 - (8) Artificial sweetener (low calorie)

Can you recall? (Textbook page no. 82)

(1) What do you mean by antibiotic?

Ans. Carbon compounds obtained from some bacteria and fungi which are able to destroy or prevent the growth of harmful microorganisms are called 'antibiotics'.

(2) Which precautions should be taken about their consumption?

Ans. It is dangerous to take antibiotics at our own will. They should be taken only when a doctor prescribes to take those. One should not purchase any antibiotic from medical stores without a prescription from a doctor. The dosage of the antibiotics as told by doctor, should be completed, and should not be left half way even if one feels well. Even if we find antibiotic very effective, we should not suggest antibiotics to other people. Antibiotics whose expiry date is over, should never be used.

14. Antibiotics :

- Antibiotics are medicines obtained from different types of bacteria and fungi by carrying out certain processes. Some human diseases and veterinary diseases have been controlled due to antibiotic treatment.



- Antibiotics which are used against Gram positive and Gram negative bacteria :
- (1) Penicillin (2) Cephalosporins
 - (3) Monobactam (4) Bacitracin
 - (5) Erythromycin (6) Gentamycin
 - (7) Neomycin (8) Streptomycin
 - (9) Tetracyclines (10) Vancomycin, etc.
 - (11) Rifamycin – against tuberculosis.

Can you tell? (Textbook page no. 82)

- (1) Which different materials are decomposed in biogas plant?

Ans. Bio-degradable substances such as animal and plant wastes, dung and urine of the animals, farm wastes, etc. are decomposed in the biogas plant.

- (2) Which useful materials are obtained through it? Which is the fuel out of those?

Ans. The best quality manure and fuel is obtained from the biogas plant. The biogas contains methane, carbon dioxide and H_2S in small proportions.

- (3) Decomposition occurs through which organisms?

Ans. The methanogenic bacteria present in the excreta of the animals bring about the decomposition of the waste matter.

15. Microbes and Fuels :

- (1) Methane is obtained from microbes present in the agricultural and industrial waste, by microbial anaerobic decomposition.
- (2) Fermentation of molasses by yeast, *Saccharomyces* produces ethanol which is a clean, smokeless fuel.
- (3) The fuel of future is hydrogen gas. It is released when bacteria perform bio-photolysis of water.
- (4) Some industrial chemicals are produced through microbial process.
- (5) **Bio-fuel :** Biofuel is a good and renewable and reliable fuels of the future. Biofuel is available in the following three forms :

- Solid : Coal, dung, crop residue
- Liquid : Vegetable oils, alcohol
- Gaseous : Gobar gas and coal gas.

16. **Microbial Pollution Control :** With the help of suitable microbes, the problem of environmental pollution is tackled.

17. Land-filling sites :

- (1) The type of degradable waste which is created in the urban areas is dumped in the land filling sites which are away from the residential areas.
- (2) The large pits are dug and then lined with plastic sheets. Used for dumping compressed waste.
- (3) It is covered with certain bioreactor substances and specific biochemicals.
- (4) Microbes present therein decompose the biodegradable materials.
- (5) The pit is sealed with soil slurry after it is full.
- (6) Compost is formed by decomposition after few days. This is removed and such land filling sites can be reused after removal of compost.

18. Sewage Management :

- (1) In cities, the sewage is sent to processing plant and is treated with microbes.
- (2) Microbes that carry out decomposition, are mixed with sewage.
- (3) Upon decomposition of the carbon compounds present in sewage, microbes release methane and CO_2 . The phenol oxidizing bacteria decompose Xenobiotic chemicals present in sewage. Pathogens are destroyed.
- (4) Some microbes bring about bioremediation of environment, that are used for treating sewage pollution.

19. Clean Technology :

Microbes are used to combat increasing soil, land and water pollution. They digest hydrocarbons.



20. Microbes used in clean technology :

Microbes performing tasks of cleaning	Function
Some microbes	Remove the sulphur from fuels.
<i>Thiobacilli</i> and <i>Sulphobacilli</i>	Conversion of heavy metals into compounds before leaching
Hydrocarbonoclastic bacteria (HCB) : <i>Pseudomonas</i> spp. and <i>Alcanovorax borkumensis</i>	To treat oil spills by destroying the pyridines and other chemicals. Conversion of hydrocarbons into CO_2 and water.
<i>Vibrio, Ideonella sakaiensis</i>	Decomposition of PET (Polyethylene Terephthalate Polyester)
<i>Actinomycetes, Streptomyces, Nocardia, Actinoplanes</i> (all bacteria)	Decomposition of rubber from garbage.
<i>Acidophillum</i> spp. and <i>Acidobacillus ferrooxidens</i>	Control of soil pollution caused by acid rain.
<i>Geobacter</i>	Conversion of salts of uranium into insoluble salts.

Can you tell? (Textbook page no. 84)

- You must have seen or read the news of dead fishes or oily water accumulating at the sea coasts. Why does this happen?

Ans. There are various causes of oil spills occurring in the marine waters. For example, accidents of oil tankers that transport crude oil, spillage through offshore oil wells, pollutants released through effluents from shore, etc. The oil spills form an oil film on the surface of water. It causes depletion of oxygen in the water. It also contains hazardous hydrocarbons which results in the death of fish.

21. Microbes and Farming :

Can you tell? (Textbook page no. 85)

- How the bacteria present in soil and root nodules of leguminous plants are useful?

Ans. The leguminous plants have root nodules in which the bacteria, *Rhizobium* resides symbiotically with the plants such as peas, beans, soyabean, etc. These bacteria supply nitrates and nitrites and amino acids to the plants. They have capacity to convert nitrogen in the soil and air to form such compounds. This is called bacterial nitrogen fixation. In return the plants provide energy in the form of carbohydrates and the place to stay in the root nodules to the bacteria. Some more bacteria and blue green algae such as *Anabaena, Nostoc* and *Azotobacter*, are free living in the soil, they too perform similar function of nitrogen fixation. Both types of bacteria make the soil fertile and reduce the demand of chemical fertilizers.

22. Microbial Inoculants :

Microbes-containing inoculants are used for spraying on seeds before sowing.

23. Benefits of microbial inoculants :

- (1) The nutrients are supplied through the microbial inoculants which help in growth of plants.
- (2) The nutritional quality of crops is increased.
- (3) Soil pollution caused by chemical fertilizers is prevented by injecting solution containing *Azotobacter* and artificial nitrogenase.
- (4) Harmful substances such as fluoroacetamide can be eradicated by using microbes.

24. Bioinsecticides :

- (1) Through biotechnology, bacterial and fungal toxins are directly integrated into plants to protect them from fungal and pest attacks.
- (2) Insects avoid such plants as they are secondarily toxic.
- (3) Some species of fungi and viruses are also used as pesticides. Spinosad, produced through fermentation is used as a biopesticide.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- (1) Enzyme obtained from fungi is used to produce vegetarian cheese.
 (a) *lipase* (b) *protease*
 (c) *amylase* (d) *trypsin*

(2) Milk is subjected to at the beginning to destroy unwanted microbes.
 (a) *pasteurization* (b) *fermentation*
 (c) *coagulation* (d) *decomposition*

(3) like compounds are formed due to *lactobacilli* that gives characteristic taste to the yoghurt.
 (a) *Lactose* (b) *Caesin*
 (c) *Acetyldehyde* (d) *All the above*

(4) Methane can be obtained by decomposition of urban agricultural and industrial waste.
 (a) *aerobic* (b) *anaerobic*
 (c) *microbial anaerobic* (d) *chemical*

(5) gas is considered to be the fuel of future.
 (a) *Hydrogen* (b) *Nitrogen*
 (c) *Methane* (d) *Butane*

(6) are mixed with waste materials at land-filling sites for quicker decomposition.
 (a) *Microbes* (b) *Bioreactors*
 (c) *Fungi* (d) *Worms*

(7) bacteria decompose the xenobiotic chemicals present in sewage.
 (a) *Hydrocarbonoclastic* (b) *Decomposing*
 (c) *E.coli* (d) *Phenol oxidizing*

(8) Microbes are used for of environment polluted due to sewage.
 (a) *protection* (b) *conservation*
 (c) *bioremediation* (d) *decomposition*

(9) is a powerful antibiotic against tuberculosis.
 (a) *Streptomycin* (b) *Tetracycline*
 (c) *Rifamycin* (d) *Bacitracin*

(10) Bacteria used to clear the oil spills are called bacteria.
 (a) *phenol oxidizing* (b) *electrolytic*
 (c) *hydrocarbonoclastic* (d) *decomposing*

- (11) convert these salts of uranium into insoluble salts.

(a) *Saccharomyces* (b) *Thiobacillus*
(c) *Acidobacillus* (d) *Geobacter*

(12) , a byproduct of fermentation is a biopesticide.

(a) *Fluoroacetamide* (b) *Vanillin*
(c) *Aspertame* (d) *Spinosad*

(13) beverage is obtained by fermentation of apple juice.

(a) *Cider* (b) *Wine*
(c) *Coffee* (d) *Cocoa* (July '19)

(14) Vinegar is the chemically acid.

(a) *Citric* (b) *Gluconic*
(c) *Glutamic* (d) *Acetic*

(15) In which of the following industries microbial enzymes are not used?

(a) *Glass industry* (b) *Cheese industry*
(c) *Tanning industry* (d) *Paper industry*

(16) Citric acid used in production of beverages, toffees, chocolates is obtained by fermentation of by *Aspergillus niger*.

(a) *grapes* (b) *sugar molasses*
(c) *apple* (d) *coffee nuts*

(17) Salts which can be used as supplement of calcium and iron are obtained from .

(a) *carbonic acid* (b) *acetic acid*
(c) *citric acid* (d) *gluconic acid*

(March '20)

Ans. (1 - b); (2 - a); (3 - c); (4 - c); (5 - a); (6 - b);
 (7 - d); (8 - c); (9 - c); (10 - c); (11 - d); (12 - d);
 (13 - a); (14 - d); (15 - a); (16 - b); (17 - d).

*Q. 2 Rewrite the following statements using correct of the options and explain the completed statements :

(gluconic acid, coagulation, amino acid, 4% acetic acid, clostridium, lactobacilli)

- (1) Process of of milk proteins occurs due to lactic acid.

(2) Harmful bacteria like in the intestine are destroyed due to probiotics.

- (3) Chemically, vinegar is
 (4) Salts which can be used as supplement of calcium and iron are obtained from acid.

Ans. (1) Process of **Coagulation** of milk proteins occurs due to lactic acid.

Explanation : The *lactobacilli* are the bacteria carrying out fermentation of the milk. In this process, the lactose sugar in the milk is converted into lactic acid. This lactic acid causes coagulation of the proteins present in the milk.

(2) Harmful bacteria like **Clostridium** in the intestine are destroyed due to probiotics.

Explanation : In probiotics, there are *lactobacilli* which are useful. They control other bacteria present in the alimentary canal and also their metabolism. These bacteria thus stop the action of *Clostridium* which is a harmful bacteria.

(3) Chemically, vinegar is 4% **Acetic acid** :

Explanation : Chemically vinegar is 4% acetic acid. It is a good preservative of the food and thus while using it as additive to the food, it is called vinegar.

(4) Salts which can be used as supplement of calcium and iron are obtained from **Gluconic acid**.

Explanation : The microbe *Aspergillus niger* is used on the source material of glucose and corn steep liquor to produce amino acid called Gluconic acid. Gluconic acid is used for the production of minerals used as supplement for calcium and iron.

Q. 3 Match the pairs :

*(1) 'A' group	'B' group
(1) Xylitol	(a) Pigment
(2) Citric acid	(b) To impart sweetness
(3) Lycopene	(c) Microbial restrictor
(4) Nycin	(d) Protein binding emulsifier
	(e) To impart acidity

Note : In examination match the column question will have 2 components in Column 'A' with 4 alternatives in Column 'B'.

- Ans.** (1) Xylitol – To impart sweetness
 (2) Citric acid – To impart acidity

- (3) Lycopene – Pigment
 (4) Nycin – Microbial restrictor.

(2) Column 'A'	Column 'B'
(1) Vinegar	(a) Polylactic acid
(2) Xanthan gum	(b) Molasses
	(c) Icecreams and puddings
	(d) Acetic acid

- Ans.** (1) Vinegar – Acetic acid
 (2) Xanthan gum – Icecreams and puddings

Q. 4 Find the odd one out :

- (1) *Lactobacillus acidophilus*, *Lactobacillus casei*, *Bifidobacterium bifidum*, *Streptococcus thermophilus*
 (2) *Lactobacillus lactis*, *Bifidobacterium bifidum*, *Lactobacillus cremoris*, *Streptococcus thermophilus*
 (3) Dark chocolate, Miso soup, Wafers, Corn syrup
 (4) Vinegar, Soya sauce, Ketchup, Monosodium glutamate
 (5) *Actinomycetes*, *Streptomyces*, *Nocardia*, yeast

Ans. (1) *Streptococcus thermophilus*. (All others are bacteria producing probiotics.)

(2) *Bifidobacterium bifidum*. (All others are bacteria used in cheese production.)

(3) Wafers. (All others are probiotic products.)

(4) Ketchup. (All others are products prepared by microbial fermentation.)

(5) Yeast. (All others have ability of decomposing rubber from garbage.)

Q. 5 Find the correlation :

- (1) Bread : Baker's yeast :: Soya sauce :
 (2) Coffee : *Coffea arabica* :: Cocoa :
 (3) Oil slick : *Alcanivorax* : Rubber from garbage :
 (4) Conversion of metals into compounds : *Thiobacilli* :: Conversion of uranium salts

Ans. (1) *Aspergillus oryzae* (2) *Theobroma cacao*
 (3) *Actinomycetes* (4) *Geobacter*.

Q. 6 Name the following :

- (1) Microbial enzymes.

Ans. Oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases.

(2) Emulsifiers.

Ans. Polysaccharides and glycolipids.

(3) Microbe used in preparation of wine and cider.

Ans. *Saccharomyces cerevisiae*.

(4) Effective antibiotic against tuberculosis.

Ans. Rifamycin.

(5) Antibiotics.

Ans. Penicillin, cephalosporins, monobactam, erythromycin, gentamycin, neomycin, streptomycin, tetracyclines, vancomycin.

(6) Bacteria that use sulphuric acid as source of energy.

Ans. *Acidobacillus ferrooxidens*, *Acidophilium spp.*

(7) Substance that makes biodegradable plastic.

Ans. Polylactic acid.

(8) Curd like food product made from sheep milk.

Ans. Kefir.

(9) Enzyme used to make vegetarian cheese.

Ans. Protease.

(10) Fungus used for making soya sauce.

Ans. *Aspergillus oryzae*.

(11) Write the molecular formula for :

4% Acetic acid (Vinegar) (Nov. '20)

Ans. CH_3COOH .

Q. 7 Complete the charts : (The answers are underlined.)

(1)

Fruit	Microbe used	Name of beverage
<i>Caffea arabica</i>	<i>Lactobacillus brevis</i>	Coffee
<i>Theobroma cacao</i>	<i>Candida</i> , <i>Hansenula</i> , <i>Pichia</i> , <i>Saccharomyces</i>	Cocoa
Grapes	<i>Saccharomyces cerevisiae</i>	Wine
Apple	<i>Saccharomyces cerevisiae</i>	Cider

(2)

Source	Microbe	Amino acid	Use
Sugar and beet molasses, ammonia salt	<i>Brevibacterium</i> , <i>Corynobacterium</i>	L-glutamic acid	Production of monosodium glutamate (Ajinomoto).
Sugar molasses, salt	<i>Aspergillus niger</i>	Citric acid	Drinks, toffees, chocolate production.
Glucose, corn steep liquor	<i>Aspergillus niger</i>	Gluconic acid	Production of minerals used as supplement for calcium and iron.
Molasses, corn steep liquor	<i>Lactobacillus delbrueckii</i>	Lactic acid	Source of nitrogen, production of vitamins.
Molasses, corn steep liquor	<i>Aspergillus itaconius</i>	Itaconic acid	Paper, textile, plastic industry, gum production

(3) (July '19)

Source	Microbe	Amino acid
(1) Sugar molasses and salt	<i>Aspergillus niger</i>	Citric acid
(2) Molasses, corn steep liquor	<i>Lactobacillus delbrueckii</i>	Lactic acid
(3) Corn steep liquor	<i>Aspergillus itaconius</i>	Itaconic acid



Substance obtained by microbial processing	Roles
(1) Citric acid	To impart acidity
(2) Ascorbic acid	Antioxidants, vitamins
(3) Beta carotene	Edible colours
(4) Glycolipid	Emulsifiers
(5) Vanillin	Essence
(6) Xylitol	Artificial sweetener (low caloric)

Q. 8 Give scientific reasons :

*(1) Use of mutant strains has been increased in industrial microbiology.

Ans. (1) By using industrial microbiology, the commercial use of microbes is done. (2) In such experiments, various economic, social and environment related processes and products are included. (3) In this, fermentation processes are used to make bread, cheese, wines, enzymes, nutrients, etc. (4) Different types of antibiotics are also made by using processes of industrial microbiology. (5) In pollution control and solid waste management, the industrial microbiology becomes helpful. (6) In farming too biotechnology is used to produce BT crops.

*(2) Enzymes obtained by microbial process are mixed with detergents.

Ans. (1) When detergents are mixed with microbial enzymes, they start working more efficiently. (2) The cleaning process takes place at lesser temperatures. (3) Therefore, for better results, enzymes obtained by microbial process are mixed with detergents.

*(3) Microbial enzymes are used instead of chemical catalysts in chemical industry.

(March '19; Nov. '20) OR

Microbial enzymes are said to be eco-friendly.

Ans. (1) Microbial enzymes are active at low temperature, pH and pressure.

(2) Due to this property, the energy is saved. The costlier erosion-proof instruments need not be used.

(3) In enzymatic reactions, the unnecessary byproducts are not formed as the reactions are highly specific.

(4) The expenses on purification of the product are minimized as no unnecessary products are formed.

(5) The elimination and decomposition of waste material is avoided and enzymes can be reused again. Hence, microbial enzymes which are eco-friendly are used in chemical industry.

Q. 9 Answer the following questions :

*(1) How the bread and other products produced using baker's yeast are nutritious?

Ans. (1) In order to make the bread the baker's yeast – *Saccharomyces cerevisiae* is added to the flour for the fermentation process.

(2) In commercial bakery, compressed yeast is used while in domestic settings dry, granular form of yeast is used.

(3) The flour prepared by using commercial yeast contains various useful contents like carbohydrates, fats, proteins, various vitamins, and minerals.

(4) The anaerobic fermentation also increases the nutritive content of the flour.

(5) Due to this, bread and other products produced with the help of yeast become nutritive.

***(2) How does the bread become spongy?**

Ans. (1) When the dough for bread is prepared, the baker's yeast – *Saccharomyces cerevisiae* is added to it.

(2) This yeast carries out anaerobic fermentation.

(3) This results in formation of CO_2 and ethanol.

(4) The CO_2 formed tries to escape out of the flour and thus the dough rises. When such dough is baked, it produces spongy bread.

(3) Which microbes are used in the baking industries?

Ans. Yeast i.e. *Saccharomyces cerevisiae* is used in the baking industries.

***(4) What are the reasons for increasing the popularity of probiotic products?**

Ans. (1) Probiotic substances are mostly milk products containing live bacteria. Such probiotics are very good for health.

(2) The useful colonies of bacteria are produced in the alimentary canal of human beings due to the probiotics.

(3) Probiotics decrease the population of harmful microbes like *Clostridium* from our digestive tract.

(4) The immunity is enhanced due to regular intake of probiotics in the diet.

(5) The ill-effects of harmful substances formed during metabolic activities are reduced by the probiotics.

(6) If someone takes the antibiotic treatment, then his or her useful intestinal bacterial flora becomes inactive or is eradicated. In such cases, probiotics restore the bacterial flora and make the person well again.

All these facts have made probiotics a popular choice for people.

***(5) Which fuels can be obtained by microbial processes? Why is it necessary to increase the use of such fuels?**

Ans. (1) Microbial anaerobic decomposition of urban agricultural and industrial waste forms the gaseous fuel in the form of methane gas.

(2) Alcohol is another clean form of energy which is used in the form of ethanol. It is obtained by the fermentation of molasses by treating it with *Saccharomyces*-yeast.

(3) By photoreduction of water with the help of bacteria, hydrogen gas is released in the process of bio-photolysis of water. This hydrogen gas is said to be the fuel of the future.

(4) The conventional fuels are exhaustible. After few hundred years, they will be over completely. Moreover, these fossil fuels cause lot of air pollution due to emission of carbon dioxide. The fuels obtained by the microbial processes are not polluting. Therefore, it is necessary to increase the use of eco-friendly fuels.

***(6) How can the oil spills of rivers and oceans be cleaned?**

Ans. (1) The oil spills in rivers or oceans are caused by crude oil or petroleum hydrocarbons.

(2) This crude oil is highly toxic to the flora and fauna of the aquatic environment.

(3) By using mechanical means the oil spill can be removed, but this is very difficult.

(4) The biological way to remove this pollution is done by using culture of microbes like *Pseudomonas* spp. and *Alcanivorax borkumensis*.

(5) They have the ability to destroy the pyridines and other chemicals present in the hydrocarbons.

(6) These bacteria are called as hydrocarbonoclastic bacteria (HCB) which decompose the hydrocarbons and bring about the reaction of carbon with oxygen.

(7) In the process CO_2 and water are formed. In this way the oil spills are cleaned, by releasing HCB at the place of oil spills.

(7) There is an oil layer on the water surface of river in your area. What will you do?

(March '19)

Ans. If there is an oil layer on the water surface, we shall use hydrocarbonoclastic bacteria like *Pseudomonas* to clean up the oil spill.

***(8) How can the soil polluted by acid rain be made fertile again?**

Ans. (1) The soil polluted by the acid rain is made fertile again by using bacteria.

(2) *Acidophilium* spp. and *Acidobacillus ferroxidens* are the bacteria which have the capacity to use sulphuric acid as their energy source.

(3) Since this sulphuric acid present in the acid rain, can be controlled by these bacteria.

(4) In this way, bacteria can control the soil pollution occurring due to acid rain, making the soil fertile again.

***(9) What is the role of microbes in compost production?**

Ans. (1) Microbes can bring about natural decomposition of the organic compounds.

(2) During the biodegradation, some bacteria and fungi bring about such decomposition and release the inorganic constituents back into the nature.

(3) Compost is formed in such a way by recycling process.

***(10) Explain the importance of biopesticides in organic farming.**

Ans. (1) By using biopesticides, soil pollution is minimized. Otherwise by using chemical pesticides and fertilizers there is large scale soil pollution.

(2) When chemical pesticides are used in agriculture, there is contamination of soil by fluoroacetamide-like chemicals.

(3) These are harmful to other plants, animals as well as for human beings. They may cause skin diseases in humans.

(4) By using bacterial and fungal toxins the pests and pathogens can be destroyed. Such toxins are directly incorporated in the plant materials.

E.g. Spinosad is a biopesticide produced as a by-product of fermentation.

***(11) Which plants are cultivated to obtain the fuel?**

Ans. (1) The ethanol is obtained from wheat, maize, beet, sugarcane and molasses of sugarcane.

(2) For biodiesel, the soybean, rapeseed, jatropha, mahua, flaxseed, mustard, sunflower, palm, jute and some types of algae are cultivated.

***(12) Which fuels are obtained from biomass?**

Ans. From biomass, the biogas and biodiesel are mainly obtained. The biogas is obtained from dung of cattle. The fermentation of cattle dung gives rise to methane. From methane, methanol is obtained. Ethanol is obtained from molasses of sugarcane and some other crops. In some countries, special crops are cultivated for the biodiesel.

***(13) What are the benefits of mixing ethanol with petrol and diesel?**

Ans. When only diesel or petrol is used as fuel, there is increased air pollution. Moreover, since these are non-renewable and exhaustible fuels, they will be finished in next some years. When petrol and diesel is mixed with ethanol, the proportion of CO₂, CO, and hydrocarbons which are emitted in the atmosphere becomes lesser. The particulate pollutants which otherwise are emitted through combustion of petrol and diesel are not formed when fuels are mixed with ethanol. By adding ethanol to the fuels, the cost of expensive petrol or diesel also becomes less. The ethanol burns more efficiently hence ethanol is mixed with petrol and diesel.

***(14) Which precautions are necessary for proper decomposition of domestic waste?**

(March '20)

Ans. The domestic waste should be properly segregated into biodegradable (wet waste) and non-biodegradable (dry waste). After segregation, these wastes should be stored separately into two different containers. The non-biodegradable substances should be either reused or sent for recycling. The biodegradable substances are decomposed naturally.

The decomposition process can be done at household level too in a pot or a tank. This decomposition will yield a rich manure. The pot should be covered

by a thin layer of soil and it should be kept in a dark but airy place.

The non-biodegradable things such as plastic articles, glass pieces, metal objects, unused medicines, e-waste should never be thrown in wet wastes. The toxic substances and the insecticides if added to wet waste, will never allow the natural decomposition process. Therefore, only after taking proper precautions we can aim at proper decomposition of domestic wastes.

***(15) Why is it necessary to ban the use of plastic bags?**

Ans. Plastic is a non-biodegradable substance. It cannot be degraded back into its original constituents. It remains just like that for many hundreds of years. It causes solid waste pollution in any environment wherever it is thrown indiscriminately. If burnt, it releases very toxic gases. If dumped in landfills it obstructs the other decomposition processes.

If thrown in water bodies, it causes harm to aquatic life. Cattle graze on plastic unknowingly and are killed by it as it clogs inside their alimentary canal. The gutters and rain water drains get clogged due to plastic bags and this causes cities to submerge in water during heavy rains. Nowadays, the fishermen get more than half of plastic if they cast their net in the sea. People use the plastic bags indiscriminately without any thought towards their environmental impact. There are better alternatives for plastic bags such as cloth bags which can be reused again and again. Therefore, it is absolutely necessary to ban the use of plastic bag.

(16) (a) How are microbes used in sewage management?

(b) How is the sludge produced in this process utilized?

Ans. (a) (1) In cities, the sewage is sent to processing plant and is treated with microbes.

(2) Microbes that carry out decomposition, are mixed with sewage. Such microbes are able to destroy pathogens as well as decompose any compounds.

(3) Some microbes bring about bioremediation of environment, that are used for treating sewage pollution.

(4) Upon decomposition of the carbon compounds present in sewage, microbes release methane and CO_2 .

(b) The sludge formed in this process, is used as fertilizer.

(17) Answer the following questions :

(a) What is clean technology?

Ans. Clean technology is the method to use microbes for controlling air, soil and water pollution. These microbes can degrade the man-made chemicals.

(b) Why is it essential to ban plastic bags?

Ans. Refer to Q. 9 (15).

(18) In the earlier class, you had prepared the solution of dry yeast for observation of yeast. Which substance is prepared by its use on commercial basis?

(Use your brain power : Textbook page no. 79)

Ans. The commercial production of bread and other bakery products need yeast. In wine and beer making also solution of yeast is required.

(19) Food materials like cold drinks, ice creams, cakes, juices are available in various colours and flavours. Whether these colours and flavours are really derived from fruits?

(Use your brain power : Textbook page no. 81)

Ans. The eatables can be made directly from fruits or essence of fruits. But most of the food products purchased from markets use these colours and flavours which are derived from synthetic chemicals.

Q. 10 Write short notes on the following :

(1) Production of Yoghurt.

Ans. (1) Yoghurt is one of the milk product produced from milk with the help of *lactobacilli* (inoculant).

(2) In the industrial production of yoghurt, the milk is added with condensed milk powder. This

increases the protein content of the milk. Then this milk is subjected to fermentation.

(3) Milk is boiled and then it is cooled till it becomes lukewarm.

(4) Then the bacterial strains of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* are added to this lukewarm milk in 1:1 proportion.

(5) The *Streptococcus* bacteria convert the milk into solution containing lactic acid. This makes the proteins to gel out. It makes the yoghurt dense.

(6) The *Lactobacilli* help in the formation of acetaldehyde like compounds giving a characteristic taste to the yoghurt.

(7) For commercial reasons, various fruit juices are mixed with yoghurt to impart different flavours forming strawberry yoghurt, banana yoghurt, etc.

(8) The pasteurization is carried out to increase the shelf life of yoghurt and improve its probiotic properties.

(2) Production of cheese.

Ans. Cheese is made from cow's milk throughout the world. The steps in the process of cheese manufacture are as follows:

(1) Chemical and microbiological testing of milk is done.

(2) Three types of bacteria, viz. *Lactobacillus lactis*, *Lactobacillus cremoris* and *Streptococcus thermophilus* along with some colour is added to the milk.

(3) It imparts sourness to the milk and it is converted into yoghurt like substance.

(4) The water from this yoghurt, i.e. whey is not removed to make the yoghurt denser.

(5) Enzyme, rennet or protease is added to the mixture to make it more denser.

(6) Later cutting the solid yoghurt into pieces, washing, rubbing, salting, and mixing of essential microbes, pigments and flavours is done in suitable steps.

(7) The pressed cheese is then cut in to pieces and stored for ripening.

(3) Land-filling sites.

Ans. (1) In the land-filling sites the degradable wastes are transferred. Usually such sites are in

urban areas.

(2) The land-filling sites are away from the residential areas for the hygienic reasons. Here large pits are dug in open spaces.

(3) These pits are lined with plastic sheets. Therefore, the leaching of toxic and harmful materials is avoided to reduce the chance of soil pollution due to leachates.

(4) Compressed waste is put in the pit and is covered with layers of soil, saw dust, leafy waste.

(5) Specific biochemical substances are added for speedy decomposition.

(6) Bioreactors which are mixtures of bacteria are mixed at some places.

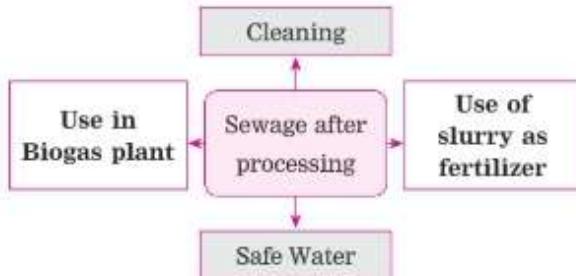
(7) Soil microbes and other top layers decompose the waste.

(8) Soil slurry is used to seal the pits completely.

(9) After a certain period, best quality compost is formed. Such land filling sites can be reused after removal of compost.

***Q. 11** Complete the following conceptual picture : (Answers are given in bold.)

(1) Complete the following conceptual picture :



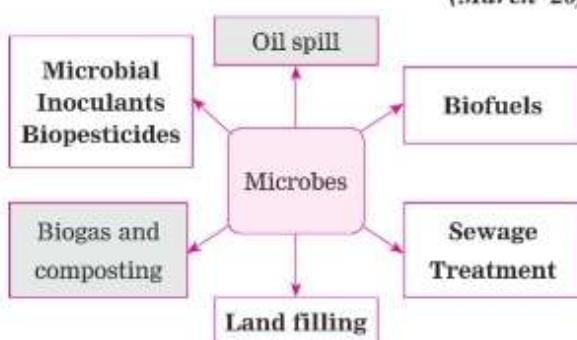
(2) Complete the following conceptual picture with respect to its uses :

Ans.



(3) Complete the following conceptual picture :

(March '20)



Q. 12 Let's Think : (Textbook page no. 83)

(1) Why is it asked to segregate wet and dry waste in each home?

Ans. The wet waste decomposes on its own as most of the matter therein is biodegradable. This waste can be converted into manure by composting. The dry waste can be picked up by the *bhangarwala* or *kabadiwala*. This waste can be reused or recycled. Therefore, if dry and wet wastes are kept separately, the solid waste management becomes much easier. On the contrary if everything is dumped indiscriminately, it adds to the total volume of the solid wastes. This becomes unmanageable. Therefore, to reduce the problems of solid waste management, the dry and wet waste segregation must be done at every point source. This also could fetch wealth from waste.

(2) What is done with the segregated waste?

Ans. In big cities, there is a mechanism to pick up the solid waste every day or even twice a day at some places. The segregated garbage is taken by the municipal garbage trucks at the land filling sites. Here it is buried deep in the ground. The dry waste that can be reused or recycled, is sold to the recycling units.

(3) Which is most appropriate method of disposal of dry waste?

Ans. Reuse and recycle is the most appropriate method of disposal of dry waste.

Q. 13 Complete the paragraph by choosing the appropriate words given in the brackets :

(1) Complete the paragraph using proper words : (March '20)

(mechanical, *Rhizobium*, aquatic, Toxic, CO_2 , Nitrogen, *Pseudomonas*, *Amoeba*, bacteria, hydrocarbons)

Spilling of petroleum oil occurs in ocean due to various reasons. This oil may prove fatal and toxic to organisms. It is not easy to remove the oil layer from surface of water by method. However, bacteria like spp. and *Alcanovorax borkumensis* have the ability to destroy the pyridines and other chemicals. Hence, these are used to clear the oil spills. These are called hydrocarbonoclastic bacteria (HCB). HCB decompose the and bring about the reaction of carbon with oxygen. and water is formed in this process.

Ans. Spilling of petroleum oil occurs in ocean due to various reasons. This oil may prove fatal and toxic to aquatic organisms. It is not easy to remove the oil layer from surface of water by mechanical method. However, bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have the ability to destroy the pyridines and other chemicals. Hence, these bacteria are used to clear the oil spills. These are called hydrocarbonoclastic bacteria (HCB). HCB decompose the hydrocarbons and bring about the reaction of carbon with oxygen. CO_2 and water is formed in this process.

(2) (*Nocardia*, *Geobacter*, *Ideonella sakaiensis*, *Pseudomonas*, *Alcanovorax borkumensis*, hydrocarbonoclastic, *Acidiphilium*, *streptomyces*)

Bacteria like spp. and have the ability to destroy the pyridines and other chemicals. Hence, these bacteria are used to clear the oil spills. These are called bacteria. It has been observed that species like *Vibrio*, can decompose the PET. Similarly, species of fungi like have ability of decomposing rubber from garbage. Sulphuric acid is source of energy for some species of bacteria like Hence, these bacteria can control the soil pollution occurring due to acid rain. convert the salts of uranium into insoluble salts.

Ans. Bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have the ability to destroy the pyridines and other chemicals. Hence, these

bacteria are used to clear the oil spills. These are called hydrocarbonoclastic bacteria. It has been observed that species like *Vibrio*, *Ideonella sakaiensis* can decompose the PET. Similarly, species of fungi like *Nocardia* have ability of decomposing rubber from garbage. Sulphuric acid is source of energy for some species of bacteria like *Acidophilium*. Hence, these bacteria can control the soil pollution occurring due to acid rain. *Geobacter* convert the salts of uranium into insoluble salts.

Q. 14 Paragraph based Questions :

(1) Read the paragraph and answer the questions given below :

Remediation is the process of removing dangerous or poisonous substances from the environment, or limiting the effect that they have on it. When any biological organism is used for remediation, it is called bioremediation. When plant species are used for the purpose of remediation, it is called phytoremediation. When any microbes are used then it is named as microbial remediation. The methods of such remediation have helped to clean the environment from toxic effluents, especially sewage and crude oil. Dr. Anand Chakraborty, a scientist of Indian origin, has worked on *Pseudomonas aeruginosa* which have reduced the crude oil films into carbon dioxide and water.

Questions and Answers :

(a) What is the meaning of remediation?

Ans. Remediation is the process by which the dangerous or toxic substances are removed from the environment.

(b) What is the difference between phytoremediation and microbial remediation?

Ans. When any plant species are used for remediation process, then it is called phytoremediation, whereas when any microbe species used for remediation then it is called microbial remediation.

(c) Which environmental pollutant is mainly removed through bioremediation processes?

Ans. Toxicants released through sewage and crude oil are removed by bioremediation processes.

(d) What is the role of *Pseudomonas aeruginosa*?

Ans. *Pseudomonas aeruginosa* helps in bioremediation by acting on film of crude oil and reduces it to carbon dioxide and water.

(e) Why Dr. Anand Chakraborty's work phenomenal?

Ans. Dr. Anand Chakraborty discovered that *Pseudomonas aeruginosa* bacteria can act on oil film which is toxic and reduce it to nontoxic products. This helps in controlling the oil pollution of marine waters which otherwise is very difficult to control.

(2) Read the paragraph and answer the questions given below :

Lady bug beetles are friends of farmers as they destroy harmful insects. It is a predatory insect, which lives on biting worm, white fly worm, white moth, flower insects and bread worms. It acts as a natural insecticide for crops like maize, *jawar*, cotton, sugarcane, cereals, vegetables, fruit trees, etc. These are attractive red or yellow or grey coloured insects. Many species of this insect are found in our farms. The lifecycle of this insect follows eggs, larvae, cocoon & moth stages. The eggs are found in flutter. The larvae are grey in colour. Larvae and adults both live on sucking insects.

(a) How does the lady bug beetle live?

(b) Of which colour the lady bug beetles are?

(c) State the stages of its lifecycle.

(d) How does it help the farmers?

Ans. (a) Lady bug beetle is a predator, living on harmful insects by sucking their juices.

(b) Lady bug beetles are attractive red or yellow or grey in colour.

(c) Eggs, larvae, cocoon and moth are the four stages of lady bug beetle.

(d) Lady bug beetle feeds on biting worm, white fly worm, white moth, bread worms and flower insects which cause damage to farm produce, thus helping farmers in protecting crops.

(3) Read the paragraph and answer the questions given below :

Sulphuric acid is present in the acid rain and materials coming out of mines. You know that erosion of metals present in statues, bridges and buildings occurs due to it. Sulphuric acid is a source of energy for some species of bacteria like *Acidophilum* spp. and *Acidobacillus ferrooxidans*.

Hence, these bacteria can control the soil pollution occurring due to acid rain.

Water soluble salts of uranium are present in the wastes produced during electroplating and in effluent released in the environment from the atomic energy plant. Geobacter convert these salts of uranium into insoluble salts and thereby prevent those salts from mixing with groundwater sources.

(a) What causes metal erosion in statues, bridges and buildings?

(b) Sulphuric acid is the source of energy for which bacteria?

(c) What kind of pollution do these bacteria control?

(d) What are the water soluble salts in nuclear power plants and in the process of electrolysis?

(e) Which bacteria prevent these salts from mixing with ground water by converting them into insoluble salts?

Ans. (a) Sulphuric acid present in acid rain causes metal erosion of statues, bridges and buildings.

(b) Bacterial species such as *Acidophilum sps.* and *Acidobacillus ferrooxidans* use sulphuric acid as source of energy.

(c) These bacteria control soil pollution which is caused due to acid rain.

(d) Uranium salts are water soluble salts produced in nuclear power plants and in the process of electrolysis.

(e) Geobacter bacteria prevent uranium salts from mixing with ground water by converting them into insoluble salts.

Q. 15 Diagram-based questions :

(1) Observe the diagram and answer the following questions :

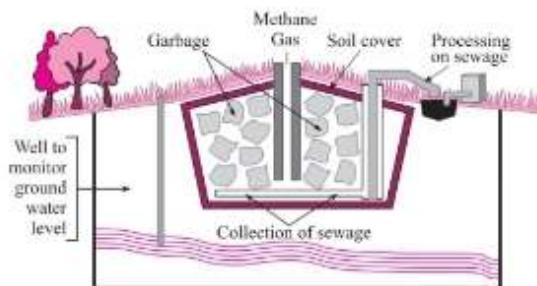


Fig. 7.1 : Modern landfill site

(a) Name the following method of solid waste management.

Ans. The above diagram shows modern landfill site. This method is used for solid waste management.

(b) What type of waste is used in this method?

Ans. In this method only degradable waste matter collected in cities can be used. Such solid waste can undergo biodegradation and hence can be managed in an eco-friendly way.

(c) What kind of useful substances can be obtained from such methods?

Ans. From such decomposition, organic fertilizers and manure formed through composting are obtained. Methane gas is also obtained which is used as fuel.

(2) Observe the Figure 7.1 and answer the following questions : *(March '19)*

(a) Identify the process shown in the figure.

Ans. The figure shows modern land fill site where microbial biodegradation process is carried out.

(b) Explain the process in short.

Ans. For answer refer to Q. 10 (3).

(3) Write the answers to the questions by observing the figure.



(a) What type of fuel production process is shown in the figure?

(b) Write two examples each of the solid, liquid and gaseous fuels produced in this fuel production process?

(c) How do microorganisms play their role in this process?

Ans. (a) Biofuel production process is shown in the above figure.

(b) Solid Fuels : Coal dung, crop residue

Liquid fuels : Vegetable oil, alcohols

Gaseous fuels : Gobar gas, coal gas.

(c) Microorganisms produce liquid fuel through fermentation. Cellulose is converted into glucose which is later fermented with the helps of microorganisms.

(4) Observe the figure and write the answers to the questions asked.



(a) Write the name of the fungus in the figure above.

(b) What is the source of these fungi?

(c) Which organic acid obtained from this organism is used in commercial production?

Ans. (a) Name of the fungus in the above figure is *Aspergillus niger*.

(b) Source of *Aspergillus niger* is sugar molasses, salt, glucose and corn steep liquor.

(c) It yields citric acid and gluconic acid which are used in commercial production.

Q. 16 Activity-based Questions :

(1) Collect Information Search :

(Textbook page no. 84)

(i) Which materials should not be present in garbage for its proper microbial decomposition?

Ans. If there are non-biodegradable materials in the garbage, they will not decompose. The plastic, glass, metals, etc. will not undergo microbial decomposition, therefore, such items should not be there in the garbage. The toxic matter, hazardous chemicals and e-waste should also be removed. If such materials are present in the garbage, the microbes will be killed and the entire process of decomposition will be suffered.

(ii) How is the sewage generated in your house or apartment disposed off?

Ans. The sewage generated in our house is carried by the drainage pipes to municipal sewage treatment plants. Here, primary, secondary and tertiary treatment is done on the sewage. The safe water is then released into the ocean.

(2) Observe : (Textbook page no. 83)

• Observe the garbage vans of grampanchayat and municipality. Nowadays, there is facility of decreasing the volume of garbage by compaction in those vans. Explain the advantages of this activity.

Ans. When the garbage is compressed, its volume is reduced. The trips of the vans that pick up the garbage can be reduced due to such measures. The land filling sites can also accommodate more garbage if it is compacted.

(3) Observe the figure and answer the following :



(i) Lack of management of which factor is shown in the picture?

Ans. The above picture shows the lack of management of sewage resulting in waste water being dumped carelessly.

(ii) How can that factor be managed with the help of microbes?

Ans. Microbes which can destroy the pathogens of cholera, typhoid, etc. are mixed with sewage. They release methane and CO_2 by decomposition of the carbon compounds present in sewage. Other microbes that decompose chemical compounds are also released. Phenol oxidizing bacteria decompose the xenobiotic chemicals present in sewage.

(iii) How are the oil spills in oceans cleared?

Ans. Hydrocarbonoclastic bacteria like *Alcanivorax borkumensis* and *Pseudomonas* are used to clear the oil spillage from ocean water. These bacteria decompose the hydrocarbons. They bring about the reaction of released carbon with oxygen to produce CO_2 and water.

PROJECTS

(1) Search : (Textbook page no. 81)

Read the ingredients and their proportion printed on bottles of cold drinks and juices and wrappers of ice creams. Find out the natural and artificial ingredients.

(2) Internet is My Friend :

(Textbook page no. 85)

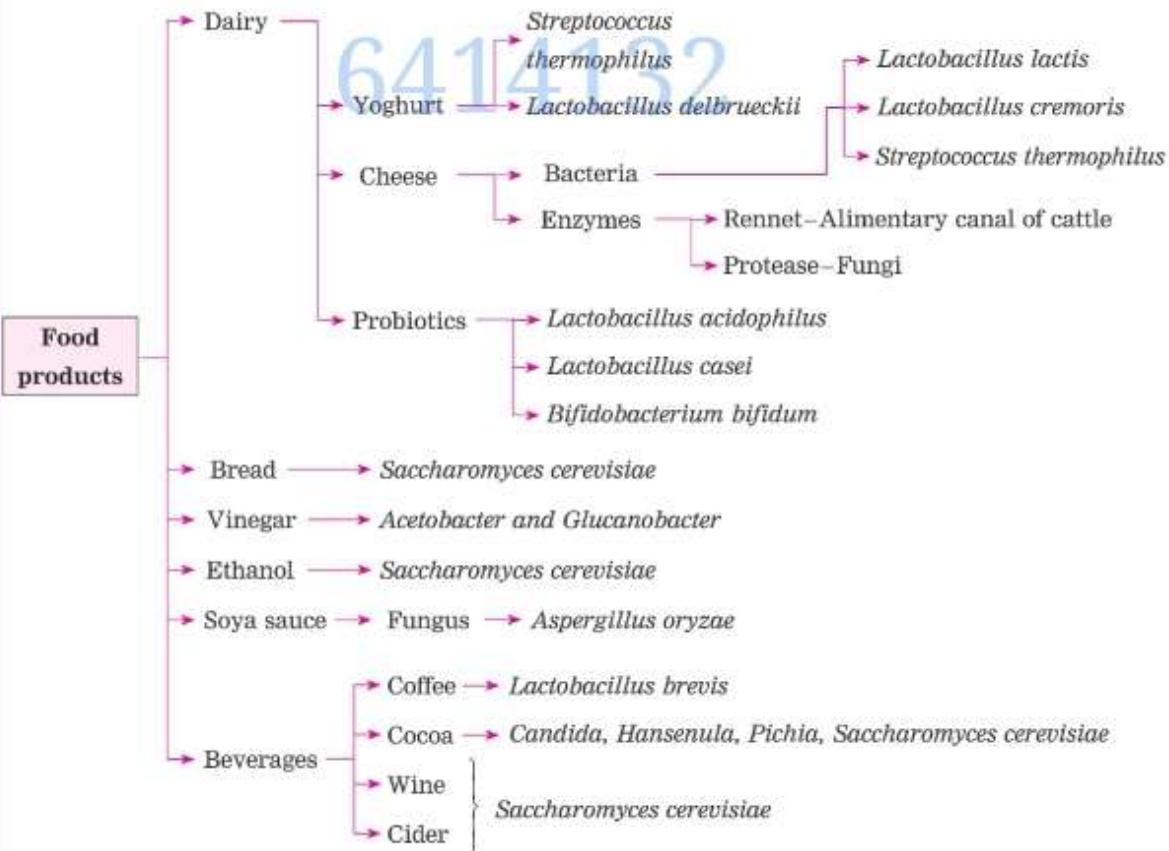
Collect pictures of various useful microbes. Display chart of their information in the classroom.

- *(3) Find the ways to implement the zero garbage system at domestic level.
- *(4) Which are the microbes that destroy the chemical pesticides in soil?
- *(5) Collect more information about reasons for avoiding the use of chemical pesticides.
- (6) Observe the figure given on Textbook page no. 82. Discuss about bio-fuel.

MEMORY MAP/CONCEPT MAP

(1)

Microbes for Food Production



(2)

Microbes for Clean Technology

- Oil spills → *Pseudomonas spp., Alcanovorax borkumensis*
(Hydrocarbonoclastic bacteria-HCB)
- Plastic/PET → *Vibrio, Ideonella sakaiensis*
- Rubber → *Actinomycetes, Streptomyces, Nocardia, Actinoplanes*
- Sulphuric acid → *Acidophilium spp., Acidobacillus ferrooxidens*
- Metalloids → *Thiobacilli, Sulphobacilli*
- Uranium → *Geobacter*

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CHAPTER AT A GLANCE

8.1 Cell Biology (Cytology)

8.2 Stem Cells

8.3 Biotechnology and its Applications

8.4 Important Stages in Development of Agriculture

IMPORTANT POINTS

Can you recall? (Textbook page no. 88)

(1) What is cell?

Ans. The structural and functional unit of the body is called a cell.

(2) What is tissue? What are the functions of tissue?

Ans. Tissue is a group of cells that performs a similar and definite function. E.g. The muscular tissues in the body perform contraction and extensions thereby helping in locomotion. The conducting tissues of the plants like xylem and phloem transport the water and food respectively.

(3) Which technique in relation to tissues have you studied in earlier classes?

Ans. The technique of tissue culture and genetic engineering has been studied last year. Tissue culture is 'Ex vivo growth of cells or tissues in an aseptic and nutrient-rich medium'. Genetic engineering and its use has also been studied under, 'Introduction to biotechnology'.

(4) Which are the various processes in tissue culture?

Ans. Various step-wise processes are done while performing the tissue culture.

These processes are primary treatment, reproduction/cell division/multiplication, shooting or rooting, primary hardening, secondary hardening, etc.

Observe : (Textbook page no. 88)

- Assign names in the figure given below. Explain the various stages those are kept blank : *(Answers are directly given in bold.)*

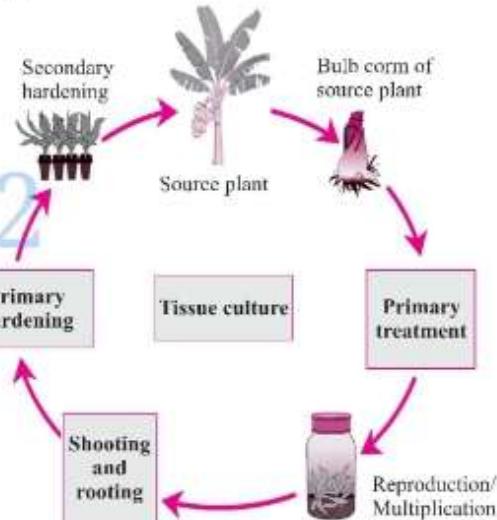
Ans.

Fig. 8.1 : Tissue culture

Tissue Culture : Tissue culture is the technique in which 'ex vivo growth of cells or tissues in an aseptic and nutrient-rich medium' is done. While performing experiments of tissue culture, a liquid, solid or gel-like medium prepared from agar, is used. Such medium supplies nutrients and energy necessary for tissue culture technique. Different processes are to be done while performing tissue culture, viz. primary treatment, reproduction or multiplication, shooting and rooting, primary

hardening, secondary hardening, etc. From the source plant, required tissues are taken out and all the processes are carried in an aseptic medium in laboratory.

8.1 Cell Biology/Cytology :

1. The study of structure, types and organelles of the cell, cell division and some other aspects together is known as cell biology or cytology. In the field of human health, there are revolutionary changes due to advances of cell biology.
2. Research institutes for dedicated research in cell biology :
 - (1) National Centre for Cell Science (<http://www.nccs.res.in>) at Pune
 - (2) Instem (<http://www.instem.res.in>) at Bengaluru

8.2 Stem Cells :

1. Special types of cells present in the body of multicellular organisms that can give rise to cells of all other types are called stem cells :
 - (1) The zygote formed after fertilization of gametes contains mass of cells, which are similar cells. These are the stem cells. They can give rise to new organism.
 - (2) Stem cells can be used to produce new tissues in laboratory.
 - (3) Stem cells also play an important role in wound healing.

2. Differentiation of stem cells :

- (1) Stem cells can form any type of cell during the further development.
- (2) The formation of different types of tissues to perform specific and different functions is called differentiation of the stem cells.
- (3) Once the new tissues are formed their capacity to differentiate is lost. Later they form cells which are similar to them.

3. Where are stem cells found?

- (1) In the umbilical cord present in the uterus of mother.
- (2) In the blastocyst stage of embryonic development.

- (3) In red bone marrow.
- (4) In adipose connective tissue of adult human beings.
- (5) In blood.

4. Stem cell preservation : Stem cell samples from umbilical cord blood, red bone marrow or blastocyst are taken and are kept in small, sterile vials, kept in liquid nitrogen at -135°C to -190°C . In this way, the stem cells can be preserved for a longer use.

5. Stem cell research :

- (1) The revolutionary event that occurred in biotechnology is stem cell research.
- (2) Stem cell research will cause the fundamental changes in the medical science.
- (3) Stem cells are of two types depending upon the source, viz. embryonic stem cells and adult stem cells.

6. Embryonic stem cells :

- (1) Embryo is formed by divisions of zygote. These embryonic cells continuously divide by mitosis. These cells are stem cells.
- (2) But by 14th day of conception cell differentiation starts. This differentiation causes formation of 220 different types of cells, e.g. osteocytes (bone cells), hepatocytes (liver cells), and neurons, etc. from the stem cells.
- (3) Before the differentiation, the embryonic cells are called embryonic stem cells. These stem cells are primary, undifferentiated cells having ability to multiply. They are called parent cells of all types of human cells.
- (4) The property to develop into different types of cells is called pluripotency. This property is present in the stem cells.
- (5) Stem cells can be collected well before the beginning of differentiation and cultured with certain biochemical stimuli in laboratory. Based on the type of stimulus, stem cells transform themselves into desired type of cells, later the tissues and organs.

7. Adult stem cells : Stem cells taken from the adult body are called adult stem cells.

For adult stem cells following sources are used : (1) Red bone marrow (2) Adipose connective tissue (3) Blood (4) Cord blood (after the birth) (5) Placenta.

8. Uses of Stem Cells :

1. Regenerative Therapy	2. Organ Transplantation
(1) Cell therapy : Replacing the dead cells in patients of diabetes, myocardial infarction, Alzheimer's disease, Parkinson's disease, etc.	In organ – failure such as kidney and liver, some tissues can be formed by stem cells and transplanted in a needy patient.
(2) The formation of blood cells in patients of anaemia, thalassemia, leukaemia, etc.	

9. Organ transplantation :

- If less efficient or completely functionless organ of the body is changed, the life of such patient can be saved. Kidney transplantation or skin transplantation can be done on the patients if there is suitable donor for the same. Investigations about the factors such as blood group, diseases, disorders, age, etc. are done for donor and recipient. This matching is done before the transplantation.
- Healthy donor should be available.
- For kidney and skin, live donor can be taken but liver, heart, eyes can be donated posthumously, i.e. after death.

10. Organ and Body donation :

- If the organs of deceased person are in good condition and functional, then they can be used for donation. Organ donations can save the life of other needy patients.

- Due to progress in science, such donations are possible. The awareness about such posthumous donations should increase so that people can donate their bodies voluntarily.
- Organ donation :** By organ donation the critical patient's life can be saved. Blind persons can again get the vision by getting a eye donation. Liver, kidneys, heart, heart valves, skin, etc. can be donated.
- Body donation :** Body can be made available for research in medical studies, after body donation.
- Organ transplantations are under the control of 'Transplantation Human Organs Act, 1994' and its further amendments of 2009, 2011 and 2014. These acts make the transplantation or donation process transparent and no one can be cheated.

Recall a Little : (Textbook page no. 91)

(1) What is biotechnology? (March '19)

Ans. The techniques of bringing about improvements in living organisms by artificial genetic changes and by hybridization for the welfare of human beings is called biotechnology.

(2) In which various fields, the biotechnology has been useful?

Ans. Biotechnology can be used in the fields of agriculture, horticulture, medical field, diagnosis of diseases etc. Biotechnology is used in the production of cash crops, improvement in varieties of cash crops, increase in abilities of plants to withstand environmental stresses, vaccine production, early diagnosis of congenital diseases, organ transplant, cancer research, production of artificial skin, cartilage, etc. in laboratories. It includes the techniques of genetic engineering and tissue culture.

(3) What is the impact of biotechnology on agriculture and other related fields?

Ans. (1) Natural characters of some species

may not have all useful features. Some of the characters may be deleterious. In order to avoid such varieties, GMO or Genetically Modified Organisms are created. For this purpose, the DNA is changed in the crops. The modified crops then possess required features. (2) Following changes have occurred in the crops due to biotechnology. The varieties that can withstand the changes in the environment can be created. E.g., constantly changing temperature, dry and wet droughts, climate change and some similar stressor-resistant varieties are produced through genetic engineering. (3) GM crops are resistant to insect pests, pathogens, chemical weedicides, etc., due to their changed genome. This reduces the use and the cost of chemical pesticides which are harmful. (4) Due to use of seeds of GM crops, there is improvement in nutritive value of crops. Therefore now, seeds of a better quality crops are being produced. (5) There is also a decrease in loss of crops. Subsequently there is increase in the cultivable land and agriculture. (6) Some insect resistant crops such as Bt Cotton have been produced which is widely used in Maharashtra.

8.3 Biotechnology and its Applications :

1. Biotechnology :



- (1) The technology that brings about artificial genetic changes and hybridization in organisms for human welfare is called biotechnology.
- (2) Cytology, biochemistry, molecular biology, and genetic engineering are different branches of science that are included in biotechnology.
- (3) In the field of agriculture and pharmacy major progress has been done due to biotechnology.
- (4) Improving the agricultural yield, production of high-class varieties of crops and suitable farm products through tissue culture are the aspects in which biotechnology is largely used.

(5) Pharmaceutical experiments to produce antibodies, vitamins, and hormones like insulin are taking support of biotechnological principles.

2. Inclusion of main areas in biotechnology :

- (1) **Microbiology** : Using microbial abilities to form yoghurt from milk and alcohol from molasses.
- (2) **Biochemistry** : By increasing the productivity of the specific cell to manufacture antibiotics and vaccines, etc.
- (3) **Molecular biology** : Use of bio-molecules like DNA and proteins in human welfare.
- (4) **Genetic engineering** : By techniques of genetic manipulations, the plant and animal varieties and products of desired quality can be obtained. E.g. From genetically modified bacteria, human growth hormone and insulin can be produced.
- (5) **Non-genetic biotechnology** : By using entire cell or tissue, non-genetic biotechnology experiments are done. E.g. In tissue culture, production of hybrid seeds, etc. such methods are used.

3. Benefits of Biotechnology :

- (1) Increasing the per hectare yield of the crop land, irrespective of the limitations.
- (2) By development of resistant varieties, the expenses on disease control become less.
- (3) Fast fruit setting varieties are developed that increase the per annum yield.
- (4) Varieties which can withstand changing environmental parameters such as variable temperature, water-stress, changing fertility of soil, etc. are created. These are stress resistant varieties.

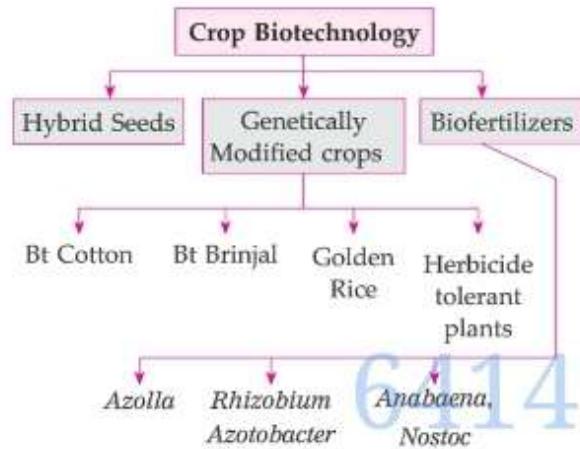
4. Development of Biotechnology in India :

- (1) Establishment of the National Biotechnology Board : 1982.
- (2) Department of Biotechnology under the Ministry of Science and Technology : 1986.

Institutes under the control of this department are as follows :

- National Institute of Immunology
- National Facility for Animal Tissue and Cell Culture
- National Centre for Cell Science
- National Brain Research Centre
- Central Institute of Medicinal and Aromatic Plants.
- Facilities of higher education and research.

5. Commercial Applications of Biotechnology :



6. Animal Husbandry :

- In animal husbandry, there are two main methods used : (a) Artificial insemination
(b) Embryo transfer
- By these methods, the quantity and quality of animal products such as milk, meat and wool are both improved.
- Stronger animal varieties that can perform hard work have been developed.

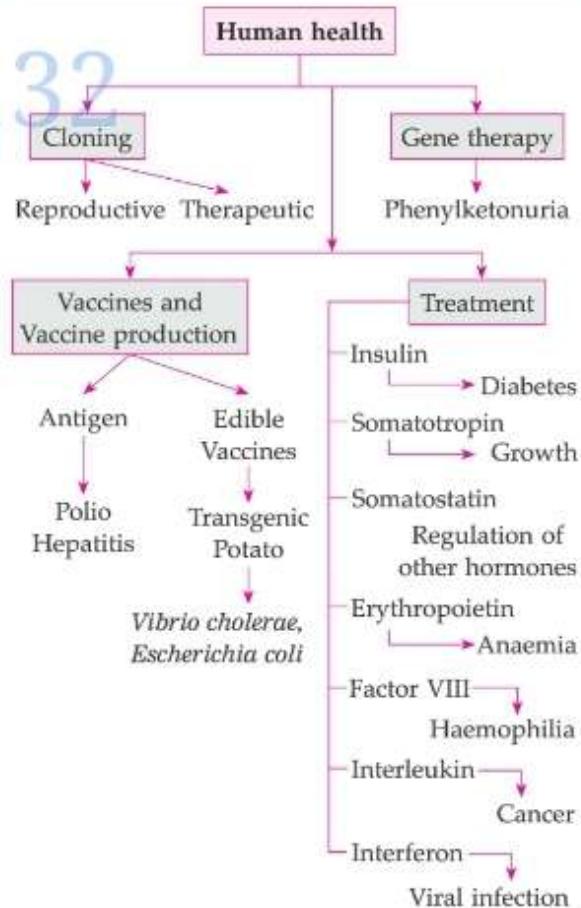
7. Human Health :

- Biotechnology for human health management takes into consideration two important tasks, these are diagnosis and treatment of the diseases.
- Identifying the role of gene, in disease of a person. Diagnosis of diabetes and heart diseases can now be done even before the onset of symptoms.
- AIDS and dengue can be diagnosed within

few minutes due to biotechnology. Treatment in such cases can be done at the earliest.

- Through biotechnology, medicines needed for the treatment can be manufactured. E.g. with the help of bacteria, human insulin can be made now. The human insulin gene is incorporated in bacterial genome for this purpose.
- Various vaccines and antibiotics are also made in this way.

On 5th July 1996, sheep 'Dolly' was the first animal clone born in Scotland. She was developed by a diploid nucleus of udder cells of Finn Dorset variety of sheep. This nucleus was introduced into enucleated ovum (haploid nucleus was removed) of Scottish sheep. The ovum was then implanted in the uterus of Scottish sheep. Dolly showed characters of Finn Dorset sheep.



8. Industrial Products / White Biotechnology :
Manufacturing alcohol by using transgenic yeast on sugarcane molasses is one of the example of white biotechnology. Similarly many other industrial chemicals are produced through less expensive processes by substituting them with biotechnology.

9. Environment and Biotechnology :

- (1) For treatment on sewage and solid wastes, microbial processes are used to speed up decomposition. If such organically rich sewage is released in natural water bodies, there is oxygen depletion in water. This is because the organic matter is oxidized with the help of dissolved oxygen in the water. Depletion in oxygen level adversely affects the aquatic life. Therefore, sewage is first oxidized by microbial techniques and then it is released.
- (2) Solid organic waste material is treated with microbes to produce compost on a large scale.
- (3) Some new concepts in biotechnological methods are bio-remediation, biopesticides, biofertilizers, biosensors, etc.
- (4) In the process of bioremediation absorption or destruction of toxic chemicals and harmful pollutants is carried out with the help of plants and microorganisms. Phytoremediation is the method of bioremediation in which plants are used for this process.

Examples of phytoremediation :

Plant/Bacteria	Function
<i>Pseudomonas</i>	Cleaning the hydrocarbon and oil pollutants from soil and water.
Fern <i>Pteris vitata</i>	Absorbing the arsenic from the soil.
Genetically modified variety of Indian mustard	Absorbing selenium from soil.

Plant/Bacteria	Function
Sunflower	Absorbing uranium and arsenic.
The bacterium, <i>Deinococcus radiodurans</i>	Being a radiation resistant organism, it absorbs the radiations from radioactive debris.
Grasses like alfalfa, clover and rye	Used in phyto-remediation.

10. Food Biotechnology : Microorganisms are used for the manufacture of food items like bread, cheese, wine, beer, yoghurt, vinegar, soya sauce, etc.

11. DNA fingerprinting :

- (1) In every organism, the nucleotide sequence in the DNA molecule is unique. In human beings as a fingerprint is unique for every person, similarly DNA is also unique. Therefore, the technique to identify any person can be proved by his or her DNA.
- (2) DNA fingerprinting technique is mainly used in (i) investigations of forensic sciences. (ii) To establish identity of the criminal. (iii) To identify parents of any child in case of disputed parentage.
- (3) In India DNA fingerprinting is done at "Centre for DNA fingerprinting and Diagnostics", located at Hyderabad.

12. Cleaning of Oil Spillage in Oceans :

- (1) Through the oil tankers or oil wells, there is oil spillage in the marine waters. This adversely affects the marine flora and fauna.
- (2) By using oil-digesting and fast multiplying bacteria, such oil spills can be cleared in a lesser cost and without affecting the marine environment.
- (3) Dr. Anand Mohan Chakrabarty discovered the use of such bacteria.

8.4 Important Stages in Agricultural Development :



1. Green revolution :

- (1) The improved methods for harvesting maximum yield from minimum land are collectively called green revolution.
- (2) Large sector of Indian population has been saved from starvation due to green revolution. In green revolution, methods of improvised dwarf varieties of wheat and rice, proper utilization of fertilizers and pesticides and appropriate water management have led to increased production of food grains.
- (3) New varieties of various crops have been developed through different agricultural research institutes.
- (4) Various research institutes and laboratories : Under ICAR, Indian Council of Agricultural Research, there are many research institutes located throughout India. These institutes perform active research regarding various cash crops, fishery and other agricultural related products.
 - (i) Indian Agricultural Research Institute (IARI), New Delhi
 - (ii) National Citrus Research Institute, Nagpur and allied branches (ICAR-CCRI)
 - (iii) Indian Institute of Sciences

- (iv) National Pomegranate Research Institute, Solapur.

2. White revolution :

- (1) The cooperative dairy movement that was undertaken with the help of biotechnology to produce abundant milk and dairy production, is called white revolution.
- (2) At Anand in the State of Gujarat, the cooperative movement was laid by Dr. Verghese Kurien. He took this movement to the greatest heights. AMUL (Anand Milk Union Limited) which was founded by him, has now become an international brand.
- (3) The self-sufficiency in dairy business was achieved due to white revolution. Many experiments done for quality control, newer dairy products and their preservation.

3. Blue revolution :

- (1) Blue revolution is production of various useful aquatic organisms by methods of aquaculture.
- (2) In East Asian region, fish species are raised in the farm ponds. This practice of rearing aquatic organisms is called aquaculture which is common in this region. Rearing fish is called pisciculture and that of marine organisms is mariculture.
- (3) Cultivation of the fishes and prawns (shrimps), marine organisms and sea weeds is also practised in India.
- (4) Government of India encourages the aquaculture activities. Government has launched the program 'Nil-Kranti Mission-2016' (NKM-16). Subsidies at 50% to 100% are offered in this case.
- (5) Aquaculture and mariculture can be carried along Indian coastline on a large scale. Fresh water fishes like rohu, catla and marine and brackish water prawns and lobster, etc. can be cultured on large scale.

4. Fertilizers :

Organic (Manure)	Chemical (Fertilizers)
<ul style="list-style-type: none">• Improved water holding capacity of the soil. Soil conservation takes place.• Due to humus formation, upper layer of the soil is formed.• Essential elements (N, P, K) are easily available due to activities of earthworms and fungi.	<ul style="list-style-type: none">• Decrease in fertility of soil due to excessive use.• Toxic for soil bacteria, cattle, human.• Contamination of the environment.

5. Insecticides :

- (1) Plants have natural immunity to fight against infections.
- (2) To eradicate the pests, insecticides are used on plants. This use can be harmful for the environment.
- (3) Natural pest control measures such as insectivorous frogs and birds keep the pest population under control.
- (4) But in an attempt to increase the yield, man excessively uses the pesticides and insecticides.
- (5) These are toxic to all resident organisms. They also show biomagnification, in which the concentration of the insecticide goes on increasing according to the food chain.
- (6) The insecticides like DDT, malathion, chloropyriphos also contaminate water and soil.

6. Organic farming :

- (1) When the chemical fertilizers and pesticides

are not used, only local, sturdy varieties are cultivated, and a natural balance is maintained, then such type of farming is called organic farming.

- (2) Organic farming and organic products are in demand these days.
- (3) The use of chemical fertilizers and pesticides cause many environmental problems due to pollution. The soil fertility is decreased, the insect-pests become resistant and cause more damage.
- (4) Organic farming can help to save the environment from such effects.

7. Apiculture :

- (1) Apiculture is rearing of honey bees to obtain products such as honey and wax.
- (2) In such practice, artificial hives are placed. By such practice, the honey can be extracted without causing any harm to the honey bees or their hives.

8. Cultivation of Medicinal Plants :

- (1) In Ayurveda, different medicines are traditionally obtained from plants. The rich biodiversity of India was conducive in gathering such medicinal herbs from forests.
- (2) Now due to deforestation, the medicinal plants and herbs are becoming rare. Hence their cultivation is to be done.

9. Fruit Processing :

- (1) Fruit processing can form following products : Chocolates, juices, jams and jellies. Since fruits are perishable agro-produce, processing is a must.
- (2) Different methods of fruit processing are keeping in cold storage, drying, salting, air tight packing, preparing jams (*muramba*), condensing, etc.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- *(1) Methods like artificial insemination and embryo transplant are mainly used for
(a) animal husbandry (b) wild life
(c) pet animals (d) for infertile women
- *(2) is the revolutionary event in biotechnology after cloning.
(a) Human genome project
(b) DNA discovery
(c) Stem cell research
(d) All the above
- *(3) The disease related with the synthesis of insulin is
(a) cancer (b) arthritis
(c) cardiac problems (d) diabetes
- *(4) Government of India has encouraged the for improving the productivity by launching NKM-16.
(a) aquaculture (b) poultry
(c) piggery (d) apiculture
- (5) The property of stem cells is called
(a) diversity (b) equality
(c) differentiation (d) pluripotency
- (6) Cell starts from 14th day of conception.
(a) development (b) specialization
(c) growth (d) differentiation
- (7) Availability of is an important requirement in organ transplantation.
(a) doctor (b) clinic
(c) donor (d) ambulance
- (8) The toxin which is lethal for was produced in leaves and bolls of BT cotton.
(a) bollworm (b) locust
(c) birds (d) frogs
- (9) Transgenic raw potatoes generate the immunity against disease.
(a) plague (b) cholera
(c) leprosy (d) TB

Ans. (1-a); (2-c); (3-d); (4-a); (5-d); (6-d);
(7-c); (8-a); (9-b).

Note : *Aquaculture is the more appropriate word which is not used in the textbook. Pisciculture is the culturing of only fish, while aquaculture includes culturing prawns, mussels, pearl, oyster, sea weeds, etc.

Q. 2 Rewrite the following wrong statements after corrections :

- *(1) Changes in genes of the cells are brought about in non-genetic technique.
- *(2) Gene from *Bacillus thuringiensis* is introduced into soyabean.
- (3) High-class varieties of crops have been developed through the technique of transplantation.
- (4) Earlier, insulin was being collected from the pancreas of pigs.
- (5) Malaria arises due to genetic changes in hepatocytes.
- (6) The *E.coli* bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water.
- (7) Various essential elements like N, P, K are removed and hence become unavailable to the crops due to earthworms and fungi.
- (8) We do not have any tradition that cures the diseases with the help of natural resources.

Ans. (1) Non-genetic biotechnology involves use of either cell or tissue.

(2) Gene from *Bacillus thuringiensis* is introduced with gene of cotton.

(3) High-class varieties of crops have been developed through the technique of tissue-culture.

(4) Earlier, insulin was being collected from the pancreas of horses.

(5) Phenylketonuria (PKT) arises due to genetic changes in hepatocytes.

(6) The *Pseudomonas* bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water.

(7) Various essential elements like N, P, K become available to crops due to earthworms and fungi.

(8) We have a great tradition of ayurveda that cures the diseases with the help of natural resources.

Q. 3 Write the following statements are True or False :

- (1) Changes in genes of the cells are brought about in non-genetic technique.
- (2) Gene from *Bacillus thuringiensis* is introduced into cotton.
- (3) High-class varieties of crops have been developed through the technique of transplantation.
- (4) Earlier, insulin was being collected from the pancreas of horses.
- (5) Malaria arises due to genetic changes in hepatocytes.
- (6) The *Pseudomonas* bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water.
- (7) Various essential elements like N, P, K become available to the crops due to earthworms and fungi.
- (8) We do not have any tradition that cures the diseases with the help of natural resources.
- (9) DNA fingerprinting is mainly useful in forensic sciences. (Nov. '20)

Ans. (1) False (2) True (3) False (4) True
(5) False (6) True (7) True (8) False (9) True.

Q. 4 Match the pairs :

* (1) Column 'A'	Column 'B'
(1) Interferon	(a) Diabetes
(2) Factor VIII*	(b) Dwarfness
(3) Somatostatin	(c) Viral infection
(4) Interleukin	(d) Cancer
	(e) Haemophilia

Note : In examination match the column question will have 2 components in Column 'A' with 4 alternatives in Column 'B'.

- Ans.** (1) Interferon – Viral infection.
(2) Factor VIII – Haemophilia.
(3) Somatostatin – Dwarfness.
(4) Interleukin – Cancer.

Note : Factor VIII * is an important protein factor and it should not be just factor as given in the textbook.

(2) Scientist	Contribution
(1) Dr. Anand Mohan Chakrabarty	(a) Wheat production in America
(2) Dr. M. S. Swaminathan	(b) White revolution (c) Green revolution in India (d) Cleaning the oil spill

Ans. (1) Dr. Anand Mohan Chakrabarty – Cleaning the oil spill.
(2) Dr. M.S. Swaminathan – Green revolution in India.

(3) Organism	Substance that is absorbed
(1) <i>Pseudomonas</i>	(a) Uranium and arsenic
(2) <i>Pteris vitata</i>	(b) Selenium (c) Arsenic (d) Hydrocarbons

Ans. (1) *Pseudomonas* – Hydrocarbons.
(2) *Pteris vitata* – Arsenic.

Q. 5 Find the odd man out :

- (1) Green revolution, Industrial revolution, White revolution, Blue revolution
- (2) DDT, malathion, chloropyriphos, Humus
- (3) Sodium, Aluminium, Potassium, Phosphorus
- (4) Diabetes, Anaemia, Leukaemia, Thalassemia
- (5) Drying, Salting, Cooking, Soaking with sugar

(March '20)

Ans. (1) **Industrial revolution.** (All others are concerned with food.)

- (2) **Humus.** (All others are insecticides.)
- (3) **Aluminium.** (All others are essential elements for plant growth.)
- (4) **Diabetes.** (All other diseases involve reduction in the number of blood cells.)
- (5) **Cooking.** (All others are food preservative methods.)

Q. 6 Identify and complete the following correlations :

*(1) Insulin : Diabetes :: Interleukin :

*(2) Interferon : :: Erythropoietin :
Anaemia.

*(3) : Dwarfness :: Factor VIII :

Haemophilia.

*(4) White revolution : Dairy :: Blue revolution :

(5) White revolution : Increase in dairy production :: Green revolution :

(March '19)

(6) Nostoc, Anabaena : Biofertilizers :

Alfalfa :

Ans. (1) Cancer (2) Viral infection

(3) Somatostatin (4) Fishery (5) Increase in agricultural production or crop yield

(6) Phytoremediation.

Q. 7 Give definition/Give meanings :

(1) Stem cell or what are stem cells? : The special cells having pluripotency and ability to divide and differentiate into new cells are called stem cells. They are present in multicellular living beings.

(2) Biotechnology : Technology that brings about artificial genetic changes and hybridization in organisms for human welfare is called biotechnology.

(3) Genetically modified crops : Crops having desired characters are developed by integrating foreign gene with their genome, such crops have modified genome and are known as genetically modified crops.

(4) Golden rice : Biotechnologically developed variety of rice in which gene synthesizing the vitamin A (Beta carotene) has been incorporated and which contains 23 times more amount of beta carotene than that of the normal variety is called golden rice. It was developed in 2005.

(5) Vaccine : The 'antigen' containing material given to a person or animal to acquire either permanent or temporary immunity against a specific pathogen or disease is called a vaccine.

(6) Cloning : Production of replica of any cell or organ or entire organism through biotechnological process is called cloning.

(7) DNA fingerprint : The nucleotide sequence present on the DNA of each person is unique just like the fingerprint, thus for establishing the identity of any person DNA can be analysed, this technique is known as DNA fingerprinting.

(8) Green revolution : All the methods applied for harvesting maximum yield from minimum land are collectively referred to as green revolution.

(9) White revolution : Achieving the self-sufficiency in dairy business, by performing various experiments for quality control, bringing about newer dairy products and their preservation and thus raising economic standards is called white revolution.

(10) Blue revolution : The aquaculture practices to increase the yield of edible aquatic organisms is called blue revolution.

Q. 8 Name the following :

(1) Research institutes involved with cell science.

Ans. (1) National Centre of Cell Science, Pune
(2) Instem, Bengaluru.

(2) Sources of stem cells.

Ans. (1) Umbilical cord (2) embryonic cells
(3) Red bone marrow (4) Adipose connective tissue and blood of adult human being.

(3) Types of stem cells.

Ans. (1) Embryonic stem cells (2) Adult stem cells.

(4) Organs that can be donated.

Ans. Eyes, heart, pancreas, liver, kidneys, skin, bones, lungs.

(5) Organisms used as biofertilizers.

Ans. Rhizobium, Azotobacter, Nostoc, Anabaena, Azolla.

(6) Two main methods used in animal husbandry.

Ans. (1) Artificial insemination (2) Embryo transfer.

(7) Two important aspects of human health management.

Ans. (1) Diagnosis (2) Treatment of diseases.

(8) Place where DNA fingerprinting research is done in India.

Ans. Centre for DNA fingerprinting and Diagnostics, Hyderabad.

(9) One benefit of biotechnology to the agriculture.

Ans. Expenses on the pesticides are reduced.

Q. 9 Give scientific reasons :

(1) Nowadays, safer vaccines are being produced.

Ans. (1) Before the advent of biotechnology, the vaccines were made from inactive or dead pathogens of that disease. (2) But now the vaccine is made artificially using biotechnological processes. (3) Such vaccines produced some disease symptoms in some cases. (4) The antigen of the disease is researched upon and its genetic code is found out. (5) A similar antigen is made in the laboratories which is used as a vaccine. (6) Such vaccines are more thermostable and remain active for longer duration. Therefore, the vaccines are now safer.

(2) Awareness about organ donation after death is increasing.

Ans. (1) Due to accidents or illness, some of the vital organs may get damaged and may not work to fullest capacity. (2) In such cases, if organ transplantation is done, it will be very helpful for that needy patient. (3) The dead person's organs can be used for organ transplantation and a life can be saved. (4) Many government and social organizations are spreading awareness about such donations. Therefore, gradually the awareness about organ transplantation is increasing.

Q. 10 Answer the following questions :

***(1) Write a comparative note on usefulness and harmfulness of biotechnology. OR**

"Biotechnology is not only beneficial but it has some harmful effects too". Express your opinion about this statement.

Ans. (1) Biotechnology has proved to be useful in the field of agriculture, medicine, clean technology and industrial products.

(2) Due to various biotechnological experiments, the food production is increased substantially. The milk and milk products are now freely available. People no longer die of hunger due to abundant food supply.

(3) The sophisticated vaccines have stopped the spread of epidemics.

(4) The diseases like diabetes can be controlled due to human insulin injections that can be manufactured by biotechnology.

(5) The problems of pollution control, solid waste management and fuels are partially tackled by biotechnological alternatives.

(6) Though all such positive aspects are there, the biotechnology also poses some problems. The genetic changes are breaking the principles of nature. By inserting human genes in bacteria or virus, the products that are needed only for humans are produced.

(7) Human cloning is also a debatable issue. It will cause social and ethical problems. The new generations formed by cloning will have mothers but no fathers. If man tries to manipulate the genomes of other living organisms, it will cause disturbances in the natural balance. The long term effects of all such genetic manipulations can be disastrous. Thus, according to some views, biotechnology can be dangerous too.

***(2) Which products produced through biotechnology do you use in your daily life?**

Ans. (1) The simplest use of biotechnology that we practice at home is making curd and buttermilk.

(2) The primary type of biotechnology is used in the process of fermentation while making food stuffs, like bread, idli-dosa, dhokla, etc.

(3) Nowadays, different types of cheese, paneer, yoghurt, energy drinks, etc. are produced with the help of biotechnology. We are consuming these in our daily life.

(4) Seedless grapes, papaya, and watermelons are available in the market these days.

(5) Violet cabbage, yellow capsicum and exotic vegetables used for salad are also biotechnology products.

(6) The vaccines, antibiotics and the injections of human insulin are in regular use in many households.

(3) Write two uses of biotechnology related to human health.

Ans. (1) Biotechnology is used to manufacture vaccines for controlling diseases.

(2) Different hormones such as insulin, somatotropin and somatostatin can be prepared in laboratories by using new biotechnological processes. The clotting factors are also manufactured through such techniques.

(4) Answer the following questions :

(a) What is biotechnology?

(b) Explain any two commercial applications of it.

(March '19)

Ans. (a) *For answer refer Q. 7 (2).*

(b) For answer refer Q. 11 (1).

(5) What is mainly included under biotechnology?

Ans. Biotechnology includes the following main areas :

(1) Abilities of microbes are used in producing yoghurt from milk and making alcohol from molasses.

(2) Production of antibiotics and vaccines, etc. is carried out by with the help of specific cells using their productivity.

(3) Bio-molecules like DNA and proteins are used for human welfare.

(4) By performing gene manipulation, plants, animals and products of desired quality are produced. Genetically modified bacteria are used to produce human hormones such as Human Growth Hormone and insulin.

(5) Tissue culture is a non-genetic technique which is used for production of new cells or tissues. Hybrid seeds are also produced in a similar way.

***(6) Why some of the organs in human body are most valuable?**

Ans. (1) The body can be in best health if all the vital organs of the body are also in the best condition.

(2) Brain, kidney, heart, liver, etc. are some such vital organs which are most essential for proper metabolism and functioning of the body. The sense

organs of the body are also of utmost importance, especially eyes.

(3) One cannot survive if any of these vital organs are not functioning properly. Some of the organs like brain will never regenerate too.

(4) Some of the organs can be brought back to functionality by performing surgeries.

However, any problem with these vital organs make life miserable, therefore, they are said to be valuable.

***(7) Explain the meaning of vaccination.**

Ans. (1) Vaccination is the administering of vaccine. Vaccine is the 'antigen', given to a person or even to animals for acquiring immunity against particular pathogens or diseases.

(2) In olden days, vaccines were prepared with the help of completely or partially killed pathogens. But this method causes some inconvenience. Some persons were allergic to such raw vaccines or they contracted the same disease through such vaccines.

(3) Hence in recent times the vaccines are produced by using biotechnology. These vaccines are artificial which are synthesised in the laboratories.

(4) The antigen is produced with the help of gene of the pathogen. Such vaccine becomes safe for administering.

(5) These antigenic proteins are injected to people to make their immune systems strong. This process of vaccination is absolutely safe. The vaccines are more thermostable and active for a long period of time.

(8) What are edible vaccines?

Ans. (1) Edible vaccines are those which are given as a food by incorporating them into the food-stuff.

(2) Such edible vaccines are produced through biotechnology.

(3) Transgenic potatoes are produced with the help of biotechnology which contain vaccine that act against bacteria like *Vibrio cholerae*, *Escherichia coli*.

(4) If raw potatoes are consumed, then the immunity is generated in the body of a person. However, eating only raw potatoes generates the immunity against cholera and the disease caused due to *E. coli*.

***9) Which precautions will you take during spraying of pesticides?**

Ans. (1) Pesticides are toxic chemicals. By using them indiscriminately, they contaminate the water, soil and also crops.

(2) The D.D.T., chloropyriphos and malathion are very dangerous. They spread through the food chain causing biomagnification.

(3) Therefore, we shall not use such insecticides and pesticides. We shall use organic pesticides. Excessive use will be avoided.

(4) At the time of spraying, nose, eyes and skin will be covered and protected.

(5) Care will be taken not to allow children or domestic animals to come in contact with a pesticide.

***10) Explain the importance of fruit processing in human life.**

Ans. (1) Fruits are perishable food stuff. They are spoilt soon if not consumed immediately. Hence for storage and usage for a long term, their preservation is absolutely essential.

(2) For year-long use of the fruits they are dried, salted, packed in air tight containers, used for preparing jams and jellies or condensed into pulps or syrups. Beverages, pickles, sauce, and various other products made from the fruits are largely used by us.

(3) The preserved products also fetch financial benefits.

(4) In national and international markets, Indian fruits like mangoes are in great demand. We can get foreign currency through exports of fruits and fruit products. The local horticulturists get good benefit from their orchards.

(5) Processed fruit products also give vitamins and minerals that help in maintaining good health. Thus fruit processing is important for human life.

(11) What is DNA fingerprinting? Explain it in brief. Where is this technique used? Give any two examples.

Ans. (1) As the fingerprints are unique for every individual, similarly the nucleotide sequence in the DNA molecule is also unique.

(2) By knowing this sequence, one can find out the identity of any person. Such technique to establish the identity of a person by taking into consideration the nucleotide sequence is called DNA fingerprinting.

(3) Its main use is in forensic sciences to confirm the identity of the criminal.

(4) Similarly, identity of parents in case of disputed parentage for any child can be understood by taking DNA fingerprints of both the parents and a child.

(12) Just like the grafting in plants, is the organ transplantation possible in humans?

(Use your brain power : Textbook page no. 89)

Ans. The grafting as done in case of plants, cannot be done in human beings. But the transplantation of certain organs can be done. Liver, kidney, heart, eyes, etc. can be transplanted. But for these transplantations the donor and the recipient should match with each other in respect of their blood groups, age, disease condition, etc. In future, the stem cell research can bring about certain changes in the field of transplantations.

(13) What will happen if the transgenic potatoes are cooked before consumption?

(Textbook page no. 94)

Ans. Some types of transgenic potatoes that contain edible vaccine against Hepatitis can be cooked. The cooking does not destroy the antigen incorporated into these transgenic potatoes. But according to some scientists, transgenic potatoes with enterotoxin vaccine, if cooked shows denaturation of vaccine.

(14) Answer the following questions :

- What is Biotechnology?
- Give one use of Biotechnology.
- Give one commercial use of Biotechnology.
- Write two bacterial examples of biofertilizer.
- Write two names of crops genetically developed.

(March '20)

Ans. (a) Biotechnology : Technology that brings about artificial genetic changes and hybridization in organisms for human welfare is called biotechnology.

(b) Biotechnology is very useful in improving the yield and variety of agricultural products.

(c) Commercial use of biotechnology : Production of hormones, interferons, antibiotics and different vaccines.

(d) *Rhizobium* and *Azotobacter* are used to prepare natural fertilizers.

(e) Genetically modified crops : Golden Rice and Bt. Cotton.

Q. 11. Write short notes :

***(1) Biotechnology : Professional uses.**

(Commercial uses)

Ans. (1) Biotechnology can be used in the following professional fields, viz. crop biotechnology, animal husbandry, human health, etc.

(2) In crop biotechnology, improvement in the yield and variety of agricultural field is done. The hybrid seeds, genetically modified crops, herbicide tolerant plants are some of the areas in which lot of biotechnological research is being done. By such research, high yielding and disease resistant varieties and varieties which can tolerate stresses such as alkalinity, weeds, cold and drought etc. are produced. Bt cotton, Bt Brinjal and golden rice are some GMO plants which have become popular in India. Due to herbicide tolerant plants, the weeds are now selectively destroyed. By using biofertilizers, the use of chemical fertilizers is reduced. Use of bacteria such as *Rhizobium*, *Azotobacter*, *Nostoc*, *Anabaena* and plants like *Azolla* the nitrogen fixation and phosphate solubilization abilities of the plants are improved.

(3) Animal husbandry is now using the methods of artificial insemination and embryo transfer by which the breeds of cattle are improved.

(4) To improve and to manage the human health, diagnosis and treatment of diseases have to be focussed. Diagnosis of diabetes, heart diseases and infectious diseases such as AIDS and dengue can be done rapidly due to biotechnology.

(5) The treatment and prevention of diseases need hormones, interferons, antibiotics and different

vaccine which are now manufactured through biotechnology. Gene therapy is also used to treat hereditary disorders.

(6) Industrial products and clean technology to combat environmental pollution uses biotechnology practices.

(7) DNA fingerprinting has revolutionized the profession of forensic science.

***(2) Importance of medicinal plants.**

Ans. (1) In Ayurveda practices, the natural remedies were used. Since India had great biodiversity and traditional knowledge of herbal medicinal uses, therefore, people depended on such medicinal plants.

(2) In olden days, such herbs were collected by roaming in the jungles.

(3) Such important medicinal herbs are now cultivated with care.

(4) In entire world people have understood the importance of Holy basil (tulsi), Adulsa, Jyesthmadh, etc.

(5) In some of the allopathy medicines too, the plant extracts are used.

(6) Medicines made from harmful chemicals have side effects and are not safe to be used unless there is medical supervision. Therefore, world-wide herbal remedies are gaining more popularity.

(3) Uses of stem cells.

Ans. Stem cells are used for following purposes :

(1) In regenerative therapy stem cells are used.

(2) In case of diseased conditions like diabetes, myocardial infarction, Alzheimer's disease, Parkinson's disease, etc. stem cells can be used to replace the damaged or functionless cells.

(3) In conditions such as anaemia, thalassaemia, leukaemia, etc. there is always the need of newer blood cells. Here, stem cells can be used to restore the number of blood cells.

(4) In techniques of organ transplantation stem cells can be used and they can help in the transplantation of new organs such as kidney and liver. The defective organs can be replaced by those that are produced with the help of stem cells and transplanted.

(4) Cloning.

Ans. (1) Cloning is the modern technique in which there is production of replica of any cell or organ or entire organism is done.

(2) There are two types of cloning, viz. (i) Reproductive cloning and (ii) Therapeutic cloning.

(3) **Reproductive cloning** : In reproductive cloning, a clone is produced by fusion of a nucleus of diploid somatic cell with the enucleated ovum of anybody. In the process, the sperm or male gamete is not needed.

(4) **Therapeutic cloning** : This technique is largely used for treatment purpose. Stem cells are derived from the cell formed in laboratory by the union of somatic cell nucleus with the enucleated egg cell.

(5) This technique is used for therapy of various diseases.

(6) Gene cloning can also be done to form millions of copies of same gene. Such genes are used for gene therapy and other purposes.

(7) Due to cloning technique, the inheritance of hereditary diseases can be controlled, continuation of generations can be achieved and certain characteristic genes can be enhanced.

(8) However, for human cloning, there is worldwide opposition due to ethical reasons.

(5) Dolly.

Ans. (1) Dolly was the first mammalian cloned sheep.

(2) Dolly was born on 5th July 1996 in Scotland by the process of cloning.

(3) The Finn Dorset sheep was chosen and her diploid nucleus from the udder cell was introduced into the ovum whose haploid nucleus was removed. This enucleated ovum was of Scottish sheep.

(4) The egg was then introduced into uterus of another Scottish sheep and it grew into Dolly.

(5) Dolly resembled exactly like Finn Dorset sheep whose diploid nucleus was used. None of the characters of Scottish sheep were seen in Dolly.

(6) In this way, Dolly had three mothers but no father.

(7) Dolly gave birth to many young ones. She died on 14th February 2003 due to cancer of the lungs.

(6) Green revolution :

Ans. (1) In agriculture, different methods used to harvest maximum yield from minimum land, these methods are collectively called green revolution.

(2) Dr. M.S. Swaminathan is called father of Green Revolution in India while Dr. Norman Borlaug has done the similar efforts in the U.S.

(3) Before the Green Revolution in India, there was always the dearth of the food grains. The overflowing Indian population was badly affected due to poor quality and quantity of food.

(4) But due to the Green Revolution in India, attention was focussed on the agricultural research.

(5) Improvised dwarf varieties of wheat and rice, proper use of fertilizers and pesticides and water management were the proper methods that increased production of food grains.

(6) This created abundance of the grains for Indian population.

(7) White revolution.

Ans. (1) Few years back, there was scarcity of milk in various parts of India. At some places, milk and milk products were abundant but they did not reach all the consumers.

(2) Dr. Verghese Kurien who was then the founder director of Anand Milk Union Limited (AMUL) started the cooperative movement in the direction to produce "operation flood", i.e. abundance of milk everywhere.

(3) The use of biotechnology was also done to increase the milk production.

(4) Dr. Kurien's efforts have reached all-time high status as India is now self-sufficient in dairy business.

(5) This is popularly known as White Revolution. Different experiments were performed for quality control, newer dairy products were thought off and preservation methods were improved.

(6) This created White Revolution. AMUL from Anand has now reached international standards.

(8) Blue Revolution.

Ans. (1) Utilization of aquaculture practices for obtaining edible and commercial aquatic organisms is called blue revolution.

(2) In East Asian countries where water bodies and fish population is abundant, the aquaculture was started.

(3) On similar lines, in India, the aquaculture of different fresh water and marine organisms is being done with the help of fishery scientists.

(4) Government of India has vowed to increase the aquaculture production by encouraging the people for aquaculture by launching the program 'Nil Kranti Mission-2016' (NKM-16).

(5) Pisciculture is culturing of fish, mariculture is culture of marine organisms such as prawns/ shrimps and lobsters. Sea weeds, oysters, clams are also cultured.

(6) For carrying out aquaculture, 50% to 100% subsidies are offered by the Government.

(7) Fresh water fishes like rohu, catla and other edible varieties like shrimp and lobsters are being cultured on a large scale which can bring about Blue Revolution.

Q. 12 Complete the paragraph by choosing the appropriate words given in the bracket :

(*degenerated, red bone marrow, adipose connective tissue, blastocyst, umbilical cord, Differentiation*)

..... of stem cells form can form various tissues in the body. Stem cells are present in the by which the foetus is joined to the uterus of the mother. Stem cells are also present in the stage of embryonic development. Stem cells are present in and of adult human beings. It has become possible to produce different types of tissues and the part of any organ with the help of these stem cells.

Ans. Differentiation of stem cells form can form various tissues in the body. Stem cells are present in the umbilical cord by which the foetus is joined to the uterus of the mother. Stem cells are also present in the blastocyst stage of embryonic development. Stem cells are present in red bone marrow and adipose connective tissue of adult human beings. It has become possible to produce different types of tissues and the degenerated part of any organ with the help of these stem cells.

Q. 13 Paragraph-based questions :

(1) Green corridor refers to a special road route that enables harvested organs meant for transplants to reach the destined hospital. A 45-year-old woman, a victim of a railway accident, was declared brain dead, her husband and children agreed to donate her kidneys, liver and heart. One of her kidneys was transplanted to a patient in MGM Hospital and the second kidney helped a patient in Jaslok hospital. Her liver helped the transplant of a patient in Wockhardt Hospital. And her heart was sent to Fortis to the patient on a super urgent priority list, transported via a green corridor covering 18 km in less than 16 minutes. This was possible due to Green corridor.

Questions and Answers :

(1) What is Green corridor?

Ans. Green corridor is a special road route that enables harvested organs meant for transplants to reach the destined hospital.

(2) Which organs of brain-dead lady were transplanted?

Ans. Two kidneys, liver and heart of the brain-dead lady were transplanted.

(3) How many lives were saved from organs of one lady?

Ans. Four patients' lives were saved due to organ donation of one lady.

(4) How was distance of 18 km covered in 16 minutes? Why?

Ans. The distance was covered because the concept of Green corridor was applied. The heart was sent from one hospital to another, where the recipient was kept ready. The quick transportation is necessary to keep heart in living condition.

(5) Who takes the decision to donate the organs?

Ans. The close relatives of deceased person take the decision to donate the organs.

(2) Read the following extract and answer the questions that follow : (March '19)

A liberal view behind the concept of organ and body donation is that after death our body should be useful to other needful persons so that their

miserable life would become comfortable. Awareness about these concepts is increasing in our country and people are voluntarily donating their bodies.

Life of many people can be saved by organ and body donation. Blinds can regain their vision. Life of many people can be rendered comfortable by donation of organs like liver, kidneys, heart, heart valves, skin, etc. Similarly, body can be made available for research in medical studies. Many government and social organizations are working towards increasing the awareness about body donation.

Questions and Answers :

(1) What is the liberal view behind the organ and body donation?

Ans. By body donation, research in medical studies is possible. The needy persons can get vital organs which can save their lives.

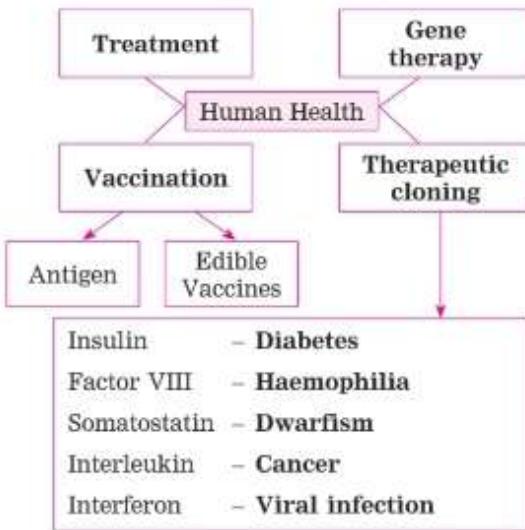
(2) Name any four organs that can be donated.

Ans. Liver, kidneys, heart, eyes, skin, etc. can be donated.

Q. 14 Complete the following table :

(1) Complete the concept paper based on 'Use of Biotechnology in Human Health'.

Ans. *(Answers are directly given in bold.)*



(2)

(July '19)
(Answers are directly given and underlined.)

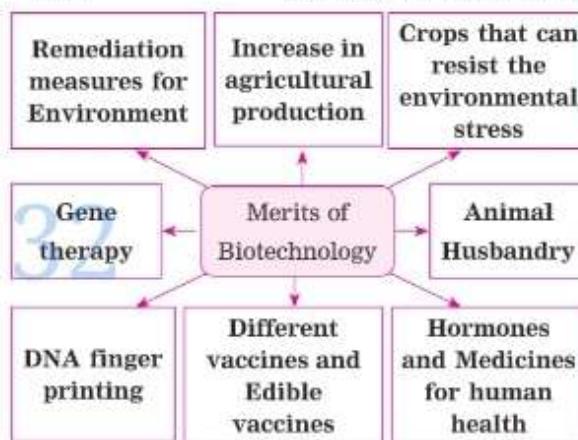
Plant/Microbes	Functions
(1) <u>Pteris vitata</u>	Absorbs arsenic from soil.
(2) <u>Pseudomonas</u>	Separates hydrocarbon and oil from water and soil
(3) <u>Sunflower</u>	Absorption of uranium and arsenic
(4) <u>Deinococcus radiodurans</u>	Absorption of radiations of nuclear waste

Q. 15 Diagram/Chart-based questions :

***(1) Complete the following chart :**

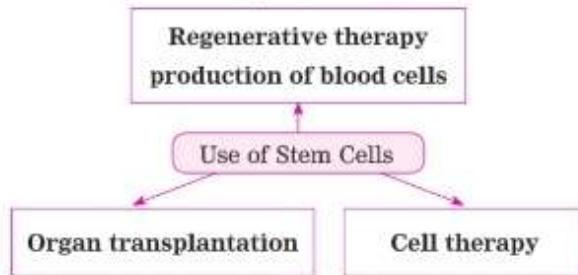
Ans.

(Answers are given in bold.)



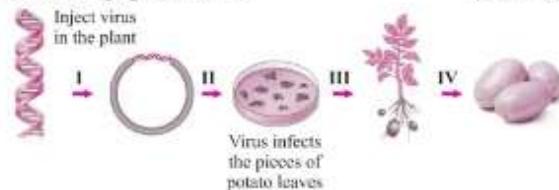
***(2) Write the correct answer in blank boxes.**

Ans. *(Answers are given in bold.)*



(3) Observe the figure and answer the following questions :

(Nov. '20)



(a) Identify the process given in the above figure.

(b) Write the importance of above process.

(c) Write any two benefits of Biotechnology.

Ans. (a) The process of making transgenic potatoes is shown in the figure.

(b) (1) These potatoes act against bacteria causing cholera e.g. *vibrio cholerae*. Also they are effective against *Escherichia coli*.

(2) Consumption of raw potatoes produces immunity against cholera and colitis – disease caused by *Escherichia coli*.

(c) (1) Per hectare yield is increased though there are limitation in crop agriculture.

(2) Expenses of disease control are minimized due to development of resistant varieties.

(4) Draw well-labelled diagram of Stem cell therapy.

Ans.

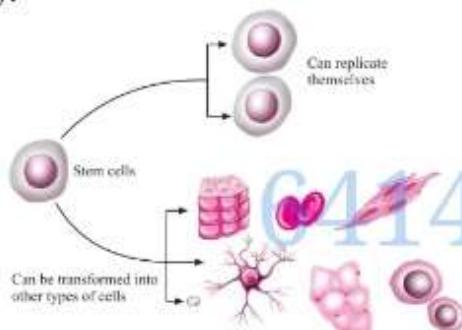
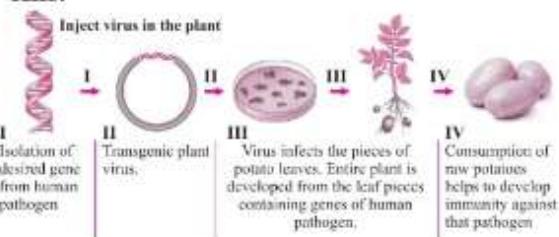


Fig. 8.2 : Stem cell therapy

(5) Describe in brief the steps I, II, III and IV.

Ans.



(6) Label the following diagram :

Stem cells and organ transplantation.

Ans.

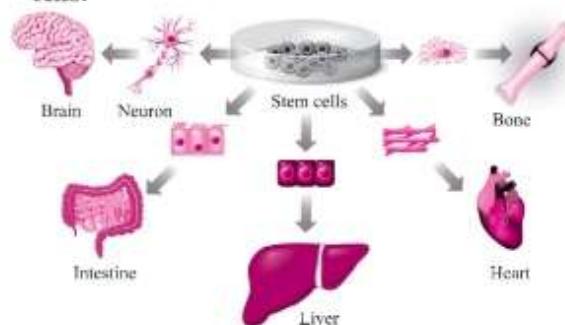


Fig. 8.3 : Stem cells and organ transplantation

(7) (i) Which therapy is shown in the Fig. 8.6?

(ii) Which will be possible benefits of this therapy in organ transplantation?

Ans. (i) The figure 8.6 shows the 'regenerative therapy' using stem cells. Also called stem cell therapy. (ii) With the help of above therapy organs like liver, kidney from stem cells can be redeveloped to replace the failed ones.

Q. 16 Activity-based questions :

(1) Bring a packet of 'Balghuti' from ayurveda shop. Learn the information about each component in it. Collect information about various other medicines and prepare the chart as shown below.

(Try this : Textbook page no. 99)

Local Name of plant	Scientific name	Name of active ingredient	Uses
Adulsa	<i>Adathoda vasica</i>	Vasicine in the leaves	Cough
Vekhand	<i>Acorus calamus</i>	A-asarone	Cough and pain killer
Bal hirde or hirda	<i>Terminalia chebula</i>	Glycoside chebulic acids	Induce purgation.
Halkund (turmeric)	<i>Curcuma longa</i>	Curcumin	Antiseptic
Kakadshingi	<i>Pistacia integerrima</i>	Pistacian, Sitosterol	Reduces fever, helps in respiration
Murudsheng	<i>Heicteres isora</i>	Macelignan	On stomach-ache and wormicidal

Nutmeg	<i>Myristica fragrans</i>	Alkaloids	Mild Sedative
Date (Kharik)	<i>Phoenix dactylifera</i>	Potassium and iron	For nutrition
Almond	<i>Prunus dulcis</i>	Potassium and vitamin E	For nutrition

(2) Give five examples of each of the fruiting and flowering plants developed through tissue culture and mention their benefits.

(Make a list and discuss : Textbook page no. 93)

Ans. I. Fruiting trees : Banana, Chikoo (Sapota), Tomato, Fig, Pineapple.

II. Flowering trees : Orchids, Roses, Chrysanthemum, Gerbera, Begonia, Carnation, Lili. Benefits of such plants may be varied. Mostly fruits developed are made seedless and tastier.

III. Benefits of plants produced through technique of tissue culture :

Ans. (1) Techniques of tissue culture can produce more copies of same plant with better characters. The plant grower likes to have bigger and more fruits from fruit trees. On the flowering trees, colourful flowers with good fragrance are favoured.

(2) Plants which do not depend on particular climate and local seasonal changes are produced by tissue culture methods. This helps to rise the yield in an area which otherwise may not produce a specific crop.

(3) For tissue culture, saplings and seedlings are made available throughout the year through laboratory. The limitations of getting natural seeds

are not there thus planting can be done throughout the year.

(4) Tissue culture techniques create the plants of uniform size, shape and yield. Since they are exactly alike, it becomes beneficial.

(5) In lesser time period, the crops reach maturity.

(6) The crops are pest and disease resistant.

(7) Tissue culture techniques are cost effective and easy to carry out.

(3) Which new species of the rice have been developed in India ?

(Collect Information : Textbook page no. 97)

Ans. (1) Species in 2015–16 : High zinc species (DRR Dhan 45), Pusa 1592, Punjab basmati 3, Pusa 1609, Telangana Sona.

(2) Species in 2014 : CR Dhan 205, CR Dhan 306, CRR, 451.

(4) Discuss about stem cells and organ transplantation in the class with the help of figures given on textbook page no. 90.

(Observe : Textbook page no. 90)

(5) Which fruits processing industries you observe in your surrounding? What is their effect?

(Make a list and discuss : Textbook page no. 99)

PROJECTS

(1) Collect information about various hybrid varieties of animals. What are their benefits? Make a presentation of various pictures and videos. **(Use of ICT : Textbook page no. 93)**

(2) Visit the websites : <http://www.who.int/transplantation/organ/en/> and www.organindia.org/ approaching-the-transplant/ and collect more information about 'brain dead', organ donation and body donation **(Internet is my friend : Textbook page no. 90)**

(3) Collect more information about the Human Genome Project, one of the important projects in the world. **(Internet is my friend : Textbook page no. 95)**

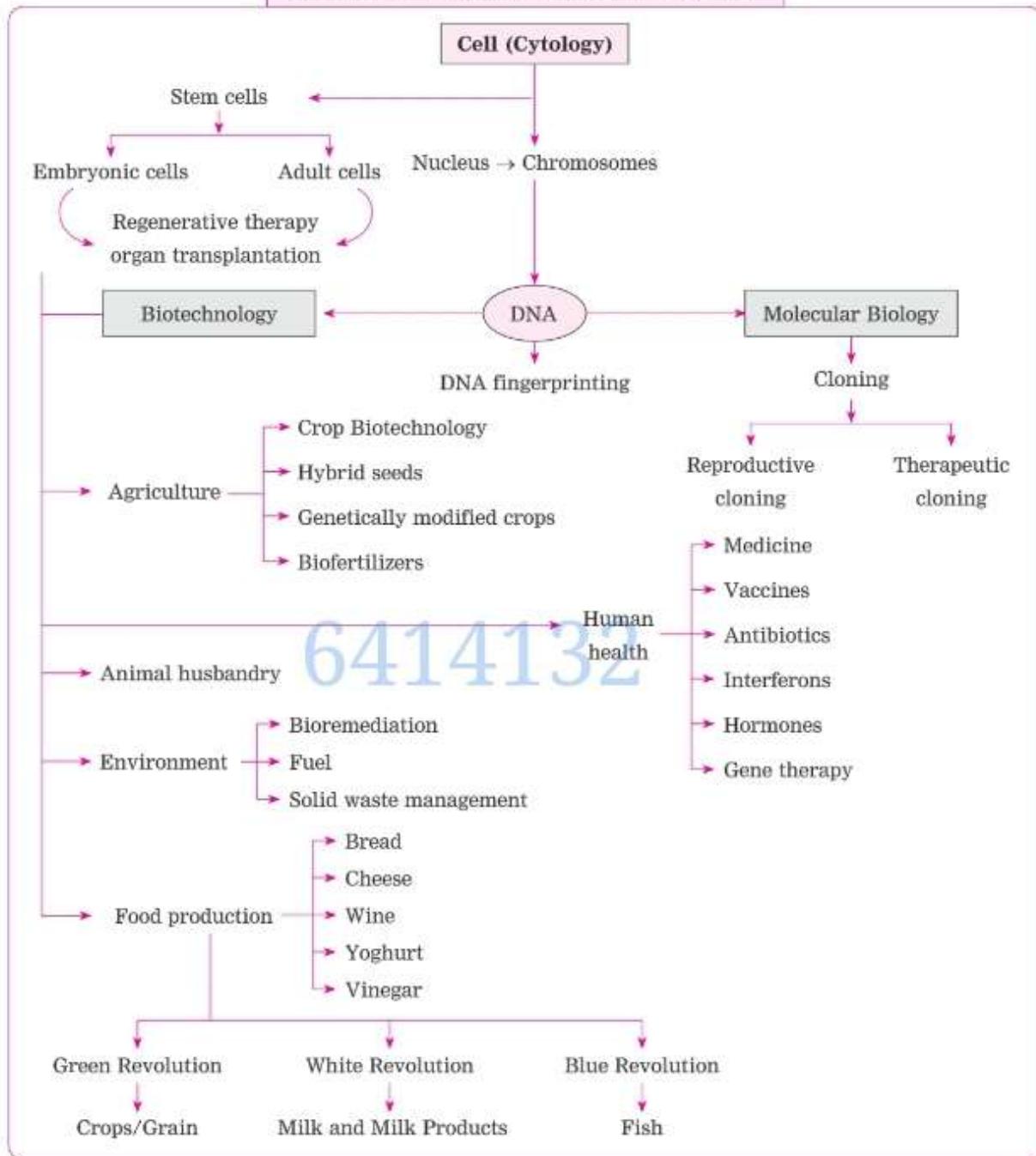
(4) Collect the information and make the chart about the work of various state and national-level institutes related with biotechnology. **(Internet is my friend : Textbook page no. 97)**

***(5) Visit the organic manuring projects nearby your place and collect more information.**

***(6) What will you do to increase public awareness about organ donation in your area?**

***(7) Collect information about 'green corridor'. Make a news-collection about it.**

MEMORY MAP/CONCEPT MAP



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this **QR Code** for the test and its model answers.



CHAPTER AT A GLANCE

9.1 Social Health

9.2 Factors endangering the Social Health

9.3 Stress Management

IMPORTANT POINTS

1. Due to advent of technology, our life styles are changing. Each person is becoming more and more self-centred. They are not concerned with anything other than their daily routine and favourite jobs.
2. Along with physical health, importance of cleanliness and staying fit keeps the social and mental health of a person. Concept of health encompasses, physical, mental and social health.

9.1 Social Health :**1. Factors affecting the social health :**

- (1) Satisfying basic needs of people - food, clothing, shelter, medicines
- (2) Residential areas
- (3) Education and job opportunities
- (4) Transport facilities
- (5) Social security
- (6) Education
- (7) Social treatment
- (8) Social environment of the surroundings.
- (9) Social and Physical conditions of the surrounding
- (10) Playgrounds
- (11) Gardens
- (12) Water
- (13) Toilets
- (14) Financial status
- (15) Political conditions (views)

2. Social health : The ability of a person to establish relationship with other persons is called social health.

3. One of the important characteristic of social health is the ability to change one's own behaviour according to changing social conditions.

The factors necessary for good social health :

- (1) Strong personality, having large number of friends and relatives.
- (2) Proper time management, trust in others, respect and acceptance for others.

9.2 Factors disturbing or Endangering the Social Health :**1. Mental Stress :**

- (1) Due to population explosion, there is increased competition in every aspect such as education, employment and business.
- (2) Due to nuclear families and working parents, children are facing the problems of loneliness and mental stress. Parents and especially mother being away from home has resulted into stress in children.
- (3) There is unequal treatment given to girl and a boy from the same house. The discrimination between brother and sister causes mental stress to girls due to such gender inequality.
- (4) In community, the adolescent girls are faced with the problems like teasing and molestation.
- (5) All the people are facing the stress due to ever increasing disorder, crime and violence. People are in the quest of getting 'fast and easy money' become part of the system of crime. This is a social illness which is very hazardous effect of changing attitudes of people.

2. Addiction :

- (1) In adolescent age group, there is tremendous pressure of peers. This peer-group influence can be at times wrong, if the friends are not

good. Instead of following advice of parents, the adolescent girls and boys tend to listen to the wrong advices of their friends.

- (2) Due to lack of parental supervision, children in their early age start using tobacco, cigarette, *gutkha*, alcoholic drinks, drugs, etc. This may be due to peer-pressure.
- (3) The children fall into the trap of addictions either due to peer-group pressure or due to false symbol of high standard living. Sometimes they try to imitate their elders.
- (4) The addictive substances are hazardous, and they cause long term effects. Some are temporarily intoxicating substances obtained from the plants. While some of the chemical ingredients in them can permanently damage the human nervous system, muscular system, heart, etc. Some tobacco like substances are carcinogenic in action especially on the mouth and lungs.

3. Chronic diseases :

- (1) Chronic diseases such as AIDS, TB, leprosy can spoil the social health.
- (2) Care of patients of mental disorders and that of the old persons is very crucial to keep the social health in proper order. Due to changing pattern of our life style, there is increase in old age homes. In order to maintain the social health, we have to care for the older people in our community. Similarly, mentally disturbed patients should be given love and care along with prompt medical help.

Can you tell? (Textbook page no. 103)

(1) Have you ever seen the persons inebriated with drugs or liquor loitering on dirty places? Whether such a pitiful condition of most intelligent human being is acceptable?

Ans. Addiction leads a person to hell. One can often see men under the influence of alcohol, fallen on the streets. The drug addicts too are

very unhygienic and dirty. They also have criminal tendencies. Alcohol and drug cause loss of conscious thinking among the addicts. They cannot think rationally and logically. Their thought process is hampered and thus though he is an intelligent human being, his intellect is totally lost. People like these are curse to the society. Such pitiful condition of man is absolutely improper.

(2) You must have read the news about many deaths due to poisonous liquor. Why does it happen ?

Ans. If alcohol is manufactured in a wrong way by using any substrates, it forms the poisonous chemicals. Such chemicals can be lethal too.

Any kind of alcohol is basically produced by the fermentation of the substrate. If the method adapted for making alcohol is wrong, then it can also make lethal solution that causes death after consuming the alcohol.

Alcohol consumption can cause long term effects too. The entire family of the alcoholic is devastated. Due to alcohol, entire nervous system, and especially brain, liver and kidneys are harmed permanently. Health is affected for ever.

In the growing age if alcohol is consumed, the brain development does not take place in a proper way. All the faculties such as learning, memory, thinking, and reasoning are reduced because of alcohol. Along with disturbed physical health, mental and social health is also affected due to alcoholism.

4. Communication Media and excessive use of Modern Technology :

(1) Modern technology and communication media have drastically changed the lives of people. Mobile phone has become an addiction that can endanger the social health. People remain constantly on the phones.

- (2) Due to addiction to electronic media, various physical problems like tiredness, headache, insomnia, (inability to sleep) forgetfulness, tinnitus (ringing or buzzing in the ears), joint pains and problems in vision are on rise. This may be due to radiation of cell phones.
- (3) Such radiations penetrate the bones of children causing damage. Person who are on computers and internet continuously become solitary. They remain aloof and do not have contact with his or her relatives and members of society. This leads to self-centredness. They lose the sensitivity towards others.

Note : As mentioned in the textbook, (Page no. 104, 2nd paragraph) persons addicted to electronic media do not develop autism. Autism is an inborn problem caused due to change in the genes. If embryo faces oxygen deficiency, the baby is born with autism. It is a hereditary disorder. Children will not get autism by excessive use of cell phones.

However, some research reveals that the radiations of the cell phone can cause genetic mutations in sperms or ova in the parents which may give rise to greater percentage of abnormal children through heredity.

Recall a little (Textbook page no. 104)

- (1) Do you recall the sudden closing of any cartoon serial of foreign origin being telecast on television?

Ans. The cartoon serial, 'Sinchan' was banned in 2008 by the 'information and broadcasting ministry, on the grounds of undesirability of its content.

The ministry believed that parents were worried about the unruly comments and acts shown on the show. The cartoon series showed a naughty five-year-old boy making the life of his parents miserable. The series was having a negative impact on kids. As many parents requested the Government, the serial was banned.

- (2) Explain in detail on happenings about blue whale game.

Ans. Online Blue Whale or Blue Whale Challenge is an internet game which originated in Russia. This is very dangerous game. It reportedly consists of a series of tasks assigned to players by administrators over a 50-day period. In these 'tasks' there are challenges like watching horror movie alone, inflict wounds on the body, leaving the house and going anywhere, etc. After performing 50 tasks like these, the final challenge requires the player to commit suicide. Many adolescents have lost their lives due to Blue Whale game. In India too, five children have committed suicide due to blue whale challenge. This game was invented in 2013 by Philipp Budeikin, a 21-year-old former psychology student. He is now arrested in 2016 and is in Russian prison. This game is banned in India.

The children who spent solitary life, the children whose parents are not around and those who are in deep stress usually fall into the traps like Blue Whale Game.

One must always remember, if you are in stress, talk to your elders, parents or teachers. The problems can be solved by logical and rational thinking. Our life is precious, it should not be wasted.

- (4) Negative computer and cell phone games cause children to become negative in their thoughts and actions. They are tremendously time consuming. The concentration in the studies is lost and memorization, understanding of the subjects also become a problem. Some activities like these cause financial loss and it may cost life too. Therefore, one should be vigilant while using such media.
- (5) The internet has such huge information that it can provide information for every question. But its use should be done for only positive

purposes. There are many inappropriate contents on the web. These should not be seen by young people. Though Government has banned such sites, elders in the house should supervise on the use of the internet.

Questions on (Textbook page no. 104)

(1) Why is there increase in news of death by drowning in ocean, falling in deep valleys or under trains during catching the cell phone selfie?

Ans. The entire community is becoming self-centred. Moreover, only the external appearance of persons is given undue importance. There is a competition between different people to click our own snaps and upload them on the social media. In an attempt to take such selfies, people often forget about the surroundings. The thought that, "it may cause an accident and can cost the life" does not rise in the mind of such people. They are thus called selfieicide. The attitude to perform adventures is much common in young boys. They do not listen to any one and do not need any advices. They live in isolation. Therefore while taking selfie on cell phone they can be victims of the accidents like drowning in the water body or falling in deep valley or getting crushed under a speeding train.

(2) There is increasing competition to upload the videos of road accidents instead of helping the victims. What is the mentality of such people?

Ans. Many a times there are accidents on the road. It may cost the life too. But due to lack of humanity in the minds of people, they feel taking pictures more important than rushing to rescue the victim. Probably the proper values are not instilled in the young minds of children, this can result in such callous attitude. The virtual wars and virtual accidents in the computer or mobile games occupy the minds to such an extent, that the people forget about present situations. They

are also not aware that the victim needs support and immediate medical help in order to save his/her life. Since there are more 'likes' for such pictures in the social media, people keep on shooting the videos or clicking the pictures. Also now-a-days, the cell phones with cameras are very common and almost everybody has it. Thus, there is a competition to shoot such perverse pictures.

(3) Why are the video-clips of parents threatening or hitting the children not studying as per their wish or domestic helpers beating the children are very common on social media nowadays?

Ans. Due to nuclear families, children stay only with their parents. Grandparents or other relatives are not at home. In most of the families the working mother also leaves the house for earning or for her career. When children come home after school hours, nobody knows what are they doing! Throughout the academic year, they either spend time over trivial things or do not complete their homework. As a result, there is sudden mental stress due to approaching examinations. In addition to this, due to population explosion there is fierce competition in every sector. Parents are not aware of the capabilities and aptitude of their children. They just think of fulfilling their own expectations from children. Therefore, they start threatening or hitting their children for not proving themselves. This is absolutely wrong type of parenting.

Due to nuclear families and educated mothers, they leave their very young children with servants or baby-sitters. Due to tremendous social change, the women also strive for equality but at the same time they do not want help from her seniors. The younger generation do not want to take care of the older generation and thus they do not want the obligation from them either. The self-centredness has crept into personality

of everyone. Thus they prefer to give payment to the servants or helpers than taking help of their own old parents or in laws. Such paid people do not take care of the children as there is no bond of love between them. Then they beat and commit atrocities on these young babies. Such clips are circulated on the social media.

All the above three questions, show a condition of changing social structure. The persons who indulge in beating or harassing are mentally sick people who themselves are under mental stress.

5. The symptoms of mental ill health :

- (1) Mentally ill persons are those who are indulging in destructive and unnatural activities.
- (2) Selfiecide persons constantly take selfies as they are not aware about their surroundings and the risks that may make them victims. Person indulging in selfie is not aware about the world around and the risks.
- (3) Persons who commit domestic violence.
- (4) Suicidal thoughts, sending messages to others and then committing suicides. Such sick people actually need support and they want others to sympathise with them.
- (5) Spending lots of time on television, computer or cell phone without having conscience about time management is also a sign of mental illness.

6. Cybercrimes :

- (1) Cheating people by misusing personal information.
- (2) Fraudulent transactions using bank cards.
- (3) Cheating people in on-line purchases.
- (4) Hacking of information.
- (5) Opening fake Facebook accounts and harassing others.
- (6) Internet piracy.
- (7) Causing attack by internet virus.

7. 'Cybercrime unit' : This is the department that collects the details, and investigate the cybercrime and thereby find the criminal with the help of the internet. This unit is under the police

department. It has all experts of the field of internet technology.

8. IT Act-2000 :

- (1) The IT Act is enacted since 17th October 2000.
- (2) It was amended in 2008.
- (3) Cybercriminal gets the imprisonment for 3 years or fine up to 5 lakh as a punishment.
- (4) Maharashtra state is the first state to start cybercrime unit which is controlling the cybercrimes.

Can you tell? (Textbook page no. 106)

- Why do you wait for periods of music, P.T., drawing in the classroom?

Ans. The periods of music, drawing or P.T. break the boring routine. The tired brain gets rejuvenated by music or drawing. In P.T., we are taken to the playground where we can play and exercise. These activities reduce the stress, therefore we wait for the periods of music, etc.

9.3 Stress Management :

1. Ways to manage the stress :

- (1) **Laughter club :** People gather together and relieve their mental stress by laughing out loudly. It is thought that by laughing together, the stress is reduced.
- (2) Communicating with all the people who are significant in our life especially with our parents.
- (3) Expressing our feeling with near and dear ones and noting down our feelings.
- (4) Hobbies like collecting curios, photography, reading, cooking, sculpturing, drawing, rangoli, dancing, etc. can relieve the stress in a major way.
- (5) Diverting the energy and mind towards the positive thinking and removing negative thoughts needs to be practised for a stress-free life.
- (6) Learning and listening to the music and singing reduces the stress.
- (7) Physical and outdoor games, exercise, discipline.

- (8) Yoga, meditation, deep breathing, yogic sleep techniques.
- (9) Massaging, visiting the spa too help to relieve the stress.
- (10) Balanced and good food, and meditation.
- (11) Enjoying nature, gardening, bird watching, lingering in nature, rearing a pet.

2. Mental problems :

- (1) Depression (2) Frustration

3. Treatment :

- (1) Medical guidance and help
- (2) Counselling
- (3) Psychotherapy
- (4) Help to be taken from NGO.

4. Institutions that offer help :

- (1) **Unified Movement against Tobacco :**
45 different well-known organizations such

as WHO, Tata trust, etc. have started the movement to control the tobacco consumption. The guidance is also provided to the activists who are active in anti-tobacco campaigns.

- (2) **Salaam Mumbai Foundation :** The children from slum area are given opportunities in the field of education, sports, arts and business. The organization also helps the children in field of education and helps them to improve their health and lifestyle. This organization helps each school to take the oath of freedom from tobacco.
- (3) **Government Schemes :** Children in distress or facing any type of trouble can call on the helpline set by the Government. Proper help and guidelines are offered to children if they narrate the problem on this helpline.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

- *(1) Laughter club is a remedy to drive away
(a) stress (b) addictions
(c) lethargy (d) epidemics
- *(2) Alcohol consumption mainly affects system.
(a) digestive (b) respiratory
(c) nervous (d) excretory
- *(3) IT Act 2000 is to control the
(a) house breaking (b) cybercrimes
(c) cheating (d) pickpocketing
- (4) Our has been changed to some extent in the age of technology.
(a) life style (b) habit
(c) circumstance (d) passion
- (5) influence is stronger in case of adolescents.
(a) Teacher's (b) Father's
(c) Relative's (d) Peer group

- (6) Tobacco containing substances has effect on mouth and lungs.
(a) acidic (b) alkaline
(c) carcinogenic (d) neutral
 - (7) Persons continuously using computers and the internet become
(a) courageous (b) timid
(c) solitary (d) criminal
 - (8) has been newly launched in Police Department.
(a) Cybercrime unit
(b) Women protection unit
(c) Senior citizen care unit
(d) Forensic unit
 - (9) helps to improve concentration in the studies.
(a) Eatables (b) Meditation
(c) Hobbies (d) Sports
 - (10) Hobbies like rearing pet animal helps to create a
(a) positive mindset (b) negative attitude
(c) wealth (d) concentration
- Ans.** (1-a); (2-c); (3-b); (4-a); (5-d); (6-c); (7-c); (8-a); (9-b); (10-a).

*Q. 2 Give three examples of each :

(1) **Hobbies to reduce stress.**

Ans. (1) To listen to music (2) Bird watching and nature trails (3) Reading good books.

(2) **Diseases endangering the social health.**

Ans. (1) AIDS (2) Tuberculosis (3) Leprosy.

(3) **Physical problems arising due to excessive use of mobile phones.**

Ans. (1) Headache (2) Vision problems (3) Joint pains.

(4) **Activities under the jurisdiction of cybercrime laws.**

Ans. (1) To do bank transactions by procuring PIN number of somebody.

(2) Misuse of written material of someone or illegal sale of the same.

(3) Hacking the information of government institutes and companies.

Q. 3 Find the odd one out :

(1) Transport facilities, Social security, Counselling, Toilets.

(2) Aadhaar card, PAN card, Greeting card, Credit card.

(3) What's app, Instagram, Facebook, Textbook.

(4) Tobacco, Laughter club, Alcoholism, Drug abuse.

Ans. (1) **Counselling.** (All others are factors affecting social health. Counselling is the positive measure for mental health.)

(2) **Greeting card.** (All others are important cards of personal use.)

(3) **Textbook.** (All others are social media.)

(4) **Laughter club.** (All others are addictions.)

Q. 4 Find out the correlation :

(1) Movement against tobacco : Tata trust :: Education of slum children :

(2) Addictive substances : Drugs :: Carcinogenic (Cancer causing) substances :

(3) Radiations from cell phones : Headache : : : Hindrance to the brain development.

Ans. (1) Salaam Mumbai Foundation

(2) Tobacco (3) Alcoholism.

Q. 5 State whether True or False :

(1) Tobacco containing substances cannot cause cancer of mouth and lungs. (March '20)

(2) Children who watch cartoon films may imitate the characters of those films.

(3) Influence of parents is very stronger in case of adolescents.

(4) Loudly laughing can increase mental stress.

Ans. (1) False (2) True (3) False (4) False.

Q. 6 Select the two options in the 'B' group related to 'A' group.

'A' Group	'B' Group
Salaam Mumbai Foundation	(a) Work against alcoholism (b) Freedom from tobacco (c) Laughter club (d) Help to improve student's lifestyle

Ans. Salaam Mumbai Foundation – (b) Freedom from tobacco (d) Help to improve student's lifestyle.

*Q. 7 What will you do? Why?

(1) You are spending more time in internet/mobile games, phone, etc.

Ans. In life, the time once spent never returns back. We therefore must use our time for studies, exercise or outdoor games and some entertainment. In the free time, we must also help our parents in house hold work. But if we are spending hours together on surfing the net without any perfect aim or playing the computer or cell phone games it is total waste of time. There are many inappropriate sites on the internet, which should not be watched. This causes stress. Continuous use of mobile phone and being hooked to the social media slowly becomes an addiction. If these bad habits are creeping in us, we must try to leave the habits by conscious change.

(2) Child of your neighbour is addicted to tobacco chewing. (July '19; March '20; Nov. '20)

Ans. The hazards of tobacco chewing will be explained to this child. Different photographs and

videos showing the conditions of oral cancer will be shown to this child to persuade him, so that he can stay away from tobacco. This addiction has to be removed, so help of his parents will be taken. They will be told about the child's habit and asked to help him free from his addiction.

(3) Your sister has become incommunicative. She prefers to remain alone.

(July '19; March '20)

Ans. The individual who prefers to be incommunicative has lots of thoughts in his/her mind.

If this is the case with sister, she will be taken into confidence and the reason behind this lack of communication will be found out. Most often such persons have depression. So she will not be left alone. Her friends will be invited at home, so that she can converse with them. She should be motivated to mix with her favourite people. She should be encouraged to pursue her hobbies. She should be helped in selecting such work. If nothing changes her, then the help of counsellor should be taken.

(4) You have to use free space around your home for good purpose. *(July '20; Nov. '20)*

Ans. The free space around our home can be used to make a small garden. The garden-soil can be bought and spread in this free space. Small saplings can be planted here and nurtured for further growth. Nursery of saplings can also be started in this free space.

The space can also be used for outdoor games. The net for Badminton can be fixed and evening times can be spent in playing the game. Also care will be taken to keep the space clean and without any garbage.

(5) Your friend has developed the hobby of snapping selfies. *(July '19; March '20; Nov. '20)*

Ans. The habit of continuously taking selfie is bad. It shows that the friend is constantly thinking of himself only. His self-centredness is to be removed by counselling him. The reason behind this behaviour should also be understood. He should be diverted and motivated to take some other tasks so that his habit can be lessened. Taking selfies is not a hobby. It is a bad habit if someone is repeatedly engaged in it.

(6) Your brother studying in XII has developed the stress.

Ans. The syllabus for class XII is vast. If the studies are not taken seriously from the beginning of the academic year, then the stress develops due to the fear of examination and result. Therefore, instead of being stressed, he should practise time management and study schedule. He should think of only one subject at a time. The atmosphere in the house should be maintained happy and tension-free. Everybody in the house should interact with him so that he gets a feeling that he is not alone. He should be convinced, "study is for you and you are not for study".

Q. 8 Give scientific reasons :

(1) Nowadays school going children suffer from mental stress.

Ans. (1) These days children stay in nuclear families. Due to need for earning and also due to her career choices, mother of the house is also away for long period of time. (2) The grandparents or other elders are not in the home. This makes the children alone in the house. (3) At school and during studies, there is fierce competition. The modern technology like internet or mobile phones are luring the children away from their regular exercises or outdoor games. (4) The wrong kind of peer pressure introduces addictive substances at the young age. (5) There is insecurity in the outside world for the young children. (6) These facts create emotional burden on the young minds and thus they suffer from mental stress.

(2) Girls are facing the problem of stress due to such gender inequality.

Ans. (1) In most of the households there are many bindings on girls and excessive freedom for boys. (2) Boys do not participate in the domestic duties whereas girls have compulsion for the same. (3) In society too, girls have to face the problems like teasing and molestation. (4) This creates insecurity among the minds of girls. (5) The social change has made women independent and equal but still the male dominated society and the gender inequality persists causing more stress for young girls.

(3) Consuming liquor is always bad.

Ans. (1) When the liquor is produced from alcohol wrong processes can be carried out which makes the liquor highly toxic. (2) It may cost the life too. Due to alcohol in the liquor, there is direct effect on the nervous system and especially on the brain. (3) Other vital organs such as liver and kidneys are harmed due to alcohol. (4) The lifespan of person decreases due to alcoholism. (5) In students, the brain functioning is affected and the ability to memorize and think rationally is lost. The learning process becomes slow. (6) Due to all these effects, there is social, mental and familial problems in the society. Therefore, consuming liquor is always bad.

(4) We need to keep the PIN number of the debit card secret.

Ans. (1) Debit card is used to withdraw our money from the bank account. (2) During withdrawal, we have to use our PIN number. (3) If this PIN number is known to anybody, he or she can withdraw all our money and loot us. (4) Therefore, to prevent such financial loss, we have to keep the PIN number of the debit card secret.

(5) Importance of outdoor games is unparalleled.

Ans. (1) Outdoor games give good physical exercise. These games give many physical benefits. (2) It improves personal discipline, interaction with fellow players and create sense of unity. (3) Through play by driving away the loneliness, mental stress and depression is reduced. (4) The person becomes more social. (5) Therefore, it is said that the importance of outdoor games is unparalleled.

Q. 9 Answer the following questions :

***(1) Which factors affect the social health? OR Write any six factors affecting social health.**

(Nov. '20)

Ans. (1) In order to maintain the social health of any community there should be good amenities for the people. E.g. food, water, shelter, clothing, medicines and medical help, equal opportunities for education, cleanliness of the surroundings, transport facilities etc. should be properly provided.

(2) The social and political conditions of the surrounding should be such that there should not be any connections with world of criminals. The presence of such criminal ties can affect the social health to a great extent.

(3) The gardens, playgrounds, the empty plots for outdoor games, sports clubs, etc. are important criteria for overall development of the society. This results into personality development and make people happy and strong.

(4) Addictions, criminal tendencies, pervert behaviour and perverse thinking affects other people in the society and this reflects negatively on the social health.

(5) Having large number of friends and relatives, proper use of time when alone and when along the peer group, trust in others, respect and acceptance for others build stronger social health.

(2) What is alcoholism? What are its effects?

Ans. (1) Alcoholism is the addiction to have alcohol in the form of different types of liquor. Liquor is produced from alcohol. Alcohol is in turn obtained by fermentation of different substances.

(2) Consuming liquor becomes an addiction for a long-term. Due to alcohol, the efficiency of nervous system and especially the brain is affected.

(3) Other vital organs such as kidneys and liver are adversely affected.

(4) Lifespan of an alcoholic decreases due to constant drinking and malnourishment.

(5) Especially in adolescent age if alcohol is consumed the brain functioning does not take place properly. The mental ability of memorization and learning becomes slow. There is lack of concentration in studies.

(6) The alcoholic person lacks the rational thinking and hence faces with social, mental and familial problems along with physical illness.

(3) How the excessive use of social media and technology is proving harmful?

Ans. Excessive use of social media and modern technology is disturbing the social health. It is also affecting physical and mental health. Increase in

cybercrime take place. People waste their time by watching useless and obscene material. Violence develops by watching few weird cartoon serials. Dependency on machine rises and persons lose self-reliance.

***(4) Which changes occur in persons continuously using the internet and mobile phones?**

Ans. (1) When a person continuously remains in contact with mobile phones, many physical problems can arise.

(2) Tiredness, headache, insomnia, forgetfulness, tinnitus, joint pains and problems in vision occur due to radiation emanating from the cell phones. For young children this is more disastrous as these radiations can penetrate through their bones.

(3) By logging into the internet for a long time, persons become solitary. Such individuals are unable to establish harmonious relations with relatives and other people around.

(4) They tend to become self-centred and selfish. They lose sensitivity towards others.

(5) Such people never take any social responsibility and the social health is thus disturbed.

***(5) Which problems does the common man face due to incidences of cybercrime?**

Ans. (1) The numbers of Aadhaar card, PAN card, credit or debit card are obtained by the cheaters. This is a cybercrime. The PIN number can be misused and the money can be withdrawn from the bank accounts. The looters withdraw cash from our accounts in this way.

(2) People can be cheated during online shopping.

(3) Fake account on Facebook is opened and false information is displayed on it. Through such accounts the girls are emotionally and financially exploited.

(4) Electronic media are misused for sending derogatory and vulgar messages, obscene pictures and provocative statements.

(5) Through the internet, hackers can send virus to crash someone's computer or even mobile phones.

In all such different ways, common people can be victimized by cybercrime.

***(6) Explain the importance of good communication with others.**

Ans. (1) Nowadays, there is fierce competition, insecurity and criminal tendencies in the society.

(2) This kind of atmosphere is increasing mental and emotional stress.

(3) If the stress remains buried in the mind, persons are depressed or frustrated. This causes, mental disorders if not treated in time. Depression can lead to addictions. The suicidal thoughts hover in the mind. If at that phase we can open our heart by good communication, many problems can be solved.

(4) Help from counsellors can be taken to relieve the stress.

(5) By good communication with parents or family members harmonious relations can be re-established.

***(7) What are the various ways to minimize mental stress?**

OR

Explain four ways to minimize stress.

(March '20)

Ans. The ways of stress-bursting are as follows :

(1) **Laughter club** : People gather together and laugh collectively to reduce stress.

(2) **Good communication** : One should establish good communication with friends, siblings, cousins, teachers, parents or anybody in whom we can confide and express our feelings.

(3) **Writing** : By writing and noting the thoughts we feel relieved. We can confess and analyse about our mistakes through writing to reduce our stress.

(4) **Hobbies** : Collecting curios, photography, reading good literature, music, cooking, gardening, bird watching, keeping a pet, sculpturing, drawing, rangoli, dancing, etc. are such hobbies which are necessary for utilizing our spare time by creativity. Persuading hobby is the best way to be stress-free. Music in particular is said to change the negative thoughts, therefore, listening to music, learning the music and singing helps to fight stress. By admiring nature too, stress is relieved.

(5) **Outdoor games and physical exercise** : By participating in the sports, there are various benefits such as physical exercise, improving discipline, interaction with others and creating the tendency of unity, becoming more social and reduce stress.

(8) Explain the importance of exercise, yoga and meditation.

Ans. (1) Exercise, yoga and meditation are the ways to reduce mental and physical stress.

(2) In yoga various asanas and pranayama are performed. It also includes good food and discipline of the body and mind.

(3) Deep breathing, yogic sleep can help in the building up health.

(4) Meditation helps in concentration and brings positivity to the mind. Especially, the students increase the concentration in the studies.

***(9) What type of changes occur in a home having chronically ill old person? How will you help to maintain good atmosphere?**

Ans. If there is a chronically ill old person in the house, the entire atmosphere of the house changes. There is tension and grief in the house. Doctor's visits to the house become routine. The ill person's diet and medicines are strictly followed.

In such times, everybody in the family should contribute to the work of taking care of the patient. We can help in bringing medicines. We can sit beside the patient during night time. We should maintain pleasant atmosphere in the house. We should help the person who is burdened by the duties towards the sick patient by helping in whatever little ways that we can.

Q. 10 Write short notes on the following :

(1) Cybercrimes :

Ans. (1) No personal information should be shared on the phone, especially the details of bank account, Aadhaar card, PAN card, credit card or debit card number, etc. Cheating persons by using this information is a greatest cybercrime.

(2) If PIN of any debit or credit card is known to a stranger, he or she can make fraudulent transactions.

(3) The PIN number and CVV number should be kept total secret. Otherwise, the bank transactions are done using PIN without the knowledge of consumers.

(4) In on-line purchases, many a times consumers are cheated. In this, the consumers are shown superior items on websites but actually the inferior ones are sold to them.

(5) 'Hacking of information' is done by some programmers in which the confidential information about government, institutes and companies is obtained from internet with the help of computer programs.

(6) Fake Facebook accounts are opened and false information is displayed there. This is for harassing girls or financially exploiting others.

(7) In internet piracy, written literature, software, photos, videos, music, etc. of other persons are misused or illegally used.

(8) Misuse of electronic media sending derogatory messages, spreading vulgar pictures and provocative statements is also a cybercrime. Very rapid exchange of information through media like email, Facebook and Whatsapp takes place these days. But we have to take care about leaking of our own important information. However, when our personal information and phone numbers are automatically spread and reached to fraudulent people, then they commit malpractices which can hinder the function or shut of the cell phones or computers.

All these are cybercrimes which are also indicative of mental health.

(2) Addiction :

(1) In adolescent age group, there is tremendous pressure of peers. This peer-group influence can be at times wrong, if the friends are not good. Instead of following advice of parents, the adolescent girls and boys tend to listen to the wrong advices of their friends.

(2) Due to lack of parental supervision, children in their early age start using tobacco, cigarette, *gutkha*, alcoholic drinks, drugs, etc. This may be due to peer-pressure.

(3) The children fall into the trap of addictions either due to peer-group pressure or due to false symbol of high standard living. Sometimes they try to imitate their elders.

(4) The addictive substances are hazardous, and they cause long term effects. Some are temporarily intoxicating substances obtained from the plants. While some of the chemical ingredients in them can permanently damage the human nervous system, muscular system, heart, etc. Some tobacco like substances are carcinogenic in action especially on the mouth and lungs.

Q. 11 Complete the paragraph by choosing the appropriate words given in the bracket :

(lungs, heart, carcinogenic, nervous, intoxicating, hazardous, addictions, peer-group)

The children fall into the trap of either due to pressure or due to false symbol of high standard living. Sometimes they try to imitate their elders. The addictive substances are, and they cause long term effects. Some are temporarily substances obtained from the plants. While some of the chemical ingredients in them can permanently damage the human system, muscular system,, etc. Some tobacco like substances are in action especially on the mouth and

Ans. The children fall into the trap of addictions either due to peer-group pressure or due to false symbol of high standard living. Sometimes they try to imitate their elders. The addictive substances are hazardous, and they cause long term effects. Some are temporarily intoxicating substances obtained from the plants. While some of the chemical ingredients in them can permanently damage the human nervous system, muscular system, heart, etc. Some tobacco like substances are carcinogenic in action especially on the mouth and lungs.

Q. 12 Paragraph-based questions :

- Read the paragraph and answer the questions given below :

Social health involves your ability to form satisfying interpersonal relationships with others.

It also relates to your ability to adapt comfortably to different social situations and act appropriately in a variety of settings. Spouses, co-workers and acquaintances can all have healthy relationships with one another. Each of these relationships should include strong communication skills, empathy for others and a sense of accountability. In contrast, traits like being withdrawn, vindictive or selfish can have a negative impact on your social health. Overall, stress can be one of the most significant threats to a healthy relationship. Stress should be managed through proven techniques such as regular physical activity, deep breathing and positive self-talk.

Questions and Answers :

(1) How can you be socially healthy?

Ans. If one has ability to form satisfying interpersonal relationships with others, he or she can be socially healthy. In all social situations and settings there should be appropriate behaviour.

(2) Which qualities are needed for having good social contacts?

Ans. Strong communication skills, empathy for others and sense of accountability are the qualities needed for having good social contacts.

(3) Which traits have negative impacts on social health?

Ans. Being withdrawn, vindictive or selfish, and stressed out personality has negative impacts on the social health.

(4) What are the stress management techniques?

Ans. Regular physical activity, deep breathing and positive self-talk can be the simple stress management techniques.

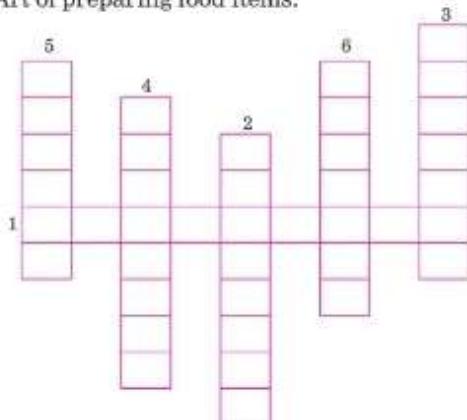
(5) What is the significant threat to social health of an adolescent in your opinion?

Ans. General stress, addictions, wrong peer pressure, too much of screen time, lack of parental care are threats to social health of an adolescent.

Q. 13 Activity-based questions :

***(1) Solve the following cross-word :**

1. Continuous consumption of alcoholic and tobacco materials.
2. This app may cause the cybercrimes
3. A remedy to resolve stress.
4. Requirement for stress free life.
5. Various factors affect health.
6. Art of preparing food items.



Ans. (1) Addiction (2) Facebook (3) Singing
(4) Goodfood (5) Social (6) Cooking.

(2) Fill in the boxes with the help of the given clue : (March '19)

Continuous consumption of alcohol and tobacco material

A O

Ans. ADDICTION

(3) Let's Think : (Textbook page no. 101)

Elders always instruct you to get out of the home to interact with relatives and others and play outdoor games but not to spend time continuously with television, phone and internet. Why the children of your age are instructed same in each home?

Ans. When we interact with the relative, it becomes easier to mix with other strangers later. The personality moulds when we talk and interact with different people. We can exchange the thoughts. We learn to converse in a rightful way. When we go to playground and take part in outdoor games, we get health benefits. Sitting at home and spending

productive time in just mobile or computer games, does not benefit in any way. Most of the serials on the television are of no use for any kind of personality development, instead they push us in a virtual world. Except for few channels like National Geographic and Animal Kingdom, we do not get any knowledge by television viewing.

The elders in the house are experienced people. They understand 'what is good' and 'what is to be avoided'. They are also genuinely concerned about bright future of the youngsters in the house. By giving instructions to the youngsters, they never get benefitted but it is our generation that gets proper guidance. These instructions should be followed for a perfect personality and bright future.

(4) Think : (Textbook page no. 103)

Whether the incidence shown in the following picture is rational? Express your opinion.



Fig. 9.1 : An incidence

Ans. In the picture is seen a woman asking the beggar to move away. The beggar looks dirty and sick.

In one way, the picture looks proper as the beggar may be causing inconvenience to the people in that house. He is unhygienic and may spread the infection.

But from the humanitarian point of view, he may be needing help. He may be starving. He may be sick. In such a case, he should be given food and help.

However, if he is a drug addict the police should be called and person should be transferred immediately.

From the picture, the exact condition of the man is not clearly understood and hence, the exact opinion about the rationality of the incidence cannot be made.

(5) Observe : (Textbook page no. 103)

Two caricatures presenting the situations of the year 1998 and 2017 about playing on playground are given below. Observe those caricatures. Express your opinion about arising of such different situations.



Fig. 9.2 : Different situations

Ans. In 1998, the technology was not so much advanced as it is today. In every house, there were no computers or lap tops. Mobile phones were not popular then. The children used to play games which were outdoor and physical. They used to spend quality time on the playground. They always wanted to rush to the playground after their school hours. Therefore, mothers of that time had the task to get back their children from the playground.

By 2017, the situations and the social and technological change became enormous. The constant growth of the cities also experienced the rising construction. This too resulted in loss of playgrounds. After school time, children started spending their time in mobile and computer games. The parents also became financially well-off and started providing all the amenities to the children. Due to the internet and the computer at home, the children got hooked to these electronic media. They started spending all the available time in virtual games, facebook, whats app and other social media. Thus mothers, of recent times had to force their children out of the house, at least for some time, so that they can play physical games.

Two caricatures presenting the situations of the year 1998 and 2017 about playing on playground show the tremendous social change that has undergone in our society.

(6) Observe : (Textbook page no. 104)

Observe the images below. Is it rational?

Why?



Fig. 9.3 : Boy using cell phone while eating



Fig. 9.4 : Selfie on the Road



Fig. 9.5 : Pedestrians recording the accident

Ans. In the above three pictures three incidences are shown. In the first picture (Fig. 9.3), the boy who is taking his lunch is shown. He is busy with his mobile while having his food. In second picture (Fig. 9.4), a young man is taking selfie while standing in the busy road. He is not aware of the approaching car too. In the third picture (Fig. 9.5), some men are taking pictures of the accident that has recently happened. The person is injured and bleeding. But these men are busy in photographing him.

All the three pictures are showing irrational and improper behaviour. We should respect the food while eating. We should eat in a disciplined way. Standing in the middle of the road and taking selfie is like inviting the mishap. Selfie taken in such circumstances usually results in an accident. In the last picture, the sensitivity and the humanity to save the victim is lacking. If the victim is immediately rushed to hospital, his life can be saved. Instead of helping the victim if people are engrossed in taking pictures, then it is absolutely wrong.

(7) Observe the pictures and answer the questions. *(March '19)*

(a) Playing games on mobile while eating is right or wrong. Justify.

Ans. The boy taking his lunch is shown in the adjoining picture. He is busy with his mobile while having his food. His nutrition may affect due to such behaviour.

(b) What do you conclude from the following picture?

Ans. Cigarette contains carcinogenic nicotine. It should never be smoked. Similarly, always stay away from addictions such as drugs, alcohol, gutkha, etc. The pictures give message for control of addictions.

(c) Observe the following picture and state what can be the outcome.

Ans. In picture, a young man is taking selfie while standing in the busy road. He is not aware of the approaching car too. This may cause an accident.



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(8) Complete the following :

Concept-diagram using factors harming the social health and based on it, answer the following questions :

(i) Tobacco products can be included in which of those factors?

(ii) How the tobacco products are harming the social health?

Ans. *(Answers are given in bold.)*



(i) Tobacco products are included under addiction.

(ii) Tobacco is carcinogenic product. By its consumption personal and social health is affected on a large scale. Spitting tobacco anywhere is also common practice among tobacco chewers. This too affects public hygiene and cleanliness.

(9) Observe the following figure and answer the given questions :



Fig. 9.6 :

(a) What does this picture given in the textbook indicate?

(b) Explain any two causes for this problem.

(c) Describe any two measures to eradicate this problem.

Ans. (a) Given picture indicates that person is suffering from mental problem. He is under severe depression and frustration. Person may be using the drugs.

(b) Causes of this problems are as under :

- (i) Nuclear families and working parents.
 - (ii) Poverty, divided family and unemployment.
- Addiction is major cause of this problem.

(c) Measures to eradicate this problem :

- (i) By good communication with parents or family members harmonious relation can be re-established.
- (ii) Help from counsellors can be helpful to minimize the problem.

(10) (i) Which mental illness is shown in the picture 9.5?

(ii) Which social message would you like to give through it.

Ans. (i) The picture (figure 9.5) shows 'insensitivity', which is a type of human nature.

(ii) (1) Instead of shooting the accident the victim should be given first aid. (2) Call on 100 and 108 and seek immediate help from police and ambulance. (3) Disperse the crowd and try to save life of victim by giving CPR.

(11) Write, which is an inappropriate action in the picture 9.5.

Ans. The picture shows lack of sensitivity and responsibility.

(12) Observe the figure and answer the questions given below.



- (a) What do these figures indicate?
- (b) Which gadgets can be misused for these?
- (c) Give two examples of such events.
- (d) Name the act amended by Government of Maharashtra to control such events.
- (e) What care should be taken by a person to avoid such events?

Ans. (a) The above figures indicate different types of cybercrime.

(b) The gadgets that are usually used for cybercrime are internet connected computers, cell

phones, ATM machines, debit and credit cards, etc. Also using aadhar and PAN cards of others.

(c) (1) Bank transactions are done without the knowledge of the account holder by stealing necessary numbers or pass codes. (2) By opening the fake accounts of social media and deceiving girls, harming them psychologically by teasing them. (3) Deceiving customers by showing superior options on the internet and providing inferior ones when bought. In online shopping many may be cheated in this way.

(d) IT Act-2000 is the act enacted since 17th Oct. 2000 and amended in 2008 that has been imposed by Government of Maharashtra to control cybercrimes.

(e) To prevent cyber crimes, one has to keep vigil over bank transactions. Never reveal any details on the phone. The ATM pin number and PAN or AADHAR details should not be revealed to anyone. While at ATM machines, the pin number should be covered. Always log out from the internet after the work is over.

PROJECTS

***(1)** Enlist various factors affecting the social health in your residential area. Decide the necessary changes to correct the situation and implement those changes.

(2) Observe and Discuss : Observe the chart given on textbook page 101. Discuss about the relationship of various factors shown therein with the social health.

(Textbook page no. 101)

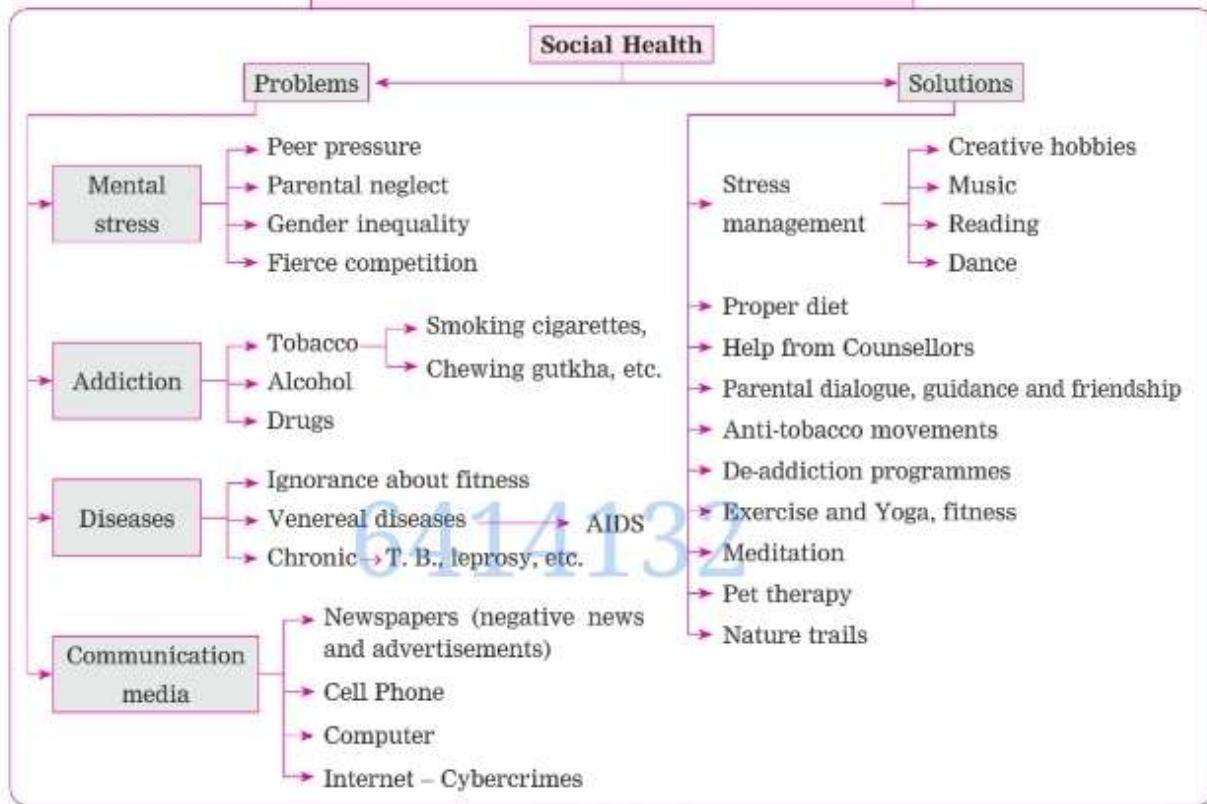
(3) Try This! (Textbook page no. 101) Classify your classmates into following groups depending upon the observation for a week.

- 1. Highly interactive.
- 2. Occasionally interactive.
- 3. Non-interactive

Make a list of the friends of each of the above three group members and also mention the group to which you belong.

- (4) **Compare** : (Textbook page no. 103) Distribute the 24 hours of your daily routine as per various duties you have observed. Make two categories as time spent on your health and time spent on other responsibilities and compare both the categories.
- (5) **Internet is my friend** : Visit the website www.cyberswachhtakendra.gov.in

MEMORY MAP/CONCEPT MAP



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this **QR Code** for the test and its model answers.



CHAPTER AT A GLANCE

- 10.1 Disaster
- 10.2 Types of disasters
- 10.3 Effects of disasters
- 10.4 Nature and scope of disaster

- 10.5 Disaster management
- 10.6 Structure of disaster management authority
- 10.7 First aid and emergency action
- 10.8 Mock drill

IMPORTANT POINT

Can you recall? (Textbook page no. 109)

(1) What is disaster?

Ans. Disaster is the incidence that occurs suddenly causing heavy damage to life and property. The disaster can be man-made or due to natural reason.

(2) Which disasters have you experienced in your area?

Ans. On September 2019, there was a heavy downpour in Pune. This disaster has been experienced recently.

On 26th November 2008 there was attack at several places by the Pakistani terrorists. The stories about the deaths and damage caused by this disaster were seen in films and learnt about this from our elders.

(3) What are the effects of that disaster on local and surrounding conditions?

Ans. Due to a heavy downpour in Pune, there was waterlogging in all the shallow areas. All the transport systems collapsed on that day. Large trees fell down injuring the people. The water logging caused condition like floods. Schools, colleges and offices were shut down. People were caught in troublesome situation.

On 26th November 2008 many innocent people lost their lives. There was tremendous damage caused to some of the important places like Taj Palace Hotel and Chabad house.

10.1 Disaster :

Hazardous event that suddenly takes place in the surroundings is called disaster.

1. **The definition of disaster as given by United Nations :** The sudden event that leads to the huge loss of life and property is called disaster.
2. **Natural disasters :** Floods, wet and dry famine, cyclones, earthquakes, volcanoes, etc. are caused due to sudden change in the environment causing great damage. Since these disasters are due to nature's wrath, they are called natural disasters.
3. **Man-made disasters :** When mankind needs natural resources for developmental purpose, environment gets damaged. Such disasters are due to man-made actions and thus they are called man-made disasters.

4. Effects of disasters :

- (1) The great loss to life and property of the people.
- (2) Different areas of life like economic, social, cultural, political, law and administration, etc. are affected due to sudden disasters.
- (3) The life in the affected area is totally disturbed.
- (4) Nature and duration of each disaster is different. The period of disaster decides whether it is short term or long-term.
- (5) Disasters are caused due to different reasons. Each disaster has its own environmental impact.

Can you tell? (Textbook page no. 109)

- Which are two main types of disasters?

Ans. According to preliminary classification of disasters there are two main types of disasters, natural and man-made.

5. Second method of classifying disasters :

- (1) **Catastrophic disasters** : Cyclones in Odisha, catastrophic earthquakes of Gujarat and Latur, frequently buzzing cyclones in coastal Andhra Pradesh, etc.
- (2) **Disasters making the impact for long duration** : Famine, various problems of crops, strikes of workers, rising levels of oceans, desertification, etc.

Can you tell? (Textbook page no. 110)

- How can disasters be classified depending upon various criteria?

Ans. Disasters can be classified depending upon following main criteria.

- (1) The extent of the damage caused.
- (2) The period of disaster.
- (3) The long term effects.
- (4) The reason for the disaster.

10.2 Types of disasters :



There are three types of disasters, viz. geophysical, biological and man-made.

1. Geophysical :

- (1) **Geological** : Earthquake, volcano, tsunami, landslides, landfall, erosion, alkalization, flooding, etc.
- (2) **Climatic** : E.g. Hot and cold waves, snowstorms, snowfall, cyclones, hailstorm, drought, flood, meteorite, sunspots, etc.

2. Biological :

- (1) **Animal-origin** : Infectious viruses, bacteria (cholera, malaria, hepatitis, plague), insects, bite of venomous animals, etc.
- (2) **Plant-origin** : E.g. Forest fire, fungal disease spreading (Blister), weed (aquatic, carrot grass, common grass).

3. Man-made :

- (1) **Accidental or Unintentional** : Toxic gases, Atomic test, Unplanned action, Accident.
- (2) **Intentional** : War, fire, bomb blast, forced migration, terrorism, rapes, child labour.

Can you recall? (Textbook page no. 110)

- (1) Which are the destructive effects of flood?

Ans. The flood waters uproot the trees, the houses collapse due to surge of water. The fields get waterlogged. The water does not recede. The cattle die of asphyxiation by drowning. Since everything is under water, the process of decomposition begins at a higher rate. This may spread the epidemics of the diseases.

- (2) Which are the effects of dry famine?

Ans. In dry famine, there is scarcity of water. The crops die as there is no proper irrigation. There is severe food shortage. Due to dearth of water, the cattle die and human beings are forced to migrate.

- (3) Which are the destructive effects of earthquake?

Ans. The earthquake is responsible for large scale devastation. The houses collapse. The roads are damaged making the transportation impossible. The electricity and water supply is disrupted due to damage. There is large scale damage to lives and property.

- (4) What is forest fire? What is its effect on environment?

Ans. The largely spread fire of the dry grass, shrubs and trees in the forest due to heightened temperatures is called forest fire. The effect of forest fire on the environment is greatly devastating. Biodiversity is lost. Plants and animals die due to fire. The vegetation becomes dead as the plants turn into ash. The atmosphere is full of smoke and hence causes air pollution.

10.3 Effects of disasters :

1. Actual effects :

- (1) Effects of every type of disasters are different.
- (2) **Floods** : Collapsing of bridges, flooding of coastal villages, shortage of food.
- (3) **Earthquake** : Collapsing of houses, developing cracks in land.
- (4) **Forest fire and drought** : Adverse effect on the environment.

2. Effects on the economy of the nation and local leadership :

- (1) Huge expenses on the reconstruction of the destroyed structures.
- (2) Long term effect on the economy.
- (3) If local leadership is weak, the victimized citizens become confused.
- (4) During disasters administrative problems arise.
- (5) Local governing bodies too are affected.
- (6) The Government departments also are unable to solve the problematic situations caused by the disaster.

- (7) Entire system collapses as all the concerned departments are affected by disasters.

10.4 Nature and scope of disaster :

Some of the important aspects of the disaster become clear only when the nature and scope of the disaster is understood.

1. For this following aspects have to be studied thoroughly :

- (1) Exact nature of the disasters.
- (2) The changes in the nature before the onset of the disaster.
- (3) Time period of impact of disaster.

2. The scope of the disaster is dependent on the following facts :

- (1) Pre-disaster phase
- (2) Warning phase
- (3) Emergency phase
- (4) Rehabilitation phase
- (5) Recovery phase
- (6) Reconstruction phase

3. Three sensitive phases of the disaster :

1. Phase of emergency	2. Transitional Phase	3. Reconstruction Phase
<p>(1) Maximum lives can be saved by quick actions.</p> <p>(2) Actions such as search and rescue operations, medical assistance, first aid, restoring communication services, removing the people from affected area, etc.</p> <p>(3) Estimating the gravity of disaster.</p>	<p>(1) The rehabilitation work starts.</p> <p>(2) Clearing of debris, restoring water supply, repairing roads, etc.</p> <p>(3) Bringing normalcy in public life.</p> <p>(4) Different institutes offer the monetary/ other help. This help is distributed to victims.</p> <p>(5) Victims are offered with the permanent means of earning livelihood.</p> <p>(6) Soothing the mental stress of victims.</p> <p>(7) Rehabilitation of the victims.</p>	<p>(1) Highly complicated phase.</p> <p>(2) Begins in transitional phase. Reconstruction of buildings and roads and restoration of water supply facilities.</p> <p>(3) Restarting of farming practices.</p> <p>(4) Lengthy phase of reconstruction.</p>

4. Most of the natural disasters have taken place in the Asian continent and region of Pacific Ocean, causing huge of loss to the life. These disasters are caused due to natural imbalances created by human beings, in the pursuit of development and the economic progress. Environmental degradation is the leading cause to natural calamities.
5. Population explosion has resulted into many problems. After the Second World War, the natural conditions on the earth have gradually changed due to human interventions. Different causes such as economic inequality, racial and religious differences have caused terrorism, abduction, social differences which in turn result into instability in nations and man-made calamities.
6. Atomic energy plants are used for generation of nuclear energy. But they emit hazardous radiations. E.g., the accidental leakage in atomic energy plant at Chernobyl, Russia. During production of atomic energy radiation leakage and allied accidents may happen.
7. Disaster management is the essential action that has to be undertaken by each nation and its citizens. By direct participation of citizens in disaster management and by different disaster management schemes, hazardous after effects are reduced. These schemes are dependent on every location, time and nature of the disaster.

10.5 Disaster management :

1. Effective short term or long term disaster management is necessary in minor and major disasters.

The disaster management should involve public participation. Disasters are suddenly forcing us to deal with them, but by disaster management techniques, the losses can be minimized. In managing the after-effects of disasters, there should be arrangements to cope up with disastrous effects or there should be ways to make citizens capable to face and fight against the consequences.

2. Objectives of disaster management :

- (1) Saving human life from disasters. Helping them to move away from the place of disasters.
- (2) Essential commodities to be supplied to the affected people. This will help to reduce the gravity of disaster.
- (3) To bring back the conditions to normalcy.
- (4) Rehabilitation of the affected and displaced victims.
- (5) Protective measures for future in order to develop capability to face the disasters in future.

3. Disaster management :

- (1) Disaster management is divided into pre-disaster management and post-disaster management. Through scientific and careful observations and analysis of previous data, suitable action plans are developed for the disasters that might come in future. Preventive measures, rehabilitation and reconstruction is included in such plans.

4. Pre-disaster management :

- (1) Pre-disaster management means measures taken to rescue people or to keep preparedness before the disaster strikes. It includes following points : (i) To identify the disaster-prone areas. (ii) Through predictive intensity maps and hazard maps, the information should be collected about the probability of future disaster's intensity and probable sites of disasters, respectively.
- (2) Learning by ourselves and then imparting special training to people to tackle with future disasters.
- (3) Making general public aware about disaster management by training them through programmes. Spreading the message through mass media, etc.

5. Post-disaster management :

- (1) Post-disaster management means helping the victims of disasters in all possible ways, after they are affected. Rescue work is done by local survivors. Controlling centres and help centres are established according to the type of disaster.

- (2) Materials provided from the control centres for the victims are categorized, and distributed the same to victims with continuous review of the help.

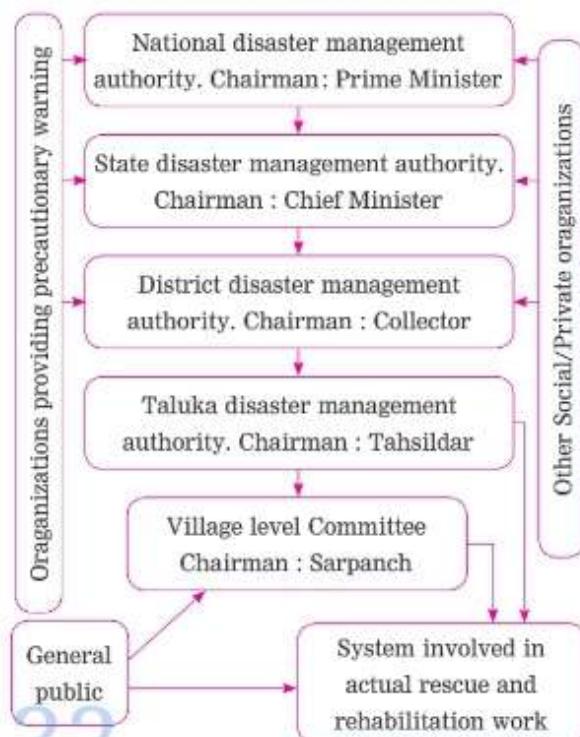
6. Main aspects of disaster management cycle :

- (1) **Preparation** : For possible future disasters, a plan for minimizing the destruction is kept ready. This is called preparation for the disaster.
- (2) **Redemption** : Planning is done to minimize such damage when disaster strikes.
- (3) **Preparedness** : In case of disaster, the general public and administration should immediately rise for action. This planned action is called preparedness.
- (4) **Impact of disaster** : After the disaster recedes, its intensity is studied. Its impact is analysed along with disaster management.
- (5) **Response** : Just before the disaster and immediately after the disaster, the response of people is analysed in this step.
- (6) **Resurgence** : Resurgence is an important link between emergency measures and national progress. It is a step showing extent of welfare and rehabilitation work done after the disaster. The progress of nation also becomes clear after analysing resurgence.
- (7) **Restoration** : The return of the normalcy after the disaster is called restoration. The restoration time depends upon the type of disaster.
- (8) Natural disasters cannot be avoided. But by proper management, the loss can be minimized. Man-made disasters can be avoided if care is taken in our actions and behaviour. It is the ethical responsibility of all human beings, to help each other during disasters.

10.6 Structure of Disaster Management Authority :

1. The Government has established an authority for management of disasters. Indian Government has also passed Disaster Management Act, 2005. The following chart shows control and

coordination of disaster management carried out from national level to village levels :



2. District Disaster Management Authority :

Planning, coordinating and controlling the implementation of rehabilitation programme is done by District Collector. He is responsible for such programmes and schemes.

3. Functions of Disaster Management Authority :

- (1) Giving the necessary instructions.
- (2) Assessing whether the instructions are followed or not.
- (3) Reviewing the entire system.
- (4) Controlling the actions.
- (5) Planning and executing the plans.
- (6) Designing schemes for each district, separately for each type of disaster and getting those sanctioned from state-level authorities.

4. District-wise Disaster Control Unit :

- (1) Establishment of district control unit is done immediately either after the impact of disaster or due to the warning of forthcoming disasters.
- (2) Help and guidance from various agencies like army, air force, navy, telecommunication

- department, paramilitary forces, etc. is taken to review the various aspects of disaster.
- (3) The control unit also coordinates with various voluntary organizations that help in disaster management.

5. The international organizations that work in the field of disaster management :

- (1) United Nations Disaster Relief Organization.
- (2) United Nations Centre for Human Settlements.
- (3) Asian Disaster Reduction Centre.
- (4) Asian Disaster Preparedness Centre.
- (5) World Health Organization.
- (6) United Nations Educational, Scientific and Cultural Organization.

6. National Disaster Response Force :

- (1) The army jawans constitute the National Disaster Response Force.
- (2) It was established as per the Disaster Management Act, 2005.
- (3) 12 divisions of this force work in the country.
- (4) Its headquarter is located at Delhi and the army takes any required action throughout all the states of India.
- (5) In Maharashtra, Jawans of State Reserve Police Force carry out responsibilities of National Disaster Response Force.
- (6) Website : <http://www.ndrf.gov.in> gives the information of National Disaster Response Force.

Can you tell? (Textbook page no. 116)

(1) What is first aid?

Ans. First aid is the primary help given to a sick or injured person until full medical treatment is available.

(2) How can we offer first aid to victims of any disaster?

Ans. The injured person should be helped and kept in a resting position in which he or she is at ease. Depending upon the nature of the disaster, first aid given may be different. But the most important is timely rescue which can help the victim to survive.

10.7 First Aid and Emergency Action :

1. First Aid :

- (1) When suddenly any disaster takes place, the help given to the victims before the medical treatment is available, is called first aid. This knowledge of first aid becomes useful to save one's life.
- (2) In day-to-day life, we come across many such disastrous incidences where such help is needed. Varieties of disasters like accidents, stampede, injuries in fighting, electric shock, burns, heat shock, snake bite, dog bite, fire due to electric short circuit, epidemic of any disease, etc. are the disasters in which first aid becomes essential.
- (3) In disasters, the victim's condition is to be taken into account before starting any first aid. As per the condition, various transportation methods like cradle method, carrying on back, carrying on two hands are to be followed.
- (4) Sometimes we face the disaster due to our own unawareness. We have to watch out for the symbols that warn us against the potential dangers. Such symbols have to be taken into account.

2. First Aid Kit : Material necessary for first aid is kept in the first aid kit. Such first aid kit should be available at every place such as in schools, colleges and offices, etc.

3. The necessary material in first aid box :

- (1) For wrapping the wounds : Bandage strips of different size, Wound gauze, Triangular and circular bandage, Medicated cotton, Band aid
- (2) For cleanliness; Hand gloves, Clean and dry cloth pieces, Soap
- (3) Medicines : Antiseptic (Dettol/Savlon), Petroleum jelly
- (4) Safety pins, Blade, Small pins, Needle, Scissors
- (5) Thermometer, Torch.

10.8 Mock Drill :

1. Nature of mock drill :

- (1) Mock drill is the activity which is carried out by creating virtual or apparent situation of disaster.

- (2) It is carried out to check the preparedness if the disaster approaches.
 - (3) The responses of the people, the quickness of actions, etc. can be analysed prior to the actual disaster happens.
 - (4) Trained personnel check execution of plan designed for disaster redressal. They are responsible for the training of people in case of disasters. The whole exercise helps to check the efficacy of the system prepared for disaster redressal.
 - (5) Mock drill is organized in various schools to create the awareness among the school children in case of disasters. Fire fighters, police force and some voluntary organizations organize mock drills.

2. Objectives of Mock Drill :

- (1) Evaluating the response of the common people to the disaster.
 - (2) Improving the coordination between various departments that work for the disaster control.

- (3) Identifying one's own abilities at the time of disaster.
 - (4) Developing the ability to respond quickly to disaster.
 - (5) Checking the competency of the planned actions.
 - (6) Assessing the possible errors and risks.

3. Important notes for our safety :

- (1) Not to crowd and push each other while using staircase in the school.
 - (2) Important help-lines should be remembered and used whenever need arises : Police 100, Fire fighting force 101, Disaster Control Unit 108, Ambulance 102, Child helpline : 1028, etc.
 - (3) Always follow the traffic rules. Looking first at left and then at right sides while crossing the road.
 - (4) Not to touch any unclaimed object.
 - (5) Not to spread rumours.
 - (6) Not to cause chaos at the crowded places.

QUESTIONS AND ANSWERS

Q. 1 Choose the correct alternative and write its alphabet against the sub-question number :

(10) Keeping ready is a practice to check the preparedness of facing the disaster.

- (a) First aid (b) Mock drill
(c) Ambulance (d) Fire brigade

(11) Which of the following is man-made disaster?

- (a) Earthquake (b) Flood
(c) Meteor (d) Leakage of toxic gases

(March, July '19)

(12) What should be done if gas cylinder at your house catches fire?

- (a) Water should be sprinkled
(b) Sand, soil should be put on it
(c) Cylinder should be covered with wet blanket
(d) one should run away

Ans. (1-b); (2-a); (3-c); (4-a); (5-b); (6-a); (7-c); (8-a); (9-c); (10-b); (11-d); (12-c).

Q. 2 Which type of disaster is described in the following statements?

- (1) On 26th July 2005, entire suburban Mumbai was waterlogged.
(2) Elephants in the Bandipur forest started running helter and skelter due to smoke.
(3) Many innocent people died in the bomb blast that occurred on 11th July 2006 in local trains.
(4) In Kutch, suddenly many school children were buried under the rubble.
(5) Because of lack of crops, people from Vidarbha are migrating to other regions.
(6) The huge waves in Chennai engulfed many human lives in December 2004.

Ans. (1) Cloudbursting and severe downpour
(2) Forest fires (3) Bomb explosion-Terrorism
(4) Earthquake (5) Dry famine (6) Tsunami.

Q. 3 Find the correlation :

- (1) Earthquake in recent times : Gujarat, Latur : : Devastating floods in 2018 :
(2) Toxic gas leakage : Accidental disaster : : War :
(3) Sun spots : Atmospheric type of disaster : : Salinization :

(4) Pre-disaster management : Preparation and warning : : Post-disaster management :

Ans. (1) Kerala/Assam (2) Intentional

(3) Geological type of disaster (4) Resurgence and restoration.

Q. 4 Match the columns :

(1) Column A : Disaster	Column B : Type
(1) Earthquake and volcano	(a) Animal origin
(2) Snowfall and snowstorms	(b) Geological (c) Climatic (d) Terrorism

Ans. (1) Earthquake and volcano – Geological

(2) Snowfall and snowstorms – Climatic.

(2) Column A : Disaster	Column B : Type
(1) Aquatic weeds	(a) Animal origin
(2) Attack by locusts (insects)	(b) Plant origin (c) Geological (d) Climatic

Ans. (1) Aquatic weeds – Plant origin

(2) Attack by locusts (insects) – Animal origin.

(3) Column A : Disaster	Column B : Type
(1) Atomic tests	(a) Intentional
(2) Terrorism	(b) Unintentional (c) Geological (d) Animal origin

Ans. (1) Atomic tests – Unintentional

(2) Terrorism – Intentional.

(4) Column A : Effect	Column B : Problem
(1) Contamination of water	(a) Economical (b) Environmental
(2) Collapsing of transport system	(c) Administrative (d) Geological

Ans. (1) Contamination of water – Environmental

(2) Collapsing of transport system – Administrative.

(5) Column A : Effect	Column B : Problem
(1) Spread of epidemics	(a) Economical
(2) Shortage of funds	(b) Administrative
	(c) Medical
	(d) Physical

Ans. (1) Spread of epidemics – Medical
(2) Shortage of funds – Economical.

(6) Column A : Effect	Column B : Problem
(1) Rift due to religions	(a) Economical
(2) Citizens getting confused	(b) Social
	(c) Political
	(d) Environmental

Ans. (1) Rift due to religions – Social
(2) Citizens getting confused – Political.

Q. 5 Identify the type of disaster and describe the effects of the same in brief :

***(1) Terrorism.**

Ans. Man-made, intentional

Due to the activities of terrorism, many innocent lives are lost. Many are seriously injured. Some become crippled for their entire life. Buildings, monuments, vehicles everything is completely destroyed. There is rift between different religions or sects. The peaceful atmosphere is disturbed. The entire society is under the constant fear of insecurity.

***(2) Soil erosion.**

Ans. Natural, geophysical, geological.

When the upper fertile layer of soil is lost, it becomes barren. The trees are uprooted. The fertility of the area is lost. The land becomes unsuitable for cultivation or farming. Due to wind, flowing water or grazing animals the naturally occurring soil erosion becomes hazardous for the environment.

***(3) Hepatitis.**

Ans. Natural, biological, animal-origin.

Hepatitis is a viral disease which spreads through the contaminated food and water. The outburst of epidemic of hepatitis is difficult to control. As in big cities the quality of road side food is often consumed, the spread of hepatitis is fast. People suffer due to hepatitis.

***(4) Forest fire.**

Ans. Natural, biological, plant-origin.

Due to heat and wind, the dry grass and the shrubs catch fire in the forests, resulting in forest fires. Such rapidly spreading forest fire can finish the biodiversity within a very short span of time. It is difficult to extinguish the naturally lit forest fires. Many trees and other vegetation, animals and birds along with their habitats are destroyed due to forest fire. The smoke emanating causes the air pollution.

***(5) Famine.**

Ans. Natural, climatic.

Due to famine there is severe water scarcity. In absence of water, the fields and farms become barren as the crops cannot grow without water. There is shortage of food grains. The cattle dies due to want of water and grass. Local people have to migrate in search of food, water and shelter.

***(6) Theft.**

Ans. Man-made, intentional.

Theft causes economic loss for the one whose money or valuables are looted. The person who suffers the loss also undergo mental and emotional shock. Sometimes the thief may also cause physical harm. It may cost on life too.

(7) Accident at Chernobyl.

Ans. Man-made, unintentional.

At Chernobyl in Russia there was the atomic energy plant, where disastrous accident took place. The radiations emitted through the reactors caused tremendous radiation pollution. These hazardous effects are even seen today.

Q. 6 Give reasons :

***(1) Mock drill is useful.**

Ans. (1) Mock drill is the practice to check whether there is preparedness for dealing with the sudden attack of disaster. (2) For this purpose, virtual or apparent situations that simulate the disaster are created. (3) The reaction time for any type of disaster is checked by such activity. In the presence of trained personnel, the execution of the

rescue plans are observed. (4) People also understand their responsibilities at the time of actual disaster. (5) The experts also check execution of plan designed for disaster redressal. (6) By such mock drills, the efficacy of the system can be understood. In future, when actual calamity strikes, there is already preparation for disaster redressal. Therefore, mock drill is useful.

***(2) Effective disaster management makes us well prepared for future.**

Ans. (1) Disaster can strike any time. The sudden disasters can be man-made with some bad intentions or may be accidental. (2) When natural calamity strikes suddenly with a huge impact, large scale devastation of property and general environment degradation occurs along with substantial mortality of people and animals. (3) Therefore, it is most appropriate to have the preparedness to reduce the impact of any future disasters. (4) We cannot control the onset of the natural disaster, but we can definitely reduce the harsh effects of the disaster by following disaster management plan.

(3) When there are riots, the cities, towns or villages show signs of tense atmosphere.

Ans. (1) During riots, there is financial loss for all the rioting groups. (2) The belongings, houses, shops, etc. are destroyed or damaged. (3) Property is looted. There is no guarantee of safety and security for anyone. (4) Women and children suffer the most as they are easily victimized. Therefore, when there are riots, the cities, towns or villages show signs of tense atmosphere.

Q. 7 Answer the following questions in detail :

(1) Which are the disasters that make impact for longer duration? Give examples.

Ans. Those disasters that make the impact for long duration and those disasters, whose after-effects are either severe are long term disasters. Their severity increases with time. Such disasters are famine, various problems of growth of crop, strikes of workers, rising levels of oceans, desertification, etc.

(2) What types of disaster are the following? Explain their impacts.

(a) Floods (b) War.

Ans. (a) Flood is geophysical climatic disaster.

(b) War is man-made intentional disaster.

Impact of flood : The low-lying and the coastal areas are seen to be submerged. The entire region is waterlogged.

Impact of war : Tremendous destruction causing loss. Many lives are lost. The costs of all the items rise due to war conditions. Entire nation faces insecurity.

(3) Explain in brief the sensitive issues of general public about disaster. OR

Which are the three aspects of disaster that are important for common citizens ?

Ans. The phase of emergency, transitional phase and reconstruction phase are the three phases of disaster that are important for common citizens.

(1) Phase of emergency : If timely and rapid action is taken during this phase, maximum lives can be saved. Search and rescue operations, medical help, first aid, restoring communication services, removing the people from affected area are done during this phase. The gravity of disaster can be estimated during this phase.

(2) Transitional Phase : The disaster subsides and then the work of transitional phase starts. The main concern is rehabilitation work for the affected and displaced people. This work includes clearing of debris, restoring water supply, repairing roads, etc. to bring normalcy in public life. Help from different voluntary and Government institute is taken to offer the monetary provision and essential commodities to affected victims. Permanent means of livelihood is given to the people to reduce their mental and emotional stress. The victims are truly rehabilitated.

(3) Reconstruction Phase : Reconstruction phase is a highly complicated phase which actually overlaps with transition stage. Help is offered to people to reconstruct their buildings. Other facilities like roads and water supply are restored. Farming practices are restarted. It is a very gradual phase that makes the victims to completely rehabilitate.

***(4) Give the reasons for increase in human disasters after the World War-II.**

Ans. (1) After Second World War, the feelings of peace and brotherhood among the global citizens were lost. The geographic, religious, racial and ethnic differences sprang up tremendously.

(2) Atrocities that Nazi has performed made deep impact on the minds of people. Terrorism, abduction, robberies and social unrest increased in almost all the countries.

(3) The financial losses had incurred in the World War II. The misuse of science and technology was done to retrieve these deficits.

(4) At the end of World War II, the atomic bombs were dropped in Japan. This has created health problems in the entire world.

(5) Social inequality, economic disparity, racial and religious differences were some adversaries that created unrest in the country.

(6) Later, the neighbouring nations kept on fighting. The geographical boundaries were changed. People always had feelings of insecurity. The terrorism flourished. All such instances gave rise to man-made disasters.

***(5) Explain the role of district disaster control unit after occurrence of any disaster.**

Ans. (1) District control unit looks after the disaster management of the district.

(2) It is immediately formed either after the impact of disaster or if warning is given about some upcoming disaster.

(3) District-wise Disaster Control Unit performs following role :

(i) The review of various aspects of disasters is done.

(ii) Through the disaster control unit there is continuous contact established with various agencies like army, air force, navy, telecommunication department, paramilitary forces, etc. for obtaining help.

(iii) The unit also coordinates with various voluntary organizations for their help in disaster management.

***(6) Which are the objectives of disaster management?**

OR

State any four objectives of disaster management. *(March '19)*

Ans. Objectives of disaster management :

(1) To save human life from disasters. To help them for moving away from the place of disasters by rapid action.

(2) To supply essential commodities to the affected people. This helps to reduce the gravity of disaster. People are given grains, water and clothes and other basic necessities under this objective.

(3) To bring back the conditions of affected people to normalcy.

(4) To rehabilitate the affected and displaced victims.

(5) To think and execute the protective measures in order to develop capability to face the disasters in future.

(7) What are the objectives of mock drill?

Ans. Objectives of Mock Drill : 

(1) To evaluate the response of the people to the disaster.

(2) To improve the coordination between various departments of disaster control.

(3) To identify one's own abilities if disaster approaches.

(4) To improve the ability of quick response to disaster and taking rapid action.

(5) To check the competency of the planned actions.

(6) To identify the possible errors and risks while dealing with disasters.

***(8) Why is it essential to get the training of first aid?** *(July '19)*

Ans. When there is a disaster, we need to immediately help the victim. Till the medical help arrives, one should be in position to treat the injured and save his or her life. In such cases, knowing first-aid is essential. Such kind of a need may arise in case of our parents, our siblings at home or with friends in school. Those who are injured should be treated at once. If we know about techniques of first aid, we can save such person before the medical help arrives. Therefore, it is essential to get the training of the first aid.

***(9) Which different methods are used for transportation of patients? Why?**

Ans. For the transportation of patients following methods are used :

(1) **Cradle method** : This method is used for children and persons with less weight.

(2) **Carrying piggy back** : This method is useful in carrying the unconscious persons.

(3) **Human crutch method** : If one leg of the person is injured, then the victim is supported with minimum load on the other leg. This is called human crutch method.

(4) **Pulling or lifting method** : For carrying an unconscious person for a short distance this method is used.

(5) **Carrying on four-hand chair** : This method is used when the support is needed for a part below waist region.

(6) **Carrying on two-hand chair** : Patients that cannot use their hands but can hold their body upright, are carried by such method.

(7) **Stretcher** : By making temporary stretcher in case of emergency, the unconscious patient can be moved. Such temporary stretchers are made by using bamboos, blanket, etc.

***(10) Which different aspects of disaster management would you check for your school? Why?**

Ans. For the pre-disaster management at school following aspects would be inspected.

(1) Are the telephones of the school working properly?

(2) Is there a first-aid box in each class?

(3) Are there any basic medicines in the school?

(4) Is the team ready for rescue of smaller children from lower classes?

(5) Has monitor or prefect participated in a mock drill? Does he/she know about first aid?

(6) Is the contact of parent representative available in emergency situations?

(7) Is the Medical Officer/Doctor present on the school campus?

(8) Is there enough drinking water and some dry snacks available in the school?

(9) Are the staircases and corridors suitable for quick evacuation of the children?

(11) Write down the names of international organizations that work for disaster management.

Ans. Following international organizations work for disaster management.

(1) United Nations Disaster Relief Organization

(2) United Nations Centre for Human Settlements

(3) Asian Disaster Reduction Centre.

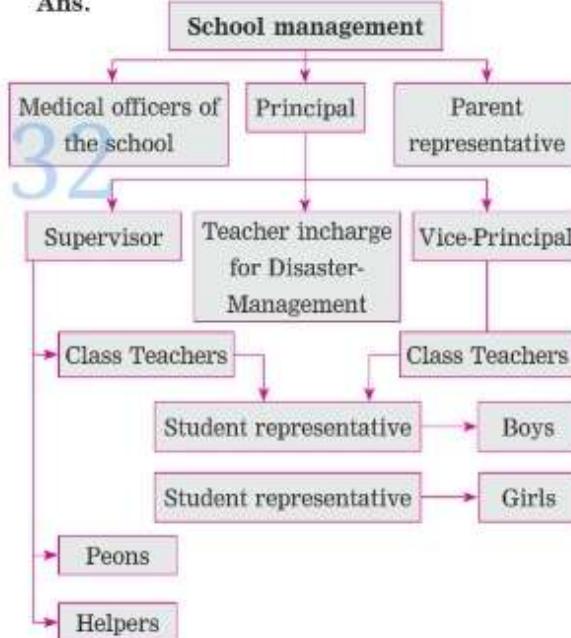
(4) Asian Disaster Preparedness Centre.

(5) World Health Organization.

(6) United Nations Educational, Scientific and Cultural Organization.

***(12) On the basis of the structure of disaster management authority, form the same for your school.**

Ans.



(13) The building in which you are residing has caught fire on the ground floor. What necessary rescue steps will you take? (July '19)

Ans. (1) We shall call out for help.

(2) We shall immediately call fire brigade.

(3) We shall try to extinguish fire with the help of other people.

(4) We will give first aid to people who are injured, till the medical help arrives.

(5) We will cover our nose and mouth with moist cloth to prevent suffocation.

*(14) Write down the reasons, effects and remedial measures taken for any two disasters experienced by you.

Ans. Students are expected to write the answer based on their own experiences.

(15) Depending upon information given on page 111, explain the various effects of the disaster of railway accident.

(Use your brain power : Textbook page no. 111)

Ans. The effects of disastrous railway accident :

The effect will be dependent upon the nature of the accident that has occurred. Whether, it is a collapse of bridge or due to derailment of the train, or due to collision of two moving trains, whether it is due to failure in signalling system, due to land slide or due to obstacle in the tunnel, that has to be understood. The impact of such railway accident will be dependent on the way that accident has occurred. Based on this impact the effects will take place.

(1) Environmental	The entire surroundings will show destruction.
(2) Administrative/ Managerial	The railway department will have stress and the time table will collapse. The regular use of tracks will hamper, resulting into delay in railway traffic.
(3) Political	Ministry of railways is considered to be responsible for the accident. Sometimes the Railway Minister resigns.
(4) Medical	The passengers commuting in the train die or suffer from serious injuries.
(5) Economic	The railways suffer huge financial loss.
(6) Social	The railway traffic is disturbed. Passengers are troubled as they get held up at some place.

(16) Answer the following. (Nov. '20)

(1) What is meant by disaster management?

Ans. Disaster management is either prevention of disasters or making arrangements to face it or at least achieve the abilities to face it.

(2) Classify the following activities into pre-disaster management.

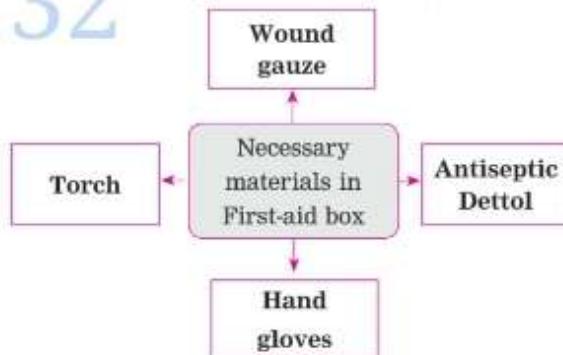
- Identifying the pro-disaster areas.
- Quick establishment of help centre.
- Participation of preferably local peoples saved from the disaster in arranging the help to victims.
- Getting special training for disaster management.

Ans. (a) Pre-disaster management.

- Post-disaster management.
- Post-disaster management.
- Pre-disaster management.

(3) Complete the diagram : (Nov. '20)

(Answers are given directly in bold.)



Q. 8 Write short notes :

*(1) Disaster Management Authority.

Ans. Disaster Management Authority is the body that works at the level of government from national level to village level. This work is basically about management of any disaster and tackling the problems of the affected people. At National level there is National Disaster Management Authority for which the Prime Minister is the chairman. For every state there is State Disaster Management Authority, where the chief minister of every state is

the chairman. Under the state level, there are district level units where district collector is responsible for disaster management and implementation of rehabilitation schemes. Below district level authority there are Taluka and then Village Disaster Management Committees. The Tahsildar is the chairman for Taluka level while the Sarpanch of the village is responsible for management of disasters at village level. Collector of each district helps in planning, coordinating and controlling the implementation of rehabilitation programme and also gives essential instructions and reviews the entire system.

***(2) Nature of disaster management.**

Ans. Disaster management involves either prevention of disasters (Pre-disaster management) or creating preparedness to face them (Post-disaster management). The action plans are prepared for managing disasters. This is done after studying the different aspects such as preventive measures, rehabilitation and reconstruction plans. The disasters are tackled by executing action plans in the following steps : Preparation, redemption, preparedness, action during actual disaster, response, resurgence and restoration. At every level there are other voluntary organizations and Government meteorological institutions for their help.

***(3) Mock drill.**

Ans. For the answer refer to Q. 6 (1).

***(4) Disaster Management Act, 2005.**

Ans. Government of India has made Disaster Management Act in 2005. The affected people are given all necessary help as per this act. With the humanitarian view, people are rehabilitated and helped them to come back to normalcy after the disaster.

As per this Act, National Disaster Response Force has been established. This force consists of 12 divisions in entire India which are attached with Indian Army. The headquarter is located in Delhi, but the action is taken all over the country with the

help of army. As per the Act, in Maharashtra National Disaster Response Force is in action through State Reserve Police Force. The personnel of this force are trained accordingly, and they take part in the rescue work during different disasters.

(5) Pre-disaster management :

Ans. The management measures taken before onset of a disaster is called pre-disaster management. In pre-disaster management, complete preparation and planning to face any type of disaster is done. For this purpose, following steps are taken.

(1) Identifying the areas where the disaster can strike. Such disaster-prone areas are to be thoroughly studied.

(2) Through predictive intensity maps and hazard maps, the information is collected about the intensity of disaster and probable sites of disasters respectively.

(3) Special training for disaster management is given to the concerned people.

(4) The mass awareness is created about disaster management through training programmes, mass media and internet, etc.

(6) Post-disaster management :

Ans. The management measures taken after the striking of a disaster is called post-disaster management. Following steps are taken during post-disaster management.

(1) Helping the victims of disasters by giving all possible help needed for their survival.

(2) Local people are trained to take part in the disaster management so that affected people can be saved rapidly.

(3) Establishing the help centres that could provide all the necessary help. Such centres will be different in case of different disasters.

(4) Collection and categorization of the material received from control centre for helping the victims. Distributing the same and reviewing the measures continuously.

(5) Disaster rescue programmes are mainly focused.

*Q. 9 Some symbols are given below. Explain those symbols. Which disasters may occur if those symbols are ignored?

(1)



Ans. The above signs are warning symbols which should never be ignored.

The meaning of each is given below. They are giving warnings about explosive, inflammable, oxidizing, compressed gas, corrosive, toxic, irritant, environmentally hazardous and health hazard.

(1) **Explosive** : Some materials are explosive. While handling such materials care should be taken. We should not take anything that would cause fire leading to explosion. If explosion occurs, there would be a major disaster causing great loss of life and property. Thus if this sign is seen, great care has to be taken.

(2) **Inflammable** : Similar to explosive substances, the inflammable materials can also catch fire easily. Therefore, to warn people such sign is given on materials that can cause hazard by burning.

(3) **Oxidizing** : Some chemical substances are oxidizing. They carry out chemical reactions with a

rapid speed. E.g. If potassium permanganate falls on the cloth, it starts the reaction on its C-C bonds. Due to such property of carrying out reactions, the cloths may catch fire. Therefore, oxidizing substances should be handled with care.

(4) **Compressed** : Compressed substances are filled under pressure in some container. If mishandled, they can come out of the container by bursting it open. This can cause some injuries.

(5) **Corrosive** : The corrosive substances are very reactive. The mere touch of corrosive substances can cause destruction of skin, eyes, respiratory passages, digestive organs, etc. rapidly. Just touching or smelling of such substances can cause major injury and thus warning sign of corrosive substance should never be ignored.

(6) **Toxic** : To taste a toxic substance or even to smell it, can lead to death. The packing of these substances are therefore marked as dangerous. They should be avoided as far as possible.

(7) **Irritant** : When skin or any delicate part of the body comes in contact with the irritant substance, it can cause harmful reaction. Especially, eyes, nasal mucosa and skin are affected by contact with corrosive substances.

(8) **Environmentally hazardous** : Many substances cause harm to the environment due to their toxicity. Air, water or soil can be polluted due to such pollutants. When environment is affected, ultimately these hazardous effects come back to human species. Therefore, such substances should be carefully used. Their use should be judicious and controlled.

(9) **Health hazard** : The substances that can cause hazard to our health should always be distanced from us. Such substances should not be kept in proximity. As far as possible they should be kept away and handled with great care if needed for any work. Materials marked with health hazard can cause severe toxicity.

(2) Write what the signs indicate :



(A)



(B)

Ans. (1) Figure 'A' indicates inflammable substances. They can catch fire if they come in contact with oxygen-rich air.

(2) Figure 'B' indicates corrosive substances which can cause damage to tissues of skin, eyes and other delicate organs etc.

(3) Both the symbols are warning signs for people to keep away or handle carefully such substances.

(3) What does the symbols below indicate? Write in brief.



(A)



(B)

Ans. (1) Symbol 'A' indicates irritant. When skin or any delicate part of the body comes in contact with the irritant substance, it can cause harmful reaction. Especially, eyes, nasal mucosa and skin are affected by contact with corrosive substances.

(2) Symbol 'B' indicates toxic substance. To taste a toxic substance or even to smell it, can lead to death. The packing of these substances are therefore marked as dangerous. They should be avoided as far as possible.

*Q. 10 Following are the pictures of some disasters. How will be your pre and post-disaster management in case you face any of those disasters?



(1)



(2)



(3)



(4)

Ans. In the pictures given, following disasters are shown :

- (1) Two groups of children are fighting with each other.
- (2) There is gas leakage from the LPG cylinder.
- (3) There is heavy downpour due to cloud bursting which has led to waterlogging in the town.
- (4) There is cyclone causing a tornado. (Commonly called a twister)

Disaster	Pre-disaster management	Post-disaster management
(1) Fight between the two groups	We will try to sort out the problem between the two groups. If that is not possible, will call the elders or teachers. If the fight is among the elders then police should be called.	If the fight is taking place, we shall try to separate the two. We shall check-up if anyone is injured. If injured, we shall give him first aid. We will also counsel them that they should not fight like this.
(2) Gas leakage	First and foremost, the windows and the doors will be opened immediately. We shall call the gas agency customer care department for help. The lights and the electrical equipment will not be turned on to avoid the accidents.	If the gas is already leaked in the house, we shall move out immediately along with pets if any.

Disaster	Pre-disaster management	Post-disaster management
(3) Downpour due to cloud bursting	If the warning of the heavy rains is broadcast then people staying in low lying areas should be taken to the safe places. Schools and colleges are kept closed. If such students or young children or sick persons are stranded anywhere, they should be helped to reach their destinations before the rain starts.	By heavy rains, the transportation comes to halt. The water enters the houses in low lying areas. We shall help the people to deal with this disaster. Help can be given for draining the water. Municipal bodies open the storm water drains in such cases. With the help of elders, we shall spread the message of warning in such places. We will not play in the clogged water, but will help the people who are in need.
(4) Tornado	The warning of cyclonic tornado is given much before its approach due to modern techniques used at Meteorological department. The consequences of such event will be disastrous so as far as possible we shall not go out of house. If house is not in proper condition, then shelter is to be taken in any safe place.	We shall help the people who are in need.

(5) By observing given picture, write any two effects of this disaster : *(March '20)*



Ans. The above disaster is railway accident.

Effects of disaster :

- (1) There is loss of lives and infrastructure of railways.
- (2) The traffic is disturbed for some days, causing inconvenience to commuters and goods transport.

Q. 11 Complete the paragraph by choosing the appropriate words given in the brackets :

(capability, Rehabilitation, commodities, Human, objectives, normalcy, amusements)

The of disaster management comprise of the following aspects. life is saved from the disasters. People are helped to move away from the place of disasters. They are given essential by the government so that the gravity of disaster is reduced. The disaster conditions are brought back to of the affected and displaced victims is done. Moreover, protective measures for future are also planned to develop among the people to face any possible disasters in future.

Ans. The objectives of disaster management comprise of the following aspects. Human life is saved from the disasters. People are helped to move away from the place of disasters. They are given essential commodities by the government so that the gravity of disaster is reduced. The disaster conditions are brought back to normalcy. Rehabilitation of the affected and displaced victims is done. Moreover, protective measures for future are also planned to develop capability among the people to face any possible disasters in future.

Q. 12 Paragraph-based questions :

- Read the paragraph and answer the questions given below :

Disasters can be properly classified into three categories, viz. natural disasters, technological disasters and man-made disasters. The forces that cause natural disasters cannot be controlled. Moreover, they are becoming more frequent in the current years due to phenomena of climate change. On and off incidences of cyclones, cloud bursting, floods, etc. are creating havoc in the lives of people. Technological disasters are due to improper and callous behaviour at the different processes carried out in technical establishments. Man-made disasters are conflicts arising due to different religions, regions and terrorism.

Questions and Answers :

- (1) What are three broad areas of disasters?

Ans. Natural disasters, technological disasters and man-made disasters are three broad areas of disasters.

- (2) Which disasters cannot be controlled?

Why?

Ans. Natural disasters cannot be controlled as they are due to natural phenomena beyond the human power to stop them.

- (3) Which type of disasters were very common in Western Maharashtra in recent times? Why?

Ans. Cloud bursting and floods were very common in Western Maharashtra caused due to climate change.

- (4) Give any one example of technological disaster that shook the entire India.

Ans. Bhopal gas tragedy that occurred in 1984 was a worst disaster that shook the entire India.

- (5) Which types of disasters can be controlled in order to lead happy, peaceful and secured life? How?

Ans. We have to control man-made disasters such as wars, riots, terrorism, etc. by having peaceful negotiations, respect for each human being and feeling of brotherhood among all.

Q. 13 Questions based on tables and charts :

- *(1) Complete the table.

(Motor accident, landsliding, forest fire, theft, riot, war, epidemic, drought, locust attack, financial crisis, flood, famine)

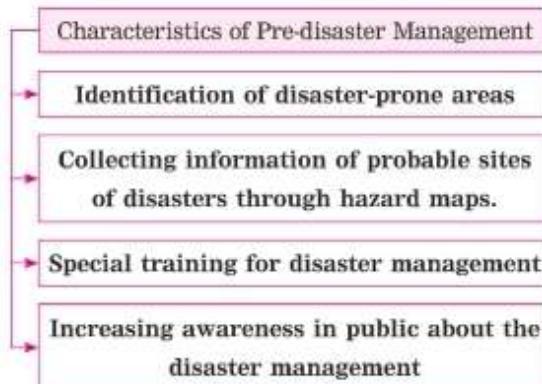
Disaster	Symptoms	Effects	Remedy
Motor accident	There is traffic jam	Somebody is injured. The car also gets damaged. If accident is on larger scale, many people are injured. Some may die too.	First disperse the crowd. The injured person should be given first aid and then rushed to hospital for immediate medical help.
Landsliding	The gravity and severity of the landslide depends upon location of the landslide.	If there are houses located near the landslide or on cliffs, there would be a major disaster. The houses and people therein are most likely to get buried. The traffic will also halt if the landslide is near the major roads.	The authority should be informed. Injured and trapped people should be removed from the rubble and given medical help as soon as possible.

Disaster	Symptoms	Effects	Remedy
Forest Fire	There is smoke spread out in the atmosphere. If it takes place in natural forests, the birds and the animals run helter skelter to save their lives. The huge flames can be seen.	Everything turns into ashes.	The fire-fighting units should be called to extinguish the fires if they are spreading in nearby areas. We should also help in putting off the fire. If anyone is injured, he/she should be given medical help.
Theft	The latch or the lock is broken. The valuables from the home or shop are missing. Everything in the house is strewn here and there.	There are financial losses and also mental and emotional shock is severe. In some cases, physical injury can also happen.	Police should be called to nab the criminals.
Riot	The cities, towns or villages show signs of tense atmosphere. People gather in groups and discuss something secretively.	There is financial loss for all the rioting groups. The belongings, houses, shops etc. are destroyed or damaged. Property is looted. Ladies and children suffer the most as they are easily victimized.	As children, we cannot stop the riots. But we can take help of police force. We can establish <i>mohalla</i> committees for peaceful behaviour with each other. For that the wise members from each community will be summoned.
War	There are tense conditions in the border areas of both the countries. Both the countries, try to instigate each other.	Tremendous destruction causing loss. Many lives are lost. The costs of all the items rise due to war conditions. Entire nation faces insecurity.	The peace agreement in both the conflicting countries.
Epidemic	Sudden rise in the number of patients of that particular disease. Dispensaries and hospitals are suddenly crowded.	Many people contract the communicable disease and thus are infected. Some of them die due to further complications. There is great demand for medicines in the pharmacy shops.	Mass immunization programmes to be undertaken. Safety of food and potable water to be enhanced.
Drought	There is scarcity of water. Women of the house bring water from the far-off water bodies. Tankers are seen supplying the water.	It is a time of dry famine. The crops are unable to grow to the fullest. Cattle suffer due to lack of water and grass.	Water management to be done. Rainwater harvesting, and other methods of water conservation to be undertaken by drought-prone villages.
Locust attack	The locusts are seen hovering over the crops. The standing crop is seen to be attacked.	Crops are damaged to a great extent.	Proper spraying of organic pesticides.

Disaster	Symptoms	Effects	Remedy
Financial crisis	The financial security of the nation is seen dwindling. There is lull in the share market.	The poverty rises. The buying power of people is reduced. The buying-selling activities are seen to be suspended. Entire economic systems collapse.	The employment opportunities should be increased. People should be helped to set up the business.
Flood	The water level of canals, streams, rivers, etc. is seen to be rising.	The low-lying and the coastal areas are seen to be submerged. The entire region is waterlogged.	People and animals have to be shifted from the waterlogged region to the safer places at the heights. After the flood water recedes the care has to be taken for controlling epidemics of communicable diseases that can spread rapidly due to deteriorating conditions in the region.
Famine	Rainfall is scanty. The water from the reservoirs and canals also recede. The crops do not grow. The crevices on the land and farms can be seen clearly.	People and cattle are starved. Due to lack of water and food the cattle die. There is major scarcity of the food grains. The prices of the food grains and other items, go on rising.	In the drought-prone regions, famine is very common. So care is to be taken for water conservation before it rains. Select the crops that are resistant to such dry conditions.

*(2) Complete the following chart :

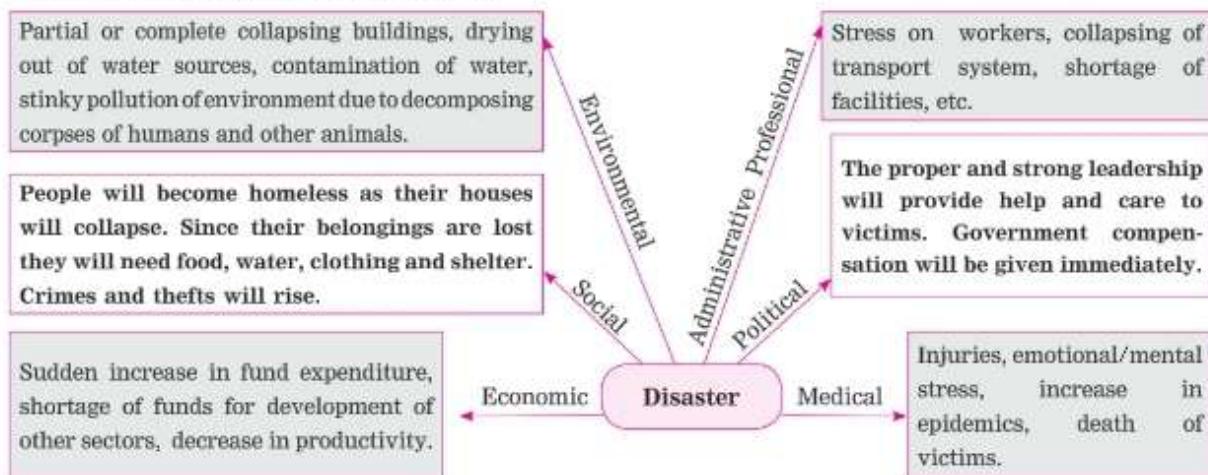
Ans. (Answers are given directly in bold.)



*(3) Complete the chart : (Textbook page no. 111)

Different problems occur with disasters. In the concept map different effects are mentioned. Read it and fill the blank places.

Ans. (Answers are given directly in bold.)



*(4) Complete the chart : (Textbook page no. 117)

Complete the chart as per the objectives of the first aid :

Ans. (Answers are given directly in bold.)



Q. 14 Activity-based questions :

• Observe/Discuss • Let's Discuss :

(Textbook page no. 110)

(1) Observe the images on textbook page no. 110. Whether the places of disasters are known to you? Discuss the effects of these disasters on public life. How people could have been saved from these disasters? Discuss with your friends in the classroom.

Ans. Students should discuss the disasters given in the pictures by themselves after collecting the information.

(2) Observe (Textbook page no. 114)

Observe the disaster cycle given on textbook page no. 114 and explain each aspect of the disaster of earthquake.

Ans. The main aspects of disaster cycle to tackle disaster of earthquake are as follows :

(1) **Preparation :** With the help of seismograph, the warning about forthcoming earthquake can be obtained these days. The intensity of the earthquake is also predicted with the help of technology. If the estimate of the Richter scale is on the higher sides, there would be more preparatory measures taken to tackle the forthcoming problem of earthquake.

(2) **Redemption** : Once this information is obtained the possible impact of the earthquake on the houses, buildings, people can be studied by the geological experts. The meetings of the Disaster Management Authority will be organized for same.

(3) **Preparedness** : What the general public should do and what action the reserved forces should take, will be decided in case of actual incidence of the earthquake. The schemes and plans will be made ready in this direction.

(4) **Impact of Earthquake** : In case of disaster of earthquake, people will be helped to safety. The trapped people will be rescued. First aid and other necessary help will be provided.

The data about the losses and the intensity of this disaster will be noted and reported for the further process.

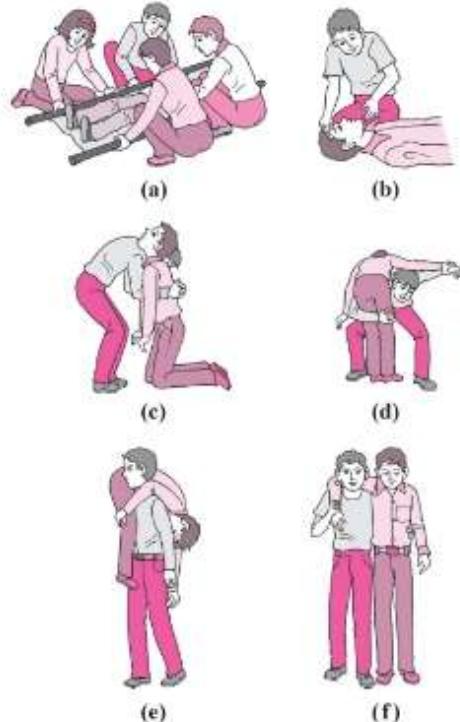
(5) **Response** : In this phase the response of the people as well as the action of Government can be well studied. The response should be quick and positive. The maximum lives and property should be saved by such responses. The disaster of earthquake should be managed with positivity and through help given to the sufferers.

(6) **Resurgence** : Earthquakes can destroy the entire households or even entire community. Such homeless people should be given the place to stay. Resurgence is important phase for the national welfare. If the citizens of India are cared for, the nation too will progress.

(7) **Restoration** : The earthquake victims should be settled by providing them with new settlements. Sometimes, entire village is to be settled. E.g. In Latur or Kutch, there was very large scale devastation. But Government of India as well as some NGOs helped to reconstruct the houses. In such earthquake-prone areas, houses are built in specific pattern to withstand any possible future calamities.

(3) **Observe** : (Textbook page no. 117)

Give the reference of following pictures and explain importance of each of those in disaster management. Which are other such activities ?



Ans. The actions shown in the above pictures are as follows :

(a) The patient is made to lie on the stretcher. He must be unconscious and injured to greater extent, so that he cannot move by himself.

(b) The patient is helped by giving artificial respiration. Probably the victim is suffocated and needs oxygen supply.

(c) and (d) The patient is being picked up. Most probably the patient is unconscious.

The unconscious person who cannot move by himself is carried by these two methods. In method 'c', the weight of the patient is less and hence he can be lifted as shown in the picture. In picture 'd' the victim has to be lifted in other way, may be due to his greater body weight.

(e) The patient is carried on the back as in 'carrying piggy back' position. He too is unconscious and needs to be shifted for medical treatment.

(f) The patient in this picture is carried by 'human crutch method'. When victim's one leg is injured, he cannot walk without support. Hence, he needs to be carried in such a way.

In all the above methods, the injured person at the time of disaster is transported to hospital or dispensary for further medical help. The primary first-aid is given to the victim. Now the volunteer is taking him for further treatment. Such rescue activities depend upon the type of disaster and the extent of the injury. Hence the methods will be of different nature.

(4) Let's Think : (Textbook page no. 111)

What will be the effect on yourself and surrounding, if any accident-like disaster occurs during the sports on playground or in school?

Ans. When in school, there is an accident, first of all we get scared. But with caring help of the teacher, we will give the first aid to the injured friends by using first aid kit. If the injury is serious, we will take him to the medical centre of the school. While playing or during sports event, children flock around and make unnecessary crowding. In case of such accident, first of all the crowd will have to be dispersed. If there is major disaster, one should not fumble but manage the disaster in a wise way with the help of teachers.

(5) Let's Think : (Textbook page no. 112)

Explain the nature and scope of the disaster of flood with the help of six points given on text book page no. 112.

Ans. The nature and the scope of the disaster of flood can be described according to the six points :

(1) Pre-disaster phase : Due to Indian Meteorological Department the warning predictions are received before any climatic disaster strikes. If the scope of the flood is predicted to be high, then the people who may be affected by the calamity are relocated to a safer area.

(2) Warning phase : In the warning phase the Government warns the general public about the forthcoming disaster of floods through mass media like radio, television, newspapers, etc. In recent times, even the cellphone messages are sent to people for warning them. The people living in coastal areas will be worst affected and hence such people are

given greater care and they are immediately made to leave their houses. They are taken to the safe places.

(3) Emergency phase : When the flood waters actually start rising up, the low-lying areas are submerged. Houses, roads and shops everything goes under water. The rescue operations are carried out by army men from National Disaster Rescue Force. They take every possible effort to rescue the trapped people. The emergency continues till the water does not recede. Later after the water starts receding, people who had been taken to places on heights, start coming back. During this phase, search, rescue operations, medical treatment, and first aid are all the aspects on which the attention is focussed.

(4) Rehabilitation phase : The people affected due to floods are given emotional and financial support. The fields, farms, houses or cattle-shed are under water. Such people are given transient accommodations. Many cattle and other animals die by drowning. Their rotting carcasses have to be disposed as soon as possible because the decaying process spreads epidemics of diseases. People are given vaccinations to protect them from diseases of such kind. Special care of young children and senior citizens is taken during this period. Supply of food and drinking water is also very important task during this time.

(5) Recovery phase : During recovery phase, the life comes gradually back to normalcy. The removal of dead, decaying material and the debris is the first priority. The water connections and electricity is restored back. Various NGOs or Government organizations provide help of various kind to the affected people. This help is to be distributed to those who are in real need. This work is also done by Disaster Management Department.

(6) Reconstruction phase : The houses and building that collapse due to floods are built back. Agricultural activities start again. Roads and water

supply is once again normalized. Schools and colleges start once again. Thus, the once flood affected area comes back to routine functioning again.

(6) Let's Think: (Textbook page no. 117)

Following are some pictures of disasters. Which precautions would you take during those disasters?

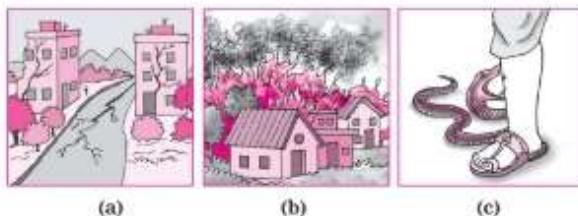


Fig. 10.1 : Various disasters

Ans. The pictures shown above are showing earthquake, fire and snake bite respectively.

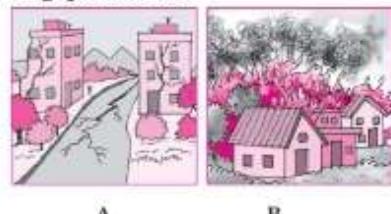
In the above disasters, the initial precautions to be taken are as follows :

(1) **Earthquake** : In case of earthquake, one should immediately come out of house and stand in the open ground. If this is not possible, one has to go below table or any other cover. During collapse of the building, there should not be a head injury. This precaution is basically for prevention of dangerous injuries and saving our life. Switch off the power supply. If in journey, stay inside the vehicle.

(2) **Fire** : First and foremost is to save ourselves from fire. Then one can help others in rescue operations. Help others to extinguish fire. Call the fire department for immediate action.

(3) **Snake bite** : Many a times the biting snake can be non-venomous too. But the victim is psychologically affected too. The tourniquet should be tied in the region above the snake bite. The rope, piece of cloth or even handkerchief can be used for this purpose, so that the venom, if any should not rise and reach vital organs. The wound should be made near the bite-wound so that the blood will ooze out and some venom can automatically flow out. Though these are first-aid measures, the victim should be rushed to a qualified doctor for an injection of antivenin.

(7) Observe the images 'A' and 'B' and answer the following questions :



A B

(i) Which disasters are shown in the images?

Ans. Image A is showing damage due to earthquake. Image B is showing house on fire.

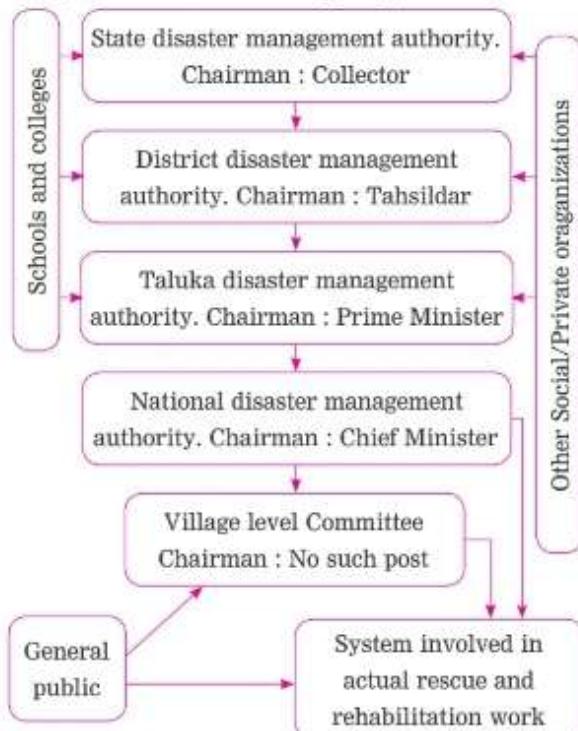
(ii) Which primary precautions will you take in case of disaster shown in 'A'?

Ans. For the answer refer to Q. 14 (6).

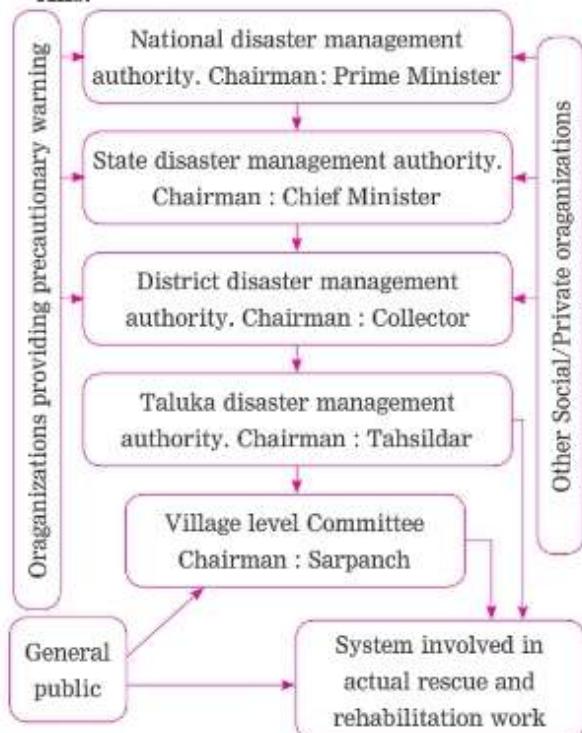
(iii) Which type of first-aid is offered to the injured people in disaster 'B'?

Ans. First aid given to burn victim : (1) The person who is injured by fire should be doused with cold water on his/her body. This will extinguish fire and give some relief caused due to inflammation. Do not break the blisters. Give water to drink. (2) Cover the burnt part by wet and moist cloth. Wash the wounds with antiseptic solution. (3) If the person is severely burnt, transfer him/her immediately to hospital.

(8) Correct the following diagram :



Ans.



PROJECTS

(1) Can you tell? (Textbook page no. 118)

Whether there had been mock drill by fire fighters under the disaster management scheme in your school? Which techniques did you see during the drill?

(2) Try this : (Textbook page no. 115)

Which factors will you consider while designing the pre-disaster management plan for your school/home? Prepare a survey report with the help of your teacher.

(3) Get information :

(1) Visit the district collector or Taluka Tehasildar office and collect the information about disaster management.

(Textbook page no. 115)

(2) Meet the medical officer/doctor from your village and collect information about providing the first aid.

(Textbook page no. 118)

(4) Internet is my friend :

(1) Search for the video clips of disasters. Discuss in your class about effects of disasters and remedies over it.

(Textbook page no. 110)

(2) Find out more about the activities of international organizations that work for disaster management.

(Textbook page no. 116)

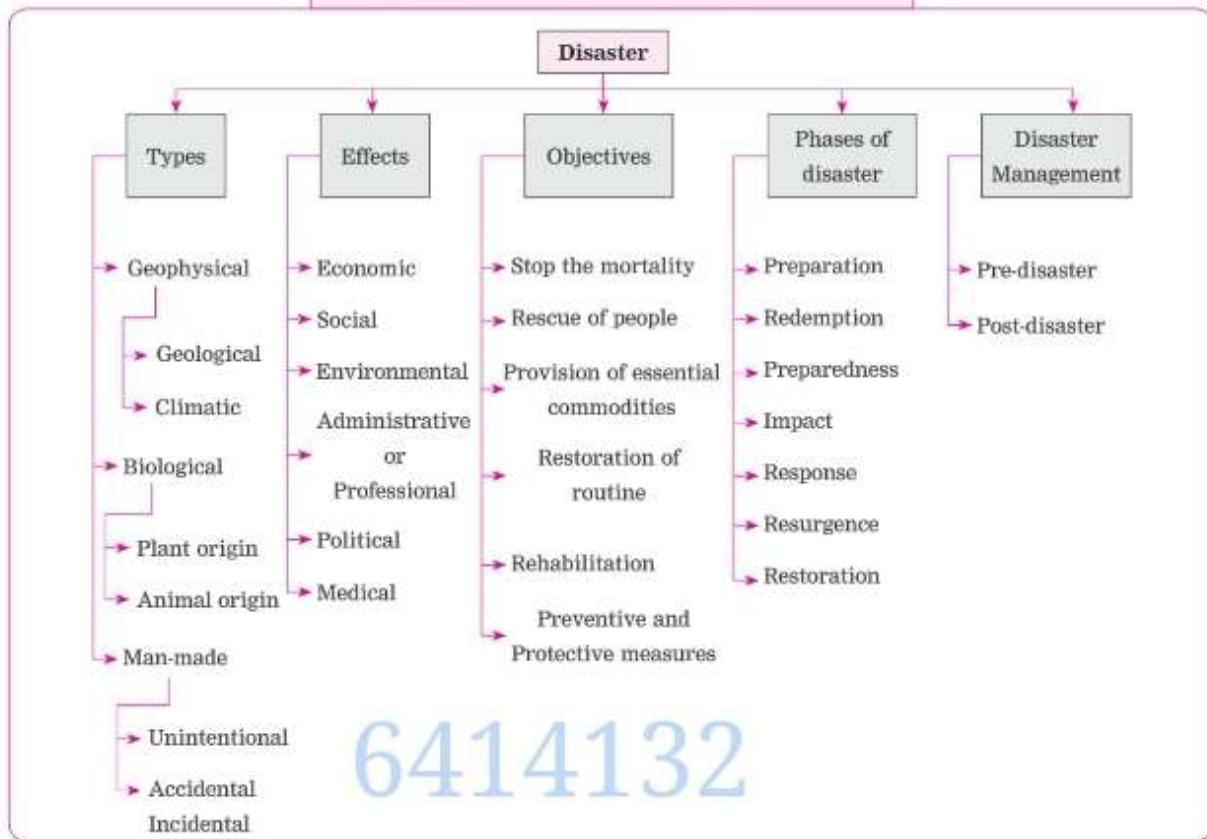
1. United Nations Disaster Relief Organization.
2. United Nations Centre for Human Settlements.
3. Asian Disaster Reduction Centre.
4. Asian Disaster Preparedness Centre.
5. World Health Organization.
6. United Nations Educational, Scientific and Cultural Organization.

*(5) Watch the video clip of fire fighting mock drill on YouTube and send to your friends and relatives. (Textbook page no. 118)

*(6) Demonstrate the activities shown on page no. 106 of Std. IX Science and Technology textbook in front of the students of other classes. Make a video clip and send it to others.

*(7) Form a group of students from your school to demonstrate the mock drill and demonstrate it in the school.

MEMORY MAP/CONCEPT MAP



Did you study the lesson/chapter from the **Navneet Digest**? Now, solve the self-test to ensure solid learning. Scan this **QR Code** for the test and its model answers.



BOARD'S ACTIVITY SHEET : MARCH 2020

Time : 2 Hours]

[Total Marks : 40]

Note :

- (i) All questions are compulsory.
- (ii) Use of a calculator is not allowed.
- (iii) The numbers to the right of the questions indicate full marks.
- (iv) In case of MCQs [Q. No. 1(A)] only the first attempt will be evaluated and will be given credit.
- (v) For each MCQ, the correct alternative (A), (B), (C), (D) with subquestion number is to be written as an answer.

For e.g. : (i) (A), (ii) (B), (iii) (C)

- (vi) Scientifically correct, labelled diagrams should be drawn wherever necessary.

Q. 1. (A) Choose the correct option and write its number for the following questions : 5

Q. 1. (B) Solve the following questions : 5

- (i) Find odd one out : Drying, Salting, Cooking, Soaking with sugar. [Ch. 8, Q. 5 (5)]

(ii) Write the correct correlation :
Annelida : Earthworm :: Platyhelminthes : [Ch. 6, Q. 6 (1)]

(iii) State whether True/False :
Tobacco containing substances cannot cause cancer of mouth and lungs. [Ch. 9, Q. 5 (1)]

(iv) Write function of testes. [Ch. 3, Q. 8 (7)]

(v) I am connecting link between Reptilia and Mammals. What is my name? [Ch. 1, Q. 7 (6)]

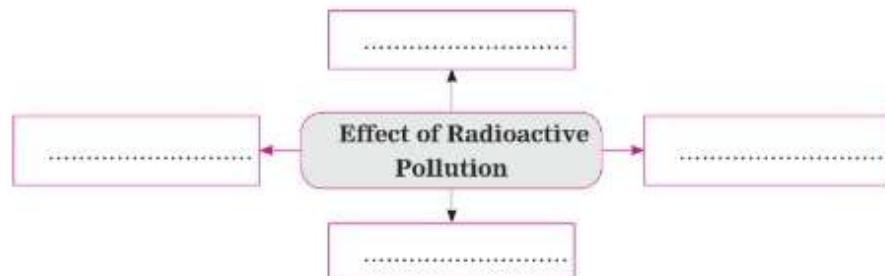
Q. 2. (A) Give scientific reasons : (Any two)

- (i) Indians should follow family planning for controlling the population. [Ch. 3, Q. 10 (4)]
 (ii) We feel exhausted after exercising. [Ch. 2, Q. 9 (4)]
 (iii) Hydroelectric energy, solar energy and wind energy are called renewable energies.
 [Ch. 5, Q. 8 (3)]

Q. 2. (B) Solve the following questions : (Any three)

6

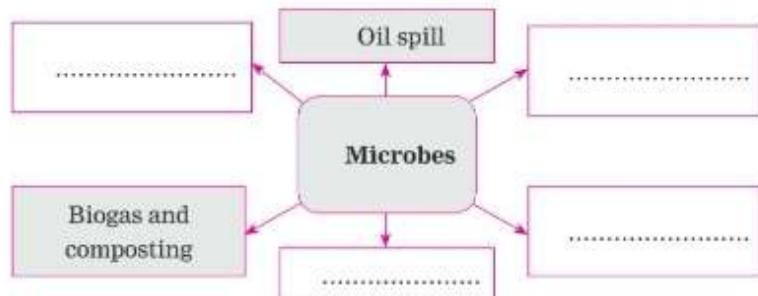
- (i) Complete the following chart : [Ch. 4, Q. 12 (Q. 1) (3)]



- (ii) Distinguish between Aves and Mammalia. [Ch. 6, Q. 8 (7)]
 (iii) By observing given picture, write any two effects of this disaster : [Ch. 10, Q. 10 (5)]

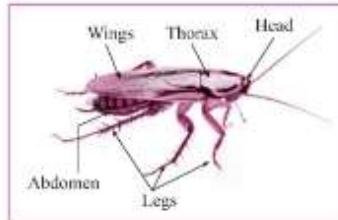


- (iv) Explain four ways to minimize stress. [Ch. 9, Q. 9 (7)]
 (v) Complete the following conceptual picture : [Ch. 7, Q. 11 (3)]

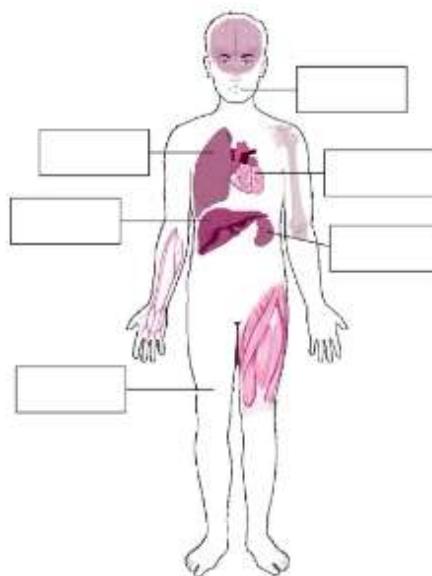


Q. 3. Solve the following questions : (Any five)

- Explain the importance of Anatomical evidences with examples. [Ch. 1, Q. 11 (6)]
- What will you do? Why?
 - Child of your neighbour is addicted to tobacco chewing. [Ch. 9, Q. 7 (2)]
 - Your friend has developed the hobby of snapping selfies. [Ch. 9, Q. 7 (5)]
 - Your sister has become incommunicative. She prefers to remain alone. [Ch. 9, Q. 7 (3)]
- Which precautions are necessary for proper decomposition of domestic waste? [Ch. 7, Q. 9 (14)]
- Observe the following diagram. Write the answers of the following questions : [Ch. 6, Q. 15 (5)]



- To which phylum does the animal included in the diagram belong?
- What is the exoskeleton made up?
- What is the symmetry?
- Explain the following concepts in short : [Ch. 3, Q. 12 (13)]
 - Surrogacy
 - In Vitro Fertilization (IVF)
 - Sperm Bank.
- Label the body organization of human which has been shown in the following figure : [Ch. 6, Q. 17 (1)]





(vii) Make a table based on forms of energy and corresponding devices : [Ch. 5, Q. 15 (2)]

Forms of Energy	Devices
(1) Electric
(2) Mechanical	Sewing machine, Bicycle
(3) Thermal
(4)	Solar cooker, Solar heater

(viii) Complete the paragraph using proper words : [Ch. 7, Q. 13 (1)]

(Mechanical, Rhizobium, Aquatic, Toxic, CO_2 , Nitrogen, *Pseudomonas*, Amoeba, Bacteria, Hydrocarbons)

Spilling of petroleum oil occurs in ocean due to various reasons. This oil may prove fatal and toxic to organisms. It is not easy to remove the oil layer from surface of water by method. However, bacteria like spp. and *Alcanivorax borkumensis* have the ability to destroy the pyridines and other chemicals. Hence, these are used to clear the oil spills. These are called hydrocarbonoclastic bacteria (HCB). HCB decompose the and bring about the reaction of carbon with oxygen. and water is formed in this process.

Q. 4. Solve the following questions : (Any one)

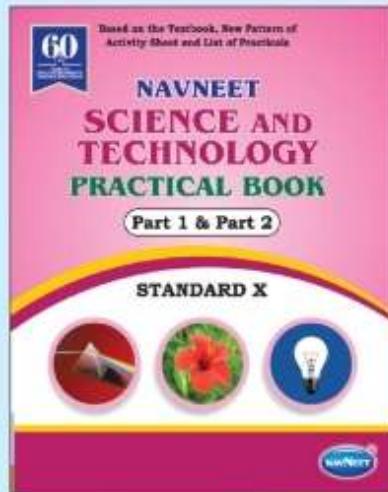
5

- (i) Attempts at various levels are performed for conserving environment. Which role would you like to perform. Give two actions each : [Ch. 4, Q. 9 (2)]
- Prevention
 - Control
 - Production
 - Awareness
 - Conservation
- (ii) (a) What is Biotechnology? [Ch. 8, Q. 10 (14)]
- Give one use of Biotechnology.
 - Give one commercial use of Biotechnology.
 - Write two bacterial examples of biofertilizer.
 - Write two names of crops genetically developed.

Shatlesh E0586



Based on the Textbook, New Pattern of Activity
Sheet and List of Practicals



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SCIENCE AND
TECHNOLOGY
PRACTICAL BOOK

Part 1 & Part 2
STANDARD X

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2. All experiments in activity method for students to understand and do the work.
3. Different types of objective questions formulated within experiments to make the scientific concepts clear.
4. Enough blank space for the answers and diagrams wherever asked.

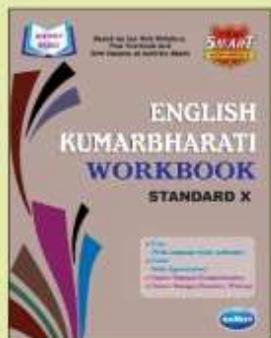
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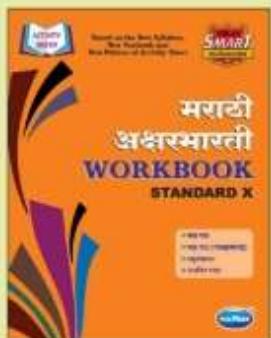
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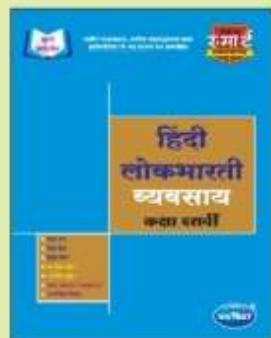
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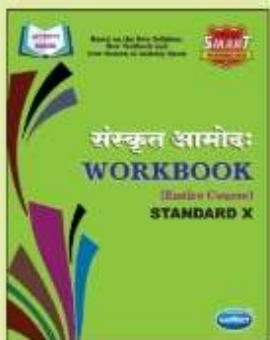
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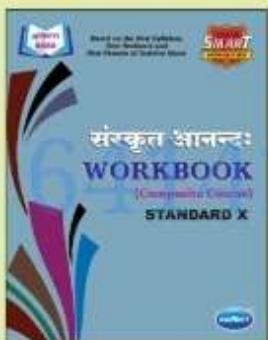
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अक्षरभारती



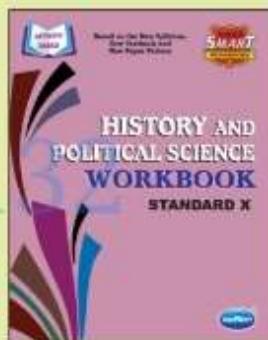
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लोकभारती



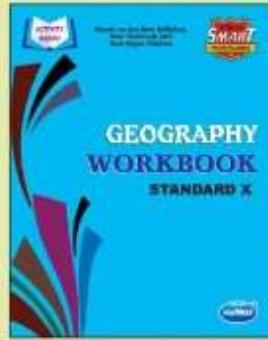
संस्कृत आमोद:
(Entire Course)



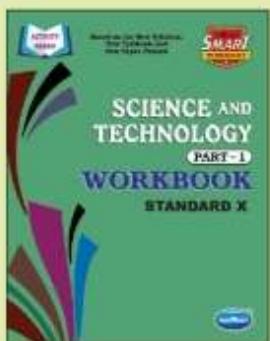
संस्कृत आनन्द:
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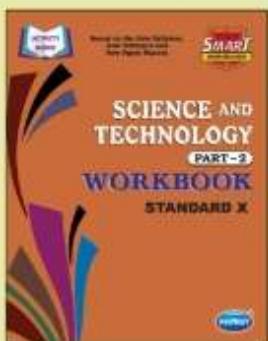
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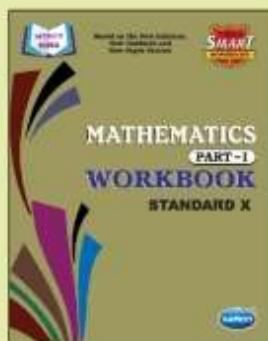
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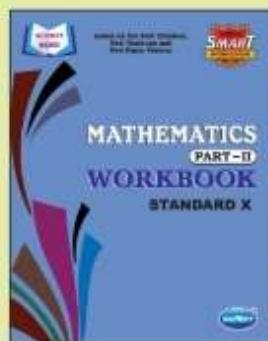
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SCIENCE AND
TECHNOLOGY (Part 2)



MATHEMATICS
(PART I)



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