

SCIENTIFIC LITERACY CORE GROUP

MODULE – I Class-X

INDEX

| Ch No. | Name Of Chapter | Stimulus number and Topic of Stimulus | | Page No. |
|--------|---------------------------------------|---------------------------------------|--|----------|
| 1. | Chemical Reactions And Equations | 1. | Transition State | 2-3 |
| | | 2. | The Energy Hill | 4-5 |
| 2. | Acid, Bases And Salts | 3. | Ph Scale | 6-8 |
| 3. | Metals And Non-Metals | 4. | Reactivity Series | 9-10 |
| | | 5. | Properties of Metals & Non-metals | 11-12 |
| 4. | Carbon And Its Compounds | 6. | Effect Of Alcohol On Living Beings | 13-15 |
| | | 7. | Circular Carbon Economy | 16-18 |
| | | 8. | Soap And Its Cleansing Action | 19-21 |
| 5. | Periodic Classification Of Elements | 9. | Helium | 22-24 |
| | | 10. | Game Of Dice | 25-26 |
| 6. | Life Processes | 11. | Excretory System | 27-29 |
| | | 12. | Human Respiratory System | 30-32 |
| 7. | Control And Coordination | 13. | Unsung Heroes Of The Body- Hormones | 33-34 |
| | | 14. | The Menstrual Cycle | 35-36 |
| 8. | How Do Organisms Reproduce | 15. | Double Fertilization | 37-38 |
| | | 16. | Binary And Multiple Fission | 39-40 |
| 9. | Heredity And Evolution | 17. | Blood Disorders Included In The Rights Of Persons With Disabilities (RPWD) Act, 2016 | 41-43 |
| | | 18. | How Do Tibetans Survive At High Altitudes? | 44-49 |
| 10. | Light-Reflection And Refraction | 19. | Qr Code And Barcode Scanner | 50-52 |
| | | 20. | Power Of Lens | 53-54 |
| 11. | The Human Eye And The Colourful World | 21. | Uncorrected Vision Problem Physics | 55-56 |
| 12. | Electricity | 22. | Human Battery | 57-58 |
| | | 23. | Electrical Paradox | 59-60 |
| 13. | Magnetic Effects Of Electric Current | 24. | Electric Fuse | 61-63 |
| | | 25. | An Electromagnetic Crane | 64-66 |
| 14. | Sources Of Energy | 26. | Can Solar Power Compete With Fossil Fuels? | 67-70 |
| | | 27. | Green Power | 71-73 |
| 15. | Our Environment | 28. | Food Chain | 74-75 |
| | | 29. | Zero Emission | 76-77 |
| 16. | Management Of Natural Resources | 30. | Sustainable Forest Management | 78-79 |
| | | 31. | Water Harvesting | 80-82 |
| | | 32. | Soil Pollution | 83-85 |
| | | 33. | Five Important R's of Our Life | 86-87 |

1-TRANSITION STATE

Area: Frontiers of Science and Technology

Class: 10

Chapter: 1

Chapter Name: Chemical Reactions and Equations.

Concept: Types of Chemical Reactions.

Learning outcomes:

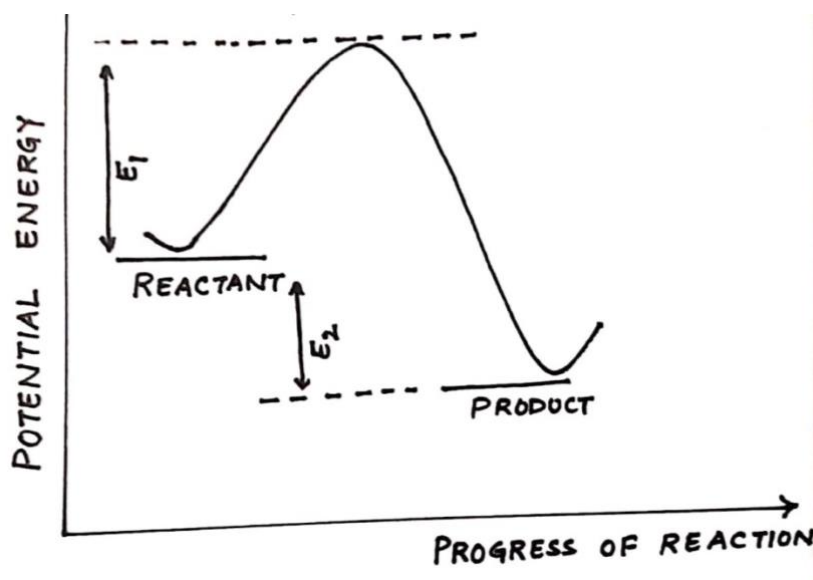
The student will be able to:

1. Explain the phenomenon of transition state.
2. Relate transition state with energy of activation.
3. Analyse and interpret the graph.

The concept of energy of activation is to be our key to the understanding of chemical reactivity. To make it useful, we need a further concept: transition state.

A chemical reaction is presumably a continuous process involving a gradual transition from reactants to products. It has been found extremely helpful, however, to consider the arrangement of atoms at an intermediate state of reaction as though it were an actual molecule. This intermediate structure is called transition state; its energy content corresponds to the top of energy hill.

Any factor that stabilizes the transition state relative to reactants tends to lower the energy of activation.



Q 1 What will happen to energy of activation if transition state is more stable relative to products?

Q 2 Mark the position of transition state in given diagram.

Q 3 Energy of activation is the difference in energy content between reactants and transition state. Justify.

Q 4 Is it possible to isolate transition state? Give your opinion.

Item Description:

| Q no . | Question type | Competency | Knowledge | Context | Difficulty level |
|--------|--------------------|--|------------|----------|------------------|
| Q 1 | Open ended | Interpret data and evidence scientifically | Content | Personal | Low |
| Q 2 | Closed constructed | Interpret data and evidence scientifically | Procedure | Personal | Medium |
| Q 3 | Open ended | Explain phenomenon scientifically | Content | Personal | High |
| Q4 | Closed constructed | Interpret data and evidence scientifically | Procedural | Personal | Medium |

Answer key:

Answer 1 The energy of activation will increase.

Answer 2 It's at the top of energy hill.

Answer 3 since the reactant sequence is:

Reactants → transition state → products

So the difference in energy of reactants and transition state is energy of activation

Answer 4 No. It's not possible. The transition state is the fleeting arrangement of atoms.

2-THE ENERGY HILL

Area: Frontiers of Science and Technology

Class: 10

Chapter: 1

Chapter Name: Chemical Reactions and Equations.

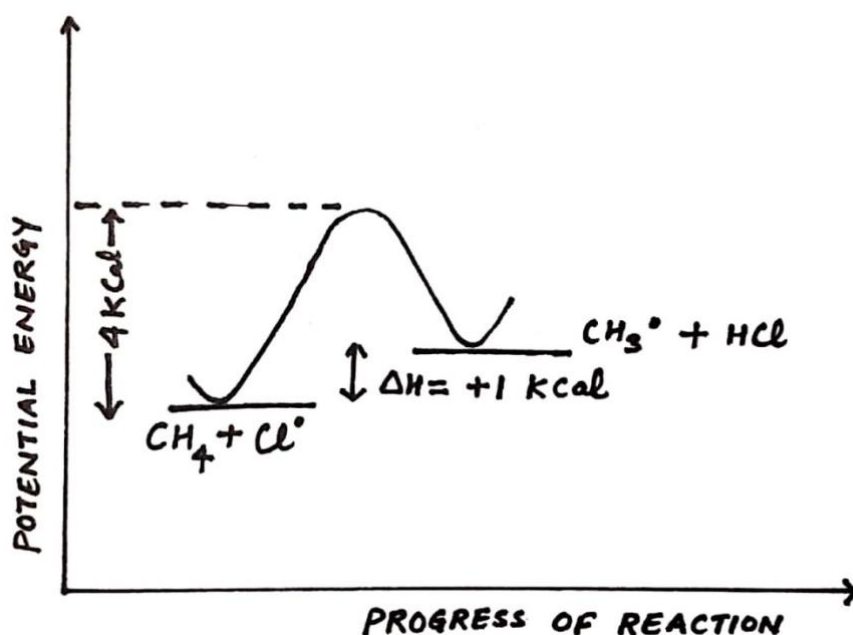
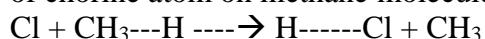
Concept: Oxidation Reactions

Learning outcomes:

The student will be able to:

1. Plan investigation to verify the facts.
2. Differentiate between endothermic and exothermic reactions.

To see what actually happens during a chemical reaction, a specific example , the attack of chlorine atom on methane molecules is given.



First of all , a chlorine atom and a methane molecule must collide. Next to be effective, the collision must provide a certain minimum amount of energy called energy of activation.

Q 1 Consider the exothermic reaction, where the heat is liberated. Do they also require energy of activation? Justify.

Q 2 (a) which energy value corresponding to energy of activation?

(b) The given reaction is endothermic . How will you justify?

Q 3 A student records following statement , for the progress of reaction . Provide the correct reason for this observation:

“ During the course of reaction , the potential energy increases

Q 4 Which of the following statement/s is / are correct:

- (a) In an exothermic reaction , the product contains less potential energy than reactants.
(b) In an endothermic reaction , the new particle contain more kinetic energy than the particle from which they are formed.

Item Description:

| Q no | Question type | Competency | Knowledge | Context | Difficulty level |
|------|--------------------|--|------------|----------|------------------|
| Q 1 | Open ended | Interpret data and evidence scientifically | Content | Personal | Low |
| Q 2 | Closed constructed | Interpret data and evidence scientifically | Procedure | Personal | Medium |
| Q 3 | Open ended | Explain phenomenon scientifically | Content | Personal | High |
| Q4 | Closed constructed | Interpret data and evidence scientifically | Procedural | Personal | Medium |

Answer/Scoring key:

Answer 1. Full credit : In exothermic reaction the bond making liberate more energy than is consumed by bond breaking.

(Or any related answer)

Answer 2

(a) 4 Kcal.

(b) Since the products are at higher level of energy so the heat will be taken by surrounding.

Answer 3 since the molecule are moving, the kinetic energy is converted into potential energy after collision.

Answer 4 (a) true

(b) false.

3-pH SCALE

Area: Frontiers of Science & Technology

Class: 10

Chapter: 2

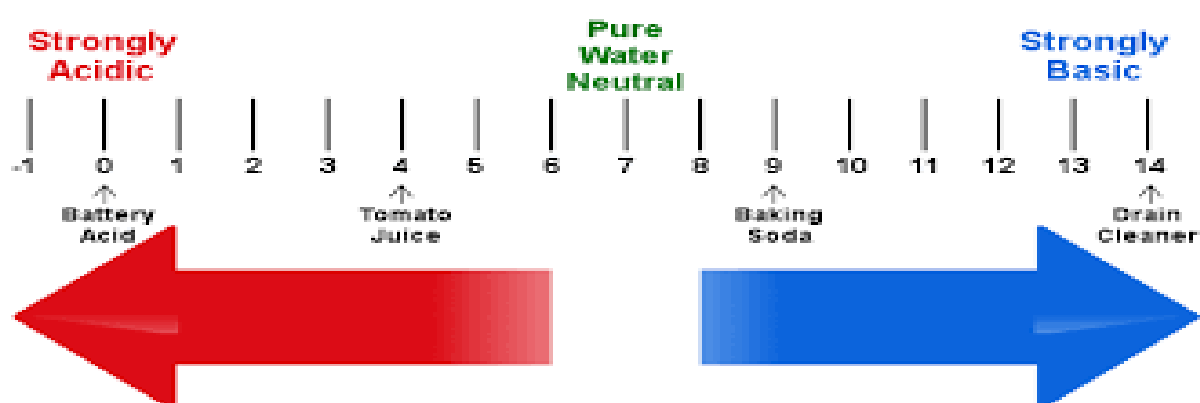
Chapter Name: Acids, Bases and Salts.

Concept: Identifying acidic, basic and neutral solutions.

Learnig outcomes:

The student will be able to:

1. Differentiate between acidic and basic solutions.
2. Calculate the pH value of a given substance.
3. Apply scientific concepts in solving daily life problems.



pH is a scale used to specify how acidic or basic a water-based solution is. Acidic solutions have a lower pH, while basic solutions have a higher pH. At room temperature (25°C or 77°F), pure water is neither acidic nor basic and has a pH of 7. The pH scale is logarithmic and inversely indicates the concentration of hydrogen ions in the solution (a lower pH indicates a higher concentration of hydrogen ions). This is because the formula used to calculate pH approximates the negative of the base 10 logarithm of the molar concentration of hydrogen ions in the solution. More precisely, pH is the negative of the base 10 logarithm of the activity of the hydrogen ion. At 25 °C, solutions with a pH less than 7 are acidic, and solutions with a pH greater than 7 are basic. The neutral value of the pH depends on the temperature, being lower than 7 if the temperature increases. The pH value can be less than 0 for very strong acids, or greater than 14 for very strong bases. Pure water is neutral. When an acid is dissolved in water, the pH will be less than 7 (25 °C). When a base, or alkali, is dissolved in water, the pH will be greater than 7. A solution of a strong acid, such as hydrochloric acid, at concentration 1 mol dm⁻³ has a pH of 0. A solution of a strong alkali, such as sodium hydroxide, at concentration 1 mol dm⁻³, has a pH of 14. Thus, measured pH values will lie mostly in the range 0 to 14, though negative pH values and values above 14 are entirely possible. Since pH is a logarithmic scale, a difference of one pH unit is equivalent to a tenfold difference in hydrogen ion concentration. Indicators may be used to measure pH, by making use of the fact that their color changes with pH. Visual comparison of the color of a test solution with a standard color chart provides a means to measure pH accurate to the nearest whole number. Another method of measuring pH is using an electronic pH meter.

Q1. Carrots have a pH of 5.0 so how would you describe them ?

- (a) acidic (b) basic (c) neutral (d) an indicator

Q2. Which of the following acids ionizes only partially in water ?

- (a) HCl (b) HNO₃ (c) H₂SO₄ (d) CH₃COOH

Q3. Which of the substances listed in the table would be most effective for neutralizing battery acid ?

| | | | | | | |
|-----------|--------------|-------------|-------|------|-----------|---------|
| pH | 1.5 | 2.5 | 3 | 6.7 | 8.5 | 12 |
| Substance | Battery acid | Lemon juice | Apple | Milk | Sea water | Ammonia |

Q 4 .Explain why a weak acid in solution has a higher pH than a strong acid of the same concentration.

Q 5. When pH of Solution drops from 3.0 to 1.0 , the hydrogen ion concentration increases by a factor of one hundred fold from .0010 . What is the concentration at pH = 1.0?

Q 6. A milkman adds a very small amount of baking soda to fresh milk

- (a) Why does he shift the pH of the the fresh milk from 6 to slightly alkaline?
(b) Why does this milk take a long time to set as curd?

Item Description

| Q No. | Q Type | Competency | Knowledge | Context | Difficulty level |
|-------|--------------------|--|-----------|---------|------------------|
| 1 | Simple MCQ | Explain phenomena scientifically | Content | global | low |
| 2 | Closed constructed | Explain phenomena scientifically | Content | global | medium |
| 3 | Closed constructed | Interpret data and evidence scientifically | Content | global | medium |
| 4 | Simple MCQ | Interpret data and evidence scientifically | Content | global | difficult |
| 5 | Closed constructed | Explain phenomena scientifically | Content | global | medium |
| 6 | Close constructed | Explain phenomena scientifically | Content | global | medium |
| 7 | Open ended | Interpret data and evidence scientifically | Epistemic | global | difficult |

Answer key

1. a

2. d
3. Ammonia
4. because of more hydrogen ions
5. .01
6. (a) Milk is made slightly alkaline so that it may not get sour easily due to formation of lactic acid in it.

(b) The alkaline milk takes longer time to set into curd because the lactic acid being formed has to first neutralize the alkali present.

4-REACTIVITY SERIES

Area: Frontiers of science & Technology

Class: 10

Chapter: 3

Chapter Name: Metals and Non Metals.

Concept: Extraction of the metal from its ore.

Learning outcomes:

The student will be able to:

1. Classify the properties of metals and non metals
2. Relate the reactivity of metals with their process of extraction.

The reactivity series of metals, also known as the activity series, refers to the arrangement of metals in the descending order of their reactivity's. The data provided by the reactivity series can be used to predict whether a metal can displace another in a single displacement reaction. It can also be used to obtain information on the reactivity of metals towards water and acids.

Q. No.1. Although hydrogen is a non-metal, it has been included in reactivity series. Give reason.

Q. No.2 Which one of the following four metals would be displaced from the solution of its salts by other three metals?

- (a) Mg (b) Ag (c) Zn (d) Cu

Q. No. 3 Nikita took Zn, Al, Cu, Fe, Mg and Na metals and put each metal in cold water and hot water. The metals were also reacted with steam.

- i) Name the metal which reacts with cold water.
- ii) Which of the above metals react with steam?
- iii) Name the metal which reacts with hot water.
- iv) Arrange these metals in order of their increasing reactivity.

Q.No.4 How does reactivity series help us in extraction of metals from their salts?

Item description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|---------|------------|-----------|---------|------------------|
|--------|---------|------------|-----------|---------|------------------|

| | | | | | |
|-----|------------------------|--|-----------|----------|--------|
| i | Close constructed | Explain phenomenon scientifically | content | Global | medium |
| ii | Simple multiple choice | Evaluate and design Scientific enquiry | epistemic | personal | Low |
| iii | close constructed | Interpret data and evidence scientifically | content | personal | medium |
| iv | Close constructed | Explain phenomenon scientifically | content | global | medium |

Answer key:

- Because
 - it behaves like metal .
 - It forms positive ion (H^+) by losing its only electron present.

Full credit: (2) for above answer

Partial credit: (1) if any one point is mentioned.

- Cu

Full credit: for above answer

No credit : for any other response.

- i) Na ii) Zn, Al, Fe iii) Mg iv) $Na > Mg > Al > Zn > Fe > Cu$

Full credit: (2) $\frac{1}{2}$ for each part.

Partial score: $\frac{1}{2}$ for each correct part.

No credit for any other response.

- These metals are non-reactive, and these metals can be extracted by heating alone.

Metals present in middle order of reactivity series are extracted by various processes like calcinations, roasting, etc.

Highly reactive metals like sodium, calcium, aluminum etc are extracted from their molten chloride solution using electrolysis.

Full credit : (2) for above answer.

Partial credit: (1) if any of the point is missing.

5-PROPERTIES OF METALS AND NON-METALS

Area: Frontiers of science & technology

Class: 10

Chapter: 3

Chapter Name: Properties of Metals and Non Metals.

Concept: Properties of metals and non metals.

Learning outcomes:

The student will be able to

1. Classify metals and non metals on the basis of their physical and chemical properties.
2. Conduct investigation to seek answers to queries.
3. Apply the concept of corrosion in their daily life.

Various elements are classified as metals or non-metals on the basis of their properties. We use many metals and non metals in our daily life. Metals are materials holding or possessing the characteristics of being shiny, hard, fusible, malleable, ductile, etc. Few examples of metals (materials) are – Gold, Silver, [Aluminium](#), Copper, Iron, etc.

Non – metals are materials not holding the characteristics of metals, means they are not shiny, hard, fusible, malleable, ductile, etc. Many materials like coal and Sulphur are very soft and dull in appearance. They break down into very fine thin powdery mass on tapping with the hammer. They are neither in – sonorous and also are a very poor conductor of heat and electricity. Few examples of non – metals are carbon, oxygen, Sulphur, etc.

Metals and non-metals react differently with a number of reagents, so show different chemical properties. The reactivity of elements depends upon their electronic configuration. According to Modern Periodic Law “ Properties of elements are a periodic function of their atomic number.” Prediction of properties of elements could be made with more precision when elements are arranged on the basis of increasing atomic number.

- Q.1 A non-metal A is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming.
- a) Identify A, B and C.
 - b) To which group of periodic table does A belong?
- Q.2 Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z?
- a) Has high melting point
 - b) Has low melting point
 - c) Conducts electricity in molten state
 - d) Occurs as solid
- Q.3. What happens when calcium is treated with water?
- i) It does not react with water
 - ii) It reacts violently with water
 - iii) It reacts less violently with water
 - iv) Bubbles of hydrogen gas formed stick to the surface of calcium
- a) i) and iv) b) i) and ii) c) ii) and iii) d) iii) and iv)

- Q.4 The copper vessels used at home are found to be coated with green colour coating.
- What is the chemical composition of green coating?
 - Why do copper vessels form such green coating?
 - Name the phenomena responsible for formation of green coating.
 - Copper vessels are best cleaned with lemon or tamarind juice but not with soap. Why?

Item description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|-------------------------|--|-----------|----------|------------------|
| 1. | Close constructed | Explain phenomenon scientifically | content | Global | medium |
| 2. | Simple multiple choice | Explain phenomenon scientifically | epistemic | personal | low |
| 3. | complex multiple choice | Interpret data And evidence scientifically | epistemic | personal | medium |
| 4. | Close constructed | Explain phenomenon scientifically | content | global | medium |

Answer Key

Q.No1. a) A is C. B is CO. C is CO₂.

b) Group no. 14

Full credit: (2) 1 for each part a and b

No credit : for any other response.

Q.No2 . Full credit b)

No credit for any other response.

Q.No3. Full credit d)

No credit for any other response.

Q.No.4 a) CuCO₃.Cu(OH)₂

b) Copper forms green coloured coating of basic copper carbonate as it reacts with water, atmospheric oxygen and carbon dioxide.

c) Corrosion

d) Copper carbonate formed on vessels is basic in nature. Tamarind juice or lemon juice is acidic in nature where as soap is basic in nature. So to neutralize the basic effect of copper carbonate, acidic substance is used.

Full credit: 4) (1) for each part.

No credit for any other responses.

6-EFFECT OF ALCOHOL ON LIVING BEINGS

Area: Health

Class: 10

Chapter: 4

Chapter Name: Carbon and its Compounds.

Concept: Properties of Alcohols.

Learning outcomes:

The student will be able to

1. Draw electron dot structure of carbon compounds.
2. Differentiate between the properties of ethanol and methanol.
3. Exhibit the value of rational thinking to sensitize others about the bad effects of alcohol on their mental and physical health.



When large quantities of ethanol are consumed, it tends to slow metabolic processes and to depress the central nervous system. This results in lack of coordination, mental confusion, drowsiness, lowering of the normal inhibitions, and finally stupor. The individual may feel relaxed but does not realise that his sense of judgement, sense of timing, and muscular coordination have been seriously impaired. Unlike ethanol, intake of methanol in very small quantities can cause death. Methanol is oxidised to methanal in the liver. Methanal reacts rapidly with the components of cells. It causes the protoplasm to get coagulated, in much the same way an egg is coagulated by cooking. Methanol also affects the optic nerve, causing blindness. Ethanol is an important industrial solvent. To prevent the misuse of ethanol produced for industrial use, it is made unfit for drinking by adding poisonous substances like methanol to it. Dyes are also added to colour the alcohol blue so that it can be identified easily. This is called denatured alcohol.

Q 1. When Ethanol is consumed in large quantities, it causes

- a. Metabolic processes to slow down b. Central nervous system is affected

c. Lack of co ordination, mental confusion and drowsiness d. All the above

Q2. Q 1.What is denatured alcohol ?

Q 3. Out of Ethanol and Methanol which when taken even in small quantity can cause death ?

Q 4.Methanol is oxidized to Inside the body

a.Methanal b. Methanoic acid c. Ethanol d. Ethanoic acid

Q 5.How methanol is responsible for causing blindness ?

Q 6. Draw electron dot structure of Ethanol .

Q 7. Consumption of Alcohol is injurious to health. Justify the statement .

Item Description:

| Q No. | Q Type | Competency | Knowledge | Context | Difficulty level |
|-------|--------------------|--|-----------|---------|------------------|
| 1 | Simple MCQ | Interpret data and evidence scientifically | content | global | low |
| 2 | Closed constructed | Explain phenomena scientifically | content | global | medium |
| 3 | Closed constructed | Explain phenomena scientifically | content | global | medium |
| 4 | Simple MCQ | Interpret data and evidence scientifically | content | global | difficult |
| 5 | Closed constructed | Explain phenomena scientifically | content | global | medium |
| 6 | Close constructed | Explain phenomena scientifically | content | global | medium |
| 7 | Open ended | Interpret data and evidence scientifically | Epistemic | global | difficult |

Answer Key :

1. d

2. which is unfit for drinking
3. Methanol
4. Methanal
5. As it affects optic nerve
- 6.



7-CIRCULAR CARBON ECONOMY

Area: Frontiers of Science & Technology

Class: 10

Chapter: 4

Chapter Name: Carbon and its Compounds.

Concept: Carbon.

Learning outcomes:

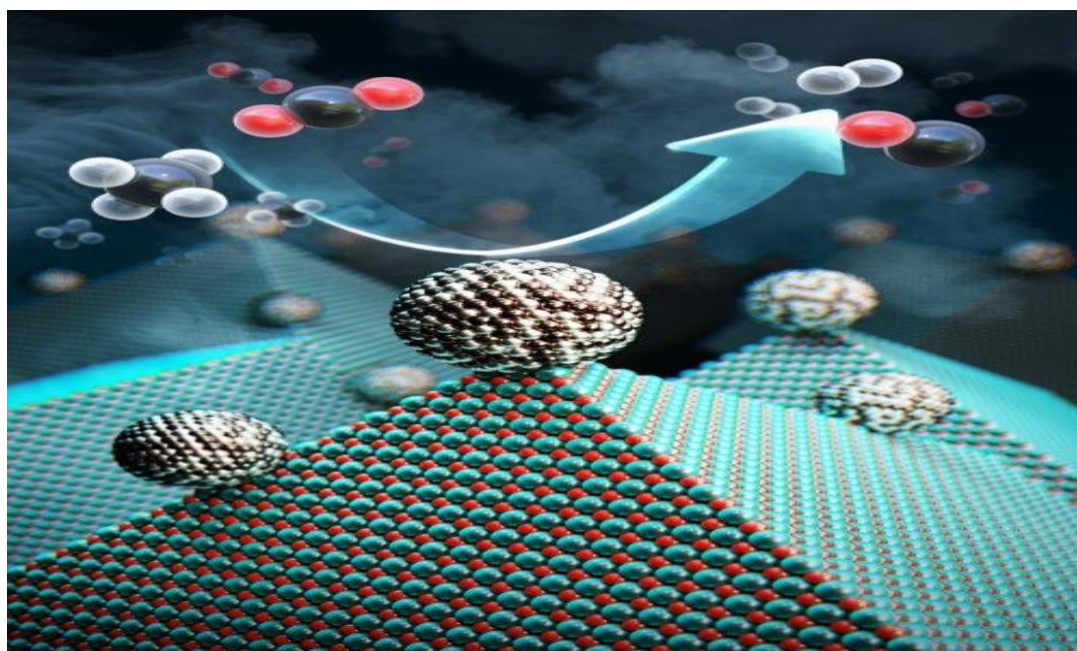
The student will be able to

1. Apply the concepts of 4 R's in carbon economy to conserve the environment.
2. Apply the concept of catalysts in solving the environmental issues.
3. Create eco friendly models to reduce carbon foot print.

The circular carbon economy is a system where carbon emissions are reduced ,reused, recycled and removed (4R).

Of course, nature has been recycling carbon dioxide for millions of years. Photosynthesis turns sunlight, carbon dioxide and water into sugars and energy. But most plants turn less than 1 % of solar energy they receive, into useful energy rich compounds. Scientists are working on technologies that they hope will improve on nature and make recycling carbon dioxide a profitable industry.

Scientists have taken a major step toward a circular carbon economy by developing a long-lasting, economical catalyst that recycles greenhouse gases into ingredients that can be used in fuel, hydrogen gas, and other chemicals. The results could be revolutionary in the effort to reverse global warming, according to the researchers.



The catalyst that recycles greenhouse gases into ingredients that can be used in fuel, hydrogen gas and other chemicals

"We set out to develop an effective catalyst that can convert large amounts of the greenhouse gases carbon dioxide and methane without failure," said Cafer T. Yavuz, paper author and associate professor of chemical and biomolecular engineering and of chemistry at KAIST.

The catalyst, made from inexpensive and abundant nickel, magnesium, and molybdenum, initiates and speeds up the rate of reaction that converts carbon dioxide and methane into hydrogen gas. It can work efficiently for more than a month.

This conversion is called 'dry reforming', where harmful gases, such as carbon dioxide, are processed to produce more useful chemicals that could be refined for use in fuel, plastics, or even pharmaceuticals. It is an effective process, but it previously required rare and expensive metals such as platinum and rhodium to induce a brief and inefficient chemical reaction.

Other researchers had previously proposed nickel as a more economical solution, but carbon byproducts would build up and the surface nanoparticles would bind together on the cheaper metal, fundamentally changing the composition and geometry of the catalyst and rendering it useless.

"The difficulty arises from the lack of control on scores of active sites over the bulky catalysts surfaces because any refinement procedures attempted also change the nature of the catalyst itself," Yavuz said.

The researchers produced nickel-molybdenum nanoparticles under a reductive environment in the presence of a single crystalline magnesium oxide in the presence of reactive gas. The nanoparticles moved on the pristine crystal surface seeking anchoring points. The resulting activated catalyst sealed its own high-energy active sites and permanently fixed the location of the nanoparticles -- meaning that the nickel-based catalyst will not have a carbon build up, nor will the surface particles bind to one another.

"It took us almost a year to understand the underlying mechanism," said first author Youngdong Song, a graduate student in the Department of Chemical and Biomolecular Engineering at KAIST. "Once we studied all the chemical events in detail, we were shocked."

The researchers dubbed the catalyst Nanocatalysts on Single Crystal Edges (NOSCE). The magnesium-oxide nanopowder comes from a finely structured form of magnesium oxide, where the molecules bind continuously to the edge. There are no breaks or defects in the surface, allowing for uniform and predictable reactions.

"Our study solves a number of challenges the catalyst community faces," Yavuz said. "We believe the NOSCE mechanism will improve other inefficient catalytic reactions and provide even further savings of greenhouse gas emissions."

Questions:

- 1) What are the main gases that contribute to increase in greenhouse effect?
 - a) Methane
 - b) Carbon dioxide
 - c) water vapours
 - d) Carbon monoxide
- 2) Which metals act as effective catalyst in recycling greenhouse gases?
- 3) What was the difficulty faced while using the new catalyst during recycling greenhouse gases?
- 4) How was nickel based catalyst produced by the researchers ?
- 5) Why nickel-based catalyst acts as an effective catalyst to recycle greenhouse gases?

Item description:

| Q. No. | Q. Type* | Competency** | Knowledge*** | Context [#] | Difficulty level ^{##} |
|--------|-------------------------|--|--------------|----------------------|--------------------------------|
| 1 | complex multiple choice | Explain phenomenon scientifically | Content | Global | Low |
| 2 | close constructed | Evaluate and design Scientific enquiry | Content | Global | Low |
| 3 | close constructed | Evaluate and design Scientific enquiry | Content | Global | Medium |
| 4 | close constructed | Explain phenomenon scientifically | Content | Global | Medium |
| 5 | close constructed | Explain phenomenon scientifically | Content | Global | Medium |

Answer Key :

Ans.1.

- Score 2 if response is a,b and c
- Score 1 if response is a or b or c
- Score 0 for any other response

Ans.2. Nickel, Magnesium and molybdenum

- Score 2 for above response
- Score 0 for any other response

Ans.3. 1) Carbon byproducts would build up and the surface nanoparticles would bind together on the cheaper metal, fundamentally changing the composition and geometry of the catalyst and rendering it useless.

2) There is lack of control on scores of active sites over the bulky catalysts surfaces because any refinement procedures attempted also change the nature of the catalyst itself

- Score 2 for above response 1 and 2
- Score 1 for response 1 or 2
- Score 0 for any other response

Ans.4. The researchers produced nickel-molybdenum nanoparticles under a reductive environment in the presence of a single crystalline magnesium oxide in the presence of reactive gas

- Score 2 for above response
- Score 0 for any other response

Ans. 5. The nickel-based catalyst will not have a carbon build up, nor will the surface particles bind to one another.

- Score 2 for above response
- Score 0 for any other response

8-SOAP AND ITS CLEANSING ACTION

Area: Frontiers of Science & Technology

Class: 10

Chapter: 4

Chapter Name: Carbon and its compounds.

Concept: Soaps and detergents.

Learning outcomes:

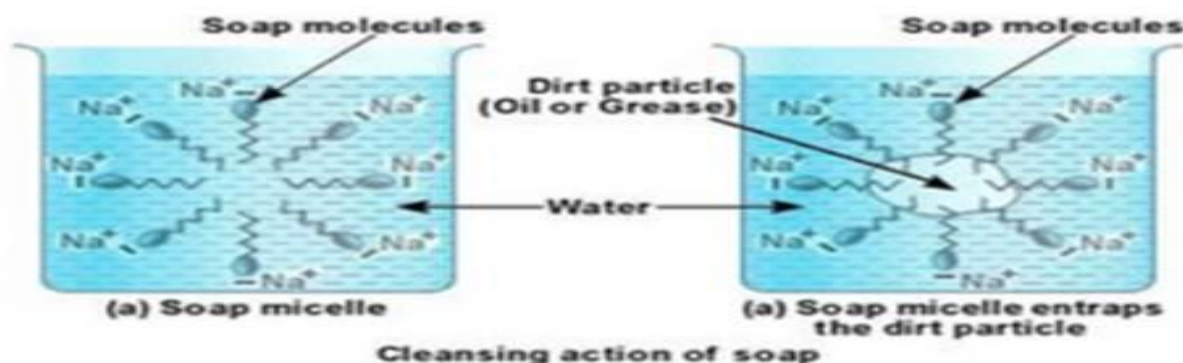
The student will be able to

1. Explain the process of saponification.
2. Apply the scientific process of cleaning action of soap.

Soaps are sodium or potassium salts of higher fatty acids. These are formed by alkaline hydrolysis of animal fats and vegetable oils. This is called Saponification.

Soap molecules ionize to give long chains carboxylate anion and sodium or potassium cation. The carboxylate anion is the active ion of the soap molecule. It has long hydrocarbon chain called tail (hydrophobic end) and the charged carboxylate ion called head (hydrophilic end).

When a soap molecule is dissolved in water, micelle is formed as shown in fig.



1. Soaps are _____ based soapy detergents.
 - a) Water
 - b) Vegetable oil
 - c) Acid
 - d) Animal fats
2. Cleansing action of soap is due to
 - a) Saponification
 - b) Emulsification
 - c) Micelle formation
 - d) Neutralization
3. Name the parts of a soap molecule
 - a) Hydrophilic head and hydrophobic tail
 - b) Hydrophobic head and hydrophilic tail
 - c) Hydrophilic head and hydrophobic tail
 - d) None of above
4. Which end of soap molecule is oil/grease loving

- a) Only hydrocarbon chain
 - b) Only carboxylate anion
 - c) Both a and b
 - d) None of these
5. The scientific terms for water loving and water hating are
- a) Hydrophilic, hydrophobic
 - b) Hydrophobic, hydrophilic
 - c) Hydrophilic, hydrophilic
 - d) Hydrophobic, hydrophobic
6. Soaps work because the hydrophilic end of the soap molecule attracts a water molecule and water hating end attracts
- a) Water molecules
 - b) Other soap molecules
 - c) Grease
 - d) Dirt
7. The water repelling end of the molecule has a _____
- a) Negative charge
 - b) Positive charge
 - c) Either positive or negative charge
 - d) No charge
8. In the soap micelles(from the figure given)
- a) The Ionic end of soap is on the surface of the cluster while the hydrocarbon chain is in the interior of the cluster.
 - b) Ionic end of the soap is in the interior of the cluster and the hydrocarbon chain is out of the cluster.
 - c) Both ionic and hydrocarbon chains are on the exterior of the cluster .
 - d) Both ionic and hydrocarbon chains are on the interior of the cluster.
9. Explain the following
- a) Most detergents are at health risk while soaps are not.
 - b) Potassium soaps are better than sodium soap.

Item description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|-------------------------|--|------------|----------------|------------------|
| 1 | complex multiple choice | Explain phenomenon scientifically | Content | Local-National | Low |
| 2 | close constructed | Explain phenomenon scientifically | Content | Local-National | Low |
| 3 | Simple multiple choice | Explain phenomenon scientifically | Content | Local-National | low |
| 4 | Simple multiple choice | Explain phenomenon scientifically | procedural | Global | low |
| 5 | Simple multiple choice | Explain phenomenon scientifically | Content | Global | Medium |
| 6 | complex multiple choice | Evaluate and design Scientific enquiry | Content | Local-National | Medium |
| 7 | Simple multiple choice | Evaluate and design Scientific enquiry | epistemic | Local-National | Medium |
| 8 | Simple multiple choice | Interpret data and evidence scientifically | Content | Local-National | Medium |
| 9 | open ended | Explain phenomenon scientifically | epistemic | Global | Medium |

Answer/Scoring key:

Ans1.

- Score 2 if response is b and d
- Score 1 if response is b or d
- Score 0 for any other response

Ans2.

- Score 2 if response is b and c
- Score 1 if response is b or c
- Score 0 for any other response

Ans 3.

- Score 2 if response is c
- Score 0 for any other response

Ans 4.

- Score 2 if response is a
- Score 0 for any other response

Ans 5.

- Score 2 if response is a
- Score 0 for any other response

Ans 6.

- Score 2 if response is c and d
- Score 1 if response is c or d
- Score 0 for any other response

Ans 7.

- Score 2 if response is d
- Score 0 for any other response

Ans8.

- Score 2 if response is a
- Score 0 for any other response

Area: Frontiers of Science and Technology

Class: 10

Chapter: 5

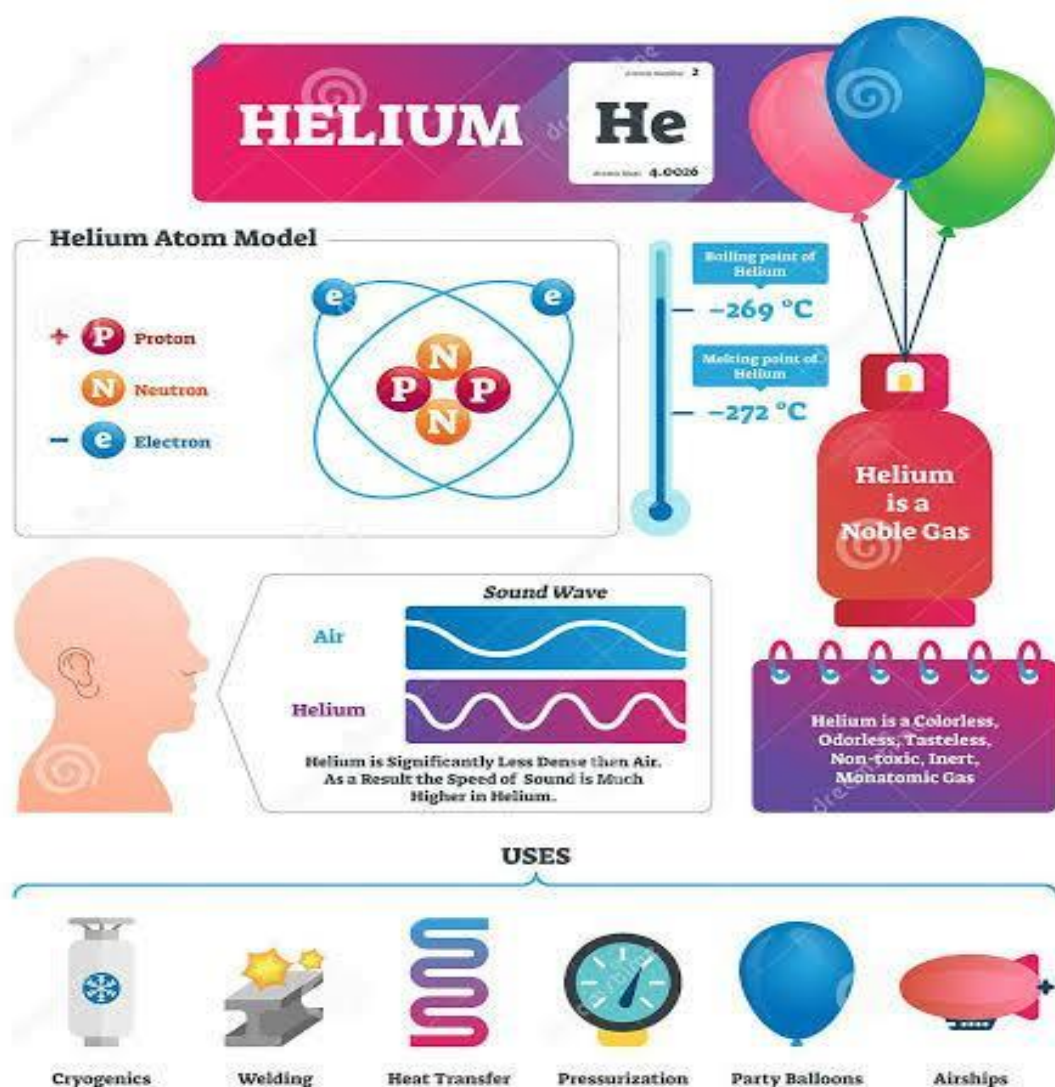
Chapter Name: Periodic classification of elements.

concept: Classification of elements.

Learning outcomes:

The student will be able to

1. Analyse and interpret the figure of Helium element.
2. Explain the properties of Hydrogen and Helium.
3. Differentiate between the structure of Hydrogen and Helium atom.
4. Apply the uses of Helium in their daily life.



Observe the information given about Helium element and answer the following questions:

Q1. Nucleus of helium atom contains

- i) Two positive and two neutral subatomic particles
- ii) Two negative and two neutral subatomic particles
- iii) Two protons and two neutrons
- iv) Two electrons and two protons

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

Q2. Both hydrogen and helium are less dense than air . Why are then helium balloons still preferred over hydrogen ones for kids' birthday parties?

Q3. Helium (in helium and oxygen mixture) finds its use in treatment of respiratory ailments to treat conditions like asthma because

- i) of its inert nature
- ii) low density that reduces airway resistance and promotes airflow through the lungs
- iii) is pure as compared to air which is a mixture

- a) 1 and 2
- b) 1 and 3
- c) 2 and 3
- d) 1, 2 and 3

Q4. Oxidation State is the state of an element or ion in a compound with regard to the electrons gained or lost by the element or ion in the reaction that formed the compound. It is expressed as a positive or negative number indicating the ionic charge of element or ion. According to the above definition, what would be the oxidation state of helium?

Q5. Helium is ____ but hydrogen is ____

- a) inert, non reactive
- b) monatomic, diatomic
- c) similar to neon, similar to argon
- d) reactive , diatomic

Q6. Helium is different from other inert gases like neon, argon because of its

- a) gaseous physical state
- b) incomplete cell
- c) two valence electrons
- d) eight valence electrons

Item description:

| Q No. | Q. TYPE | COMPETENCY | KNOWLEDGE | CONTEXT | DIFFICULTY LEVEL |
|-------|--------------------|--|------------|---------|------------------|
| 1 | Complex MCQ | Interpret data and evidence scientifically | Content | Global | Low |
| 2 | Close constructed | Evaluate and design scientific enquiry | Epistemic | Global | Medium |
| 3 | Complex MCQ | Evaluate and design scientific enquiry | Epistemic | Global | High |
| 4 | Closed constructed | Interpret data and evidence scientifically | Procedural | Global | Medium |
| 5 | Simple MCQ | Explain phenomenon scientifically | Content | Global | High |
| 6 | Simple MCQ | Evaluate and design scientific enquiry | Content | Global | Low |

Answer Key:

1.a

FC for correct answer and NC for any other option

2. Helium is an inert gas whereas hydrogen is highly flammable.

Though both are less dense than air, helium is much more safe as compared to hydrogen ,specially, for kids' birthday parties .

FC for correct explanation

NC for incorrect answer

3.a

FC for correct answer and NC for any other option

4. 0

FC for correct answer and NC for incorrect answer

5.b

FC for correct answer and NC for any other option

6.c

FC for correct answer and NC for any other option

10-GAME OF DICE

Area : Natural Resources

Class: 10

Chapter: 5

Chapter Name: Periodic classification of elements.

Concept: Modern periodic table.

Learning outcomes:

The student will be able to

1. Exhibit creativity in designing games for learning.
2. Explain the placement of elements in the modern periodic table.

Dice are small, throwable objects with uniquely marked sides that can rest in different positions.



They are used for generating random numbers and are commonly used in board games.

For the 6 sided die, opposite faces are arranged to always sum to seven.

With respect to the number on the die and the atomic number of elements in the periodic table, answer the following questions:

Q1.Which element would be present on the face opposite to the alkali metal?

Q2.Name the elements that form a

- i) pair of non metals whose atomic number would sum up to seven?
- ii) Which type of bond would exist between the above two non metals if they formed a compound?

Q3.The valency of element opposite to Boron is

a) 0 b) 1 c) 2 d) 3

Item description:

| Q.No. | Q TYPE | COMPETENCY | KNOWLEDGE | CONTEXT | LEVEL |
|-------|-------------------|--|------------|---------|--------|
| 1 | Close Constructed | Evaluate and Design scientific enquiry | Content | Global | easy |
| 2 | Close Constructed | Evaluate and Design scientific enquiry | Procedural | Global | medium |
| 3 | Simple MCQ | Interpret data and evidence scientifically | Procedural | Global | medium |

Answer Key:

Q1. Beryllium

Atomic no of Lithium is 3 . the opposite faces add to 7,
therefore, the element with atomic no. 4 will be present ie Beryllium

FC for correct answer and NC for incorrect answer

Q2. i) Hydrogen and Carbon

ii) Covalent Bond

FC for correct answer , PC for any one part correct and NC for both parts incorrect

Q3 a)

FC for correct answer and NC for incorrect answer

11-EXCRETORY SYSTEM

Area: Health

Class: 10

Chapter: 6

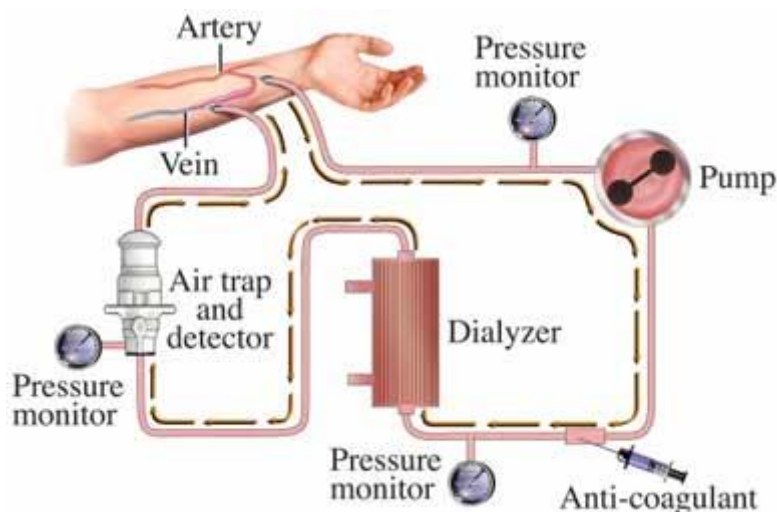
Chapter Name: Life processes.

Concept: Excretion.

Learning outcomes:

The student will be able to

1. Analyse and interpret the process shown in the figure.
2. Connect the functioning of our kidneys with the process of haemodialysis.
3. Explain the phenomenon of excretion in human beings.



Q1. What does the above process showing?

Q2. When is a patient put on dialysing machine?

Q3. Why blood doesn't clot during the process of dialysis?

Q4. If a person's both kidneys have stopped working he should

| | Agree | Disagree |
|--|-------|----------|
| a) Immediately get a kidney transplant done. | | |
| b) Go for dialysis first than later on for kidney transplantation. | | |

| | | |
|---|--|--|
| c)Should continue only with haemodialysis for ever. | | |
| d)Should not take any treatment at all. | | |

Q5.What does haemodialysis do?

Q6.Why pressure needs to be maintained during haemodialysis?

Item Description:

| Q.No | Q.Type | Competency | Knowledge | Context | Difficulty |
|------|-------------------|--------------------------------------|------------|---------|------------|
| 1 | Close Constructed | Explain Phenomena Scientifically | Procedural | Global | Low |
| 2 | Close Constructed | Explain Phenomena Scientifically | Context | Global | Low |
| 3 | Close Constructed | Evaluate and design scientific query | Context | Global | Medium |
| 4 | Open ended | Evaluate and design scientific query | Context | Global | Medium |
| 5 | Close Constructed | Explain Phenomena Scientifically | Procedural | Global | High |
| 6 | Close Constructed | Evaluate and design scientific query | Procedural | Global | High |

Answer/Scoring Key :

Ans.1 Haemodialysis

Score 2 for Haemodialysis

Score 1 for dialysis

Score 0 for any other answer

Ans. 2 Score 2 When kidneys are non functional/kidney failure.

Score 0 for any other answer.

Ans.3 Heparin is used o prevent blood from clotting in the dialysis tubes during haemodialysis.

Score 2 If answer is Heparin

Score 0 If any other answer.

Ans.5. It removes toxins and excess fluid and corrects the balance of electrolytes like potassium,sodium, phosphate and calcium to name a few from the patient's body.

Score 2 for Correct answer

Score 0 for any other answer.

Ans.6. A sudden drop in the blood pressure while undergoing dialysis has long vexed many kidney patients. They may suffer from stroke to seizures to heart damage to death.

Score 2 Stroke,Seizure,Heart damage, death

Score 1 any two effects

Score 0 any other answer

12-HUMAN RESPIRATORY SYSTEM

Area: Health

Class: 10

Chapter: 6

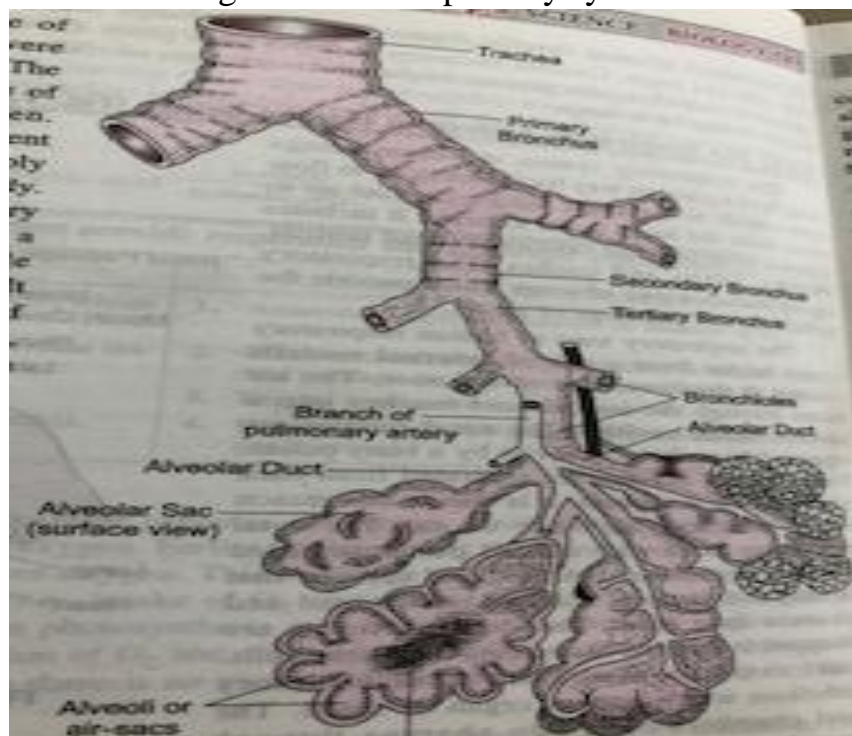
Chapter Name: Life processes.

Concept: Respiration

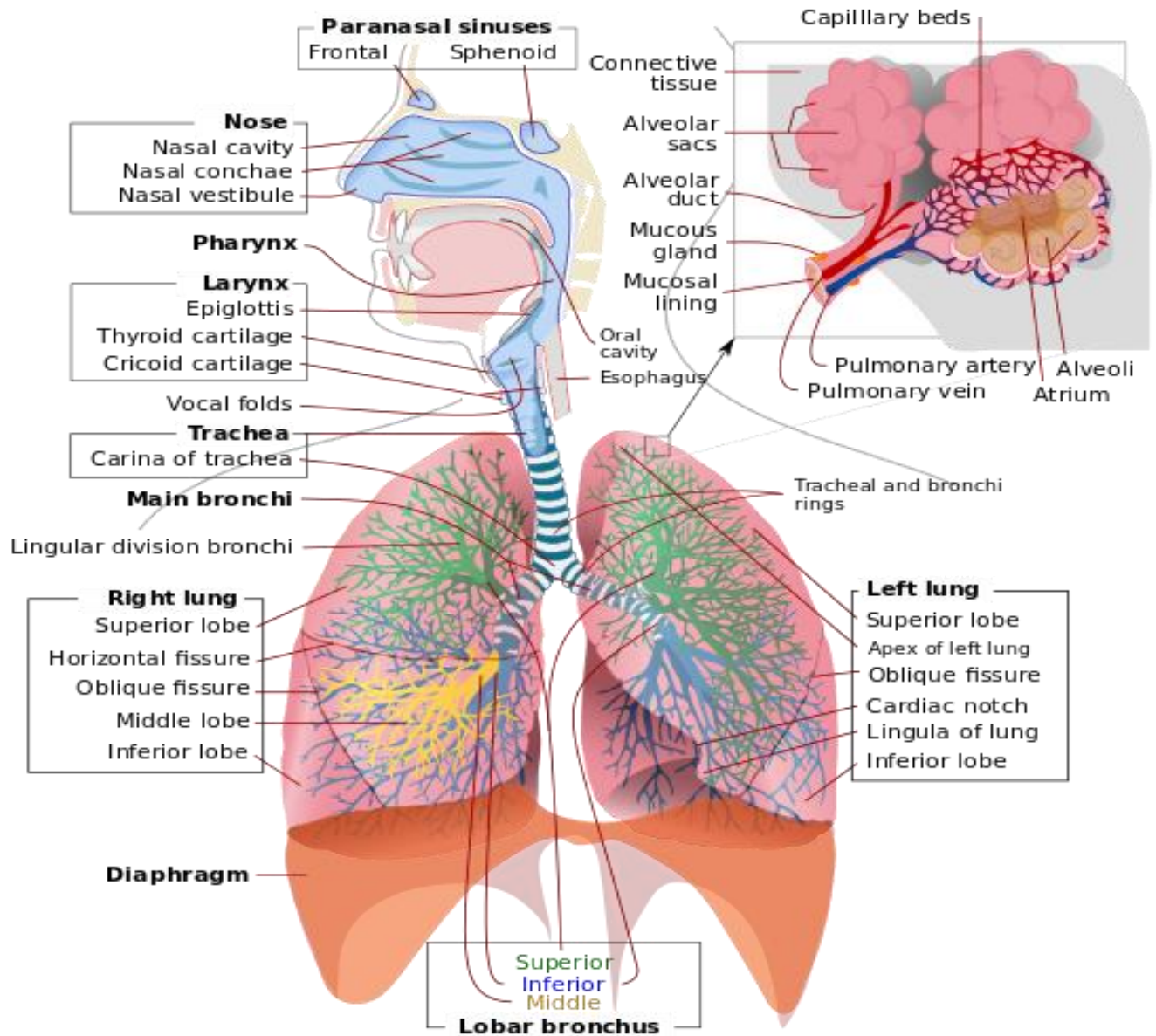
Learning outcomes:

The student will be able to

1. Explain the functions of the organs involved in the process of respiration.
2. Draw a labelled diagram of the respiratory system in human beings.



Human Respiratory and lungs allow us to breathe. They bring oxygen into our body and send carbon dioxide out. This exchange is called respiration. The inhaling and exhaling of gases involve the respiratory organs and environment. The some parts of respiratory tract have cartilaginous rings so that they do no collapse in the absence of air. The pulmonary artery and pulmonary veins play important role in bringing oxygenated and deoxygenated blood. The deoxygenated blood is taken to alveoli which are then walled and richly supplied with blood vessel. The alveoli in lungs never collapse because after exchange of gases, some air still remained in them which is very useful to maintain the exchange of gases in them.



- Q1. Identify the part in stimulus with cartilaginous rings.
- Q2. All the arteries carry oxygenated blood except pulmonary artery. Give reason.
- Q3. Label the part where exchange of gases takes place.
- Q4. Why branches of pulmonary artery are very thin and narrow?
- Q5. Which part of the diagram have residual volume?
- Q6. What is the advantage of residual volume?

Item description:

| Q.No | Q.Type | Competency | Knowledge | Context | Difficulty |
|------|-------------------|--------------------------------------|------------|---------|------------|
| 1 | Close Constructed | Explain Phenomena Scientifically | Context | Global | Low |
| 2 | Close Constructed | Evaluate and design scientific query | Context | Global | Medium |
| 3 | Close Constructed | Evaluate and design scientific query | Context | Global | Low |
| 4 | Open ended | Evaluate and design scientific query | Context | Global | Low |
| 5 | Close Constructed | Explain Phenomena Scientifically | Procedural | Global | Medium |
| 6 | Close Constructed | Explain Phenomena Scientifically | Context | Global | High |

Answer key:

Ans 1 a. Score 2 for Trachea and primary bronchus

b. Score 1 for Trachea or primary bronchus

c. Score 0 for Any other part

Ans 2 a. Score 2 for Arteries always carry blood away from heart.

b Score 0 for.Any other answer

Ans 3 a. Score 2 for Alveoli

b. Score 0 for Any other

Ans 4. a Score 2 for.To facilitate exchange of materials

b. Score 0 for Any other answer

Ans 5 a. Score 2 for Alveloi,Bronchioles

b. Score 1 for Alveloi or Bronchioles

c. Score 0 for Any other

Ans 6 a. Score 2 for To maintain the structure and maintain continuity of exchange of gases

b. Score 1 for To maintain the structure or for continuity of exchange of gases

c. Score 0 for Any other

13-UNSUNG HEROES OF THE BODY- HORMONES

Area: Health

Class: 10

Chapter: 7

Chapter Name: Control and coordination.

Concept: Endocrine system.

Learning outcomes:

The student will be able to

1. Explain the functions of hormones in human body.
2. Calculate the required units of insulin for diabetic patients.
3. Apply the knowledge of functions of hormones in identifying various hormonal disorders.

These unsung heroes of the body inform cells when its time to go to work. Various tissues of the body secrete hormones into fluids, like blood. From there, the hormones travel far from the place they were made until they reach cells that read the chemical as an instruction. That hormone might tell the cell to grow- or to stop. It might direct a cell to change its shape or activity. These instructions might cause the heart to pump more rapidly or signal hunger to the brain. Another hormone might let you know that you're full. One hormone latch onto sugar in the bloodstream and then helps ferry that sugar into cells to fuel their work. Yet another might tell your body to burn some nutrients as fuel- or instead store their energy as fat for use at a later date.

Q1. Rahul is a player. Sometimes he feels weakness while playing. The doctors diagnose the cause of Rahul's condition to be diabetes. They advised him to calculate the number of grams of carbohydrates in his meal so that he can calculate the number of units of insulin he will need to lower his blood glucose concentration.

Each unit of insulin he injects reduces his blood glucose concentration by $1.5 \text{ milli moles/dm}^3$

He needs to inject one unit for every 10 grams of carbohydrates he consumes. The table shows estimated carbohydrates in the breakfast eaten by the player.

| Food | Carbohydrates |
|---------------------------|---------------|
| One glass Juice | 25 gms |
| Two slices of bread toast | 70 gms |
| 300 grams of pulses | 38 gms |
| Tea with sugar | 25 gms |

Calculate how many unit of insulin the athlete would need to inject to control the rise in blood glucose level.

.....

 Q2. A person is detected as under reactive thyroid gland. The thyroid gland secretes thyroid hormones. If an under reactive thyroid could cause the person to feel tired and have an increased body mass, then what would be the functions of thyroid hormones in our body?

.....

Item Description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|--------------------|--|-----------|----------|------------------|
| 1 | Closed constructed | Interpret data and evidence scientifically | content | Personal | High |
| 2 | Closed constructed | Explain the process scientifically | content | Personal | Medium |

Answers:

A 1 158/10 (1 point)

16 units of insulin (1 point)

A2. The explanation should include:

- thyroid gland helps to regulate metabolic rate
 - an underactive thyroid would cause less hormone to be reduced
 - metabolic rate drops
 - feel tired as less energy would be release from food
 - more fat storage so the person gains body mass
- (1 points each for each of the above explanation. Student to write any two points)

14-THE MENSTRUAL CYCLE

Area: Health

Class: 10

Chapter: 8

Chapter Name: How do organisms reproduce?

Concept: The Menstrual Cycle

Learning outcomes:

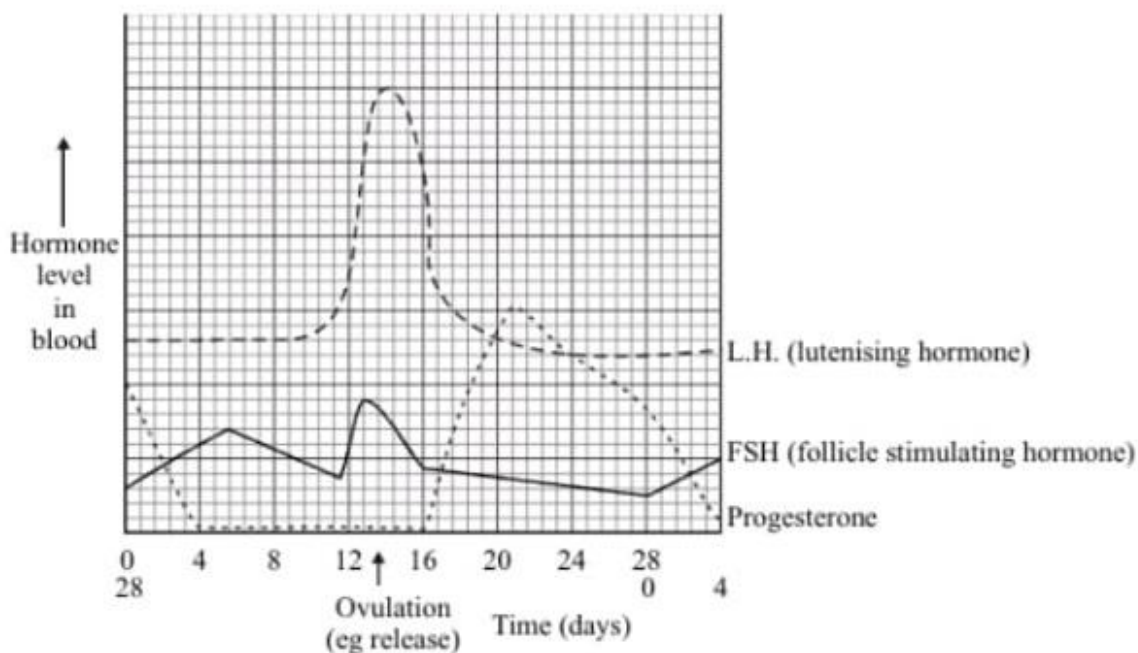
The student will be able to

1. Explain the functions of different hormones controlling the menstrual cycle.
2. Analyse and interpret the graph to explain the functions of hormones.
3. Apply the knowledge of hormones in maintaining sexual health.

Several hormones control this cycle- for example, they are involved in controlling the release of an egg each month from an ovary, and changing the thickness of the uterus lining.

| Hormones | Functions |
|------------------------------------|---|
| FSH (Follicle Stimulating Hormone) | Causes an egg to mature in an ovary. Stimulates the ovaries to release oestrogen |
| LH (Luteinizing Hormone) | Triggers ovulation (the release of a mature egg) |
| Progesterone | Maintains the lining of the uterus during the middle part of the menstrual cycle and during pregnancy |

The graph shows changes in the levels of three hormones in a menstrual cycle.



Q1. A woman is facing the problem of the infertility. The doctor diagnoses that the reason for her situation is that the eggs are not released at the appropriate time. Now study the graph and identify the hormones that may be responsible for the situation.

.....

Q2. In another situation a woman is prescribed contraceptive pills which keeps the level of progesterone high for most of the cycle. Suggest how these pills might work and why they have been prescribed?

.....

Q3. Outline two arguments for and two arguments against using hormones as contraceptive pills.

For: 1.....
 2.....

Against: 1.....
 2.

Item Description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|--------------------|--|-----------|----------|------------------|
| 1 | Closed constructed | Interpret data and evidence scientifically | content | Personal | Medium |
| 2 | Closed constructed | Interpret data and evidence scientifically | content | Personal | Medium |
| 3. | Open ended | Explain the process scientifically | epistemic | Personal | High |

Answer key:

A1. LH or FSH (1point for one mentioned and 2 points for both)

A2. LH or FSH level kept low results in no egg released (1 point for each)

A3. For: very effective/ prescribed/personal preference/ convenient/promotes family values (any 2 for 1 point)

Against: upsets internal environment/ has side effects/ religious beliefs/
 no protection against sexually transmitted diseases such as
 AIDS/long term effect/moral beliefs. (any 2 for 1 point)

15-DOUBLE FERTILIZATION

Area: Health

Class: 10

Chapter: 8

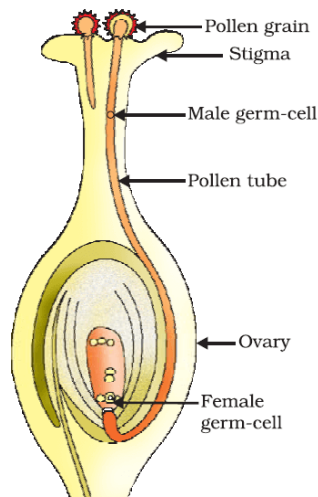
Chapter Name: How do organisms reproduce?

Concept: Sexual Reproduction.

Learning outcomes:

The student will be able to

1. Draw a labelled diagram of double fertilisation for understanding the parts of male and female reproductive organs of a flower.
2. Explain the step wise process of double fertilisation.



Courtesy – NCERT

1. Pollen grain can be carried to the stigma by
 - a) Wind
 - b) Water
 - c) Insect
 - d) All of the above
2. Embryo sac have following cells
 - a) Polar Nuclei
 - b) Synergids
 - c) Antipodals
 - d) All the above
3. Pollen Tube in the given figure enters through
 - a) Microphle
 - b) Chlaza
 - c) Interguments
 - d) Nucellus

4. Double fertilization leads to the formulation of
 - a) Zygote
 - b) Endosperm
 - c) Both zygote and Endosperm
 - d) Formation of two Embryos
 5. What happens to the egg cell polar nuclei after fertilization?
-

Item Description:

| Q. No Level | Q. Type | Competency | Knowledge | Content | Difficulty |
|-------------|------------------|----------------------|-----------|---------|------------|
| 1 | Complex Multiple | Scientific Enquiry | Content | Global | Medium |
| 2 | Complex Multiple | Scientific Enquiry | Content | Global | Medium |
| 3 | Simple Multiple | Scientific Knowledge | Content | Global | Low |
| 4 | Simple Multiple | Scientific Knowledge | Content | Global | High |
| 5 | Open ended | Scientific Knowledge | Content | Global | High |

Answer key:

1. d > Full credit >2 , any other option >1
2. d > Full credit >2 , any other option > 1
3. a > Full credit > 2, any other option > 0
4. c > Full credit > 2, any other option > 0
5. They produce **Zygote** and **Primary Endosperm** after fertilization. Full credit > 2

16-BINARY AND MULTIPLE FISSION

Area: Health

Class: 10

Chapter: 8

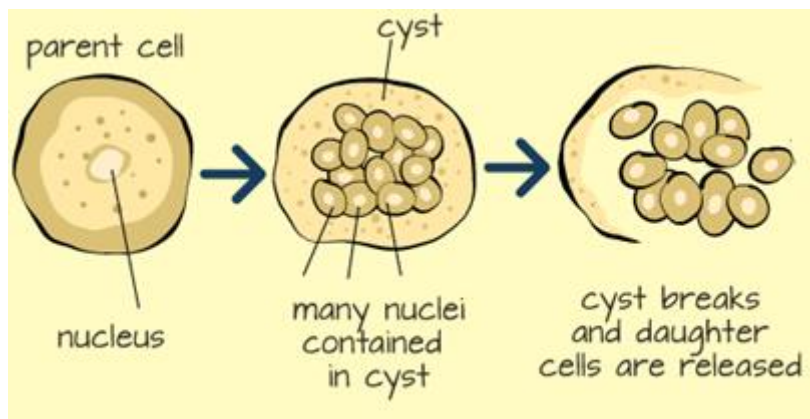
Chapter Name: How do organisms reproduce?

Concept: Asexual Reproduction.

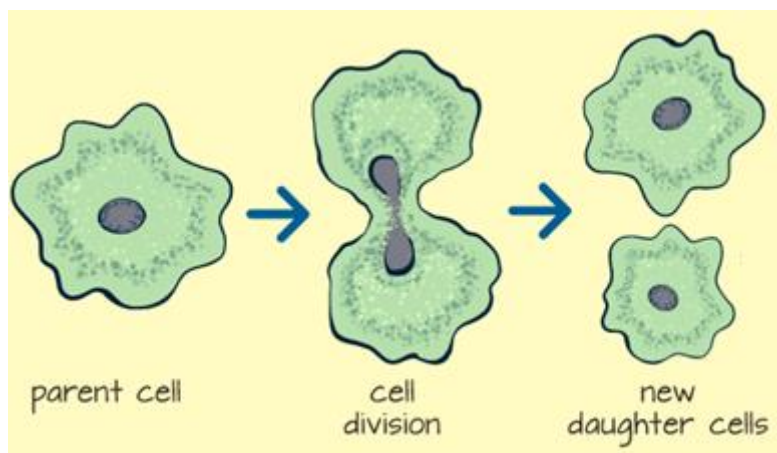
Learning outcomes:

The student will be able to

1. Explain the modes of asexual reproduction.
2. Draw labelled diagrams showing the process of fission.
3. Differentiate between binary and multiple fission.



Fission in simple terms is the splitting of a cell into two or more cells. Each small cell is known as a daughter cell. In Binary Fission, the cell divides itself into two, equal, identical parts with the same DNA.



Notice that binary fission starts with the nucleus dividing itself into two (mitosis) and move to opposite sides of the cell. After the cytoplasm constricts in the middle to split into two. The two new cells will have identical DNA.

In Multiple Fission, the cell divides into many cells by mitosis. In Multiple Fission, a protective covering called a cyst develops over the cell. The nucleus then divides itself into many more nuclei which become the core of many daughter cells contained in the cyst. As the cyst breaks, the daughter cells are released. Example of multiple fission can be seen in some protozoans such as plasmodium (malaria parasites)

1. In Binary Fission the organism can produce
 - a. Two organisms
 - b. One organisms
 - c. More than two organisms
 - d. None of the above
2. Which of the following organism that can reproduce by binary and multiple fission
 - a. Euglena
 - b. Plasmodium
 - c. Amoeba
 - d. Hydra
3. In which organism Binary fission is present?
 - a. Euglena
 - b. Paramecium
 - c. Hydra
 - d. Yeast
4. Amoebic Dysentery is caused by
 - a. Amoeba
 - b. Entamoeba
 - c. Engulena
 - d. Salmonella
5. Name the protozoan which undergoes multiple-fission and name the disease caused by it.

Item Description:

| Q. No Level | Q. Type | Competency | Knowledge | Content | Difficulty |
|----------------|------------------|----------------------|-----------|---------|------------|
| 1 | Simple Multiple | Scientific Enquiry | Content | Global | Low |
| 2 | Simple Multiple | Scientific Enquiry | Content | Global | Medium |
| 3 | Complex Multiple | Scientific Knowledge | Content | Global | Medium |
| 4 | Simple Multiple | Scientific Knowledge | Content | Global | High |
| 5 | Open ended | Interpret Data | Content | Global | High |

Answer key

1. a > Full credit >2 , any other option >0
2. c > Full credit >2 , any other option > 0
3. a,b > Full credit > 2, only a or only b > 1 , any other option > 0
4. b > Full credit > 2, any other option > 0
5. **Plasmodium vivax**, It causes **Malaria** . Full credit > 2

17-BLOOD DISORDERS INCLUDED IN THE RIGHTS OF PERSONS WITH DISABILITIES (RPWD) ACT, 2016

Area: Health

Class: 10

Chapter: 9

Chapter Name: Heredity and evolution.

Concept: Heredity.

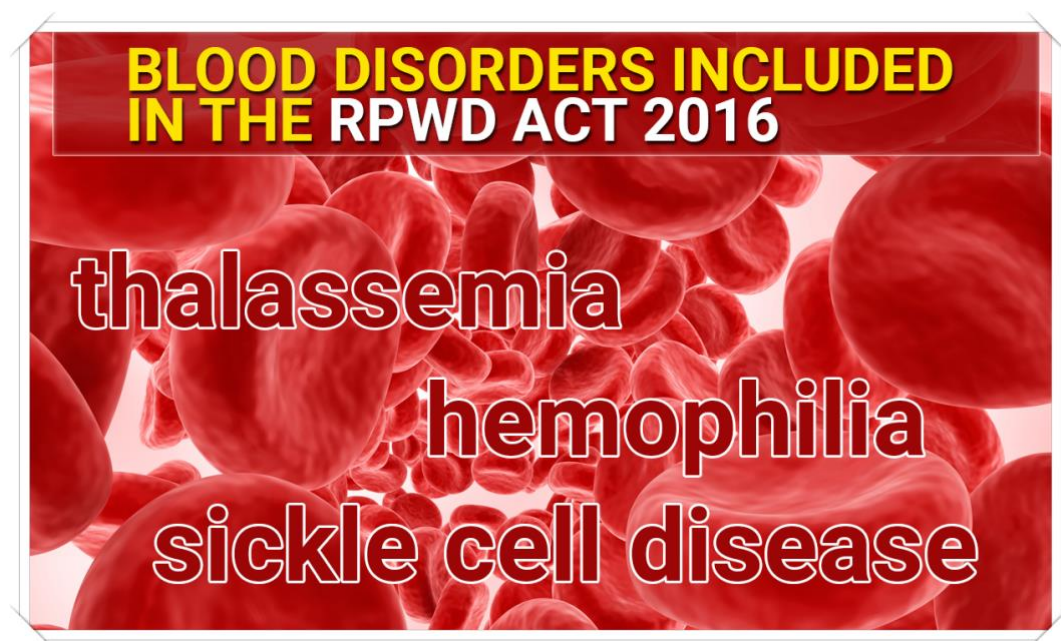
Learning outcomes:

The student will be able to

1. Differentiate the causes of Thalassemia, Haemophilia and Sickle Cell disease.
2. Relate the symptoms with the given types of blood disorders.
3. Understand the blood disorders included in the RPWD Act, 2016.

What are the blood disorders covered in The RPWD Act, 2016?

The three blood disorders included in The RPWD Act are Thalassemia, Hemophilia and Sickle Cell Disease.



Thalassemia

In Thalassemia, body cannot make enough haemoglobin or makes defective red blood cells (RBC) due to imbalance in alpha and beta genes in haemoglobin. RBCs break much early by 10-20 days than normal lifespan of 120 days. This leads to severe anemia. Severe anemia leads to lethargy, loss of appetite, disfigurement of facial bones, enlarged liver and spleen which lead to protruded abdomen and increased destruction of red blood cells.

Hemophilia

In Hemophilia, there is a deficiency of one of the factors necessary for coagulation of blood. This leads to excessive bleeding. People with hemophilia bleed easily, and the blood

takes a longer time to clot. There are different types of Hemophilia – Types A and B, based on the deficiency of the type of the clotting factor.

Sickle Cell Anaemia/Disease (SCD)

Normal RBC's (red blood cells) are smooth surfaced, enabling them to change their shape to flow through small blood vessels. Under certain conditions RBC's containing hemoglobin become rigid, elongated, and sickle shaped. These sickle-shaped cells are not flexible; they stick to vessel walls, causing a blockage of blood flow resulting into reduced supply of oxygen in nearby tissues causing sudden, severe pain attacks, called pain crises. Signs and symptoms of SCD include severe pain, hand-foot syndrome, abdominal pain, infections, leg ulcers, anemia, gallstones, organ damage, hip bone necrosis and stroke.

Q1. The RPWD 2016 act has included some blood disorders. This include

_____.

Q2. A person suffered a cut. Due to genetic blood disorder he suffered from severe blood loss, which was life threatening. Which blood disorder was he suffering from and what is the basis of classification of the disease.

Q3. A player suffered from fatigue, abdominal pain, organ damage and infection.

What could be the reason for these symptoms.

Q4. Thalassemia patients are at the risk of anaemia, lethargy what could be the reason.

Item Description

| Q.No | Q. Type | Competency | Knowledge | Context | Difficulty Level |
|------|--------------------|-----------------------------------|------------|----------|------------------|
| 1 | Closed constructed | Explain Phenomenon scientifically | Procedural | National | Low |
| 2 | Closed constructed | Explain Phenomenon scientifically | Procedural | National | Medium |
| 3 | Closed constructed | Explain Phenomenon scientifically | Procedural | National | Medium |
| 4 | Closed constructed | Explain Phenomenon scientifically | Procedural | National | Medium |
| 5 | Open ended | Explain Phenomenon scientifically | Epistemic | National | Medium |

Answer Key:

Q1. Thalassemia, Haemophilia and Sickle cell disease

Q2. The person is suffering from haemophilia. The classification is based on the type of clotting factor. Type of disease include A and B.

Q3. The person suffers from sickle cell anaemia

Q4. What accommodations (adjustments) should educational institutions provide.

1. There should be no discrimination in educational institutions.
2. There should be special arrangements in the playgrounds for their safety.
3. They should be provided extra time for exams
4. Any other point

18-HOW DO TIBETANS SURVIVE AT HIGH ALTITUDES?

Area: Environment

Class: 10

Chapter: 9

Chapter Name: Heredity and evolution.

Concept: Evolution

Learning outcomes:

The student will be able to

1. Explain the process of Homeostasis.
2. Apply his learning in hypothetical situation related to travelling in mountains.
3. Correlate adaption with the environmental conditions.



[1] If you live in the lowlands, you may have experienced the huffing and puffing that typically accompany a trip to higher altitudes. That's because oxygen levels go down as one goes up. Travelling to Shimla from sea level means a 17 % decrease in available oxygen. Our bodies compensate for even this small change with faster breathing and a higher heart rate –at least until we acclimate to the thinner atmosphere.

[2] What happens when you travel to the mountains.

As you increase elevation the PO_2 (P stands for partial pressure of oxygen in the atmosphere which is related to it's percentage) in the air drops which affects the pressure in arterial blood (PAO_2). The brain detects these changes and sends a message to increase respiration rate condition called **hyperventilation**. You are likely to take deeper breaths in addition to breathing faster and your rate will increase. You may experience dizziness, nausea, fatigue, and headaches.

3] Low arterial PO_2 will cause the release of **erythropoietin** from the kidneys. Erythropoietin will stimulate the bone marrow produce **more red blood cells** to increase the concentration of haemoglobin in the blood. This haemoglobin will have the effect of providing tissues with more oxygen

4] Extra haemoglobin may compensate for decreased oxygen levels, allowing breathing and heart rate to return to normal. This is an example of **phenotypic plasticity**, shifts in an organism's body, physiology or behaviour that are dependent upon the environment it occupies, **it is not a genetic change**. People can usually acclimate to higher altitudes within a couple of weeks.

Q1. What does the word 'compensate' mean. How does your circulatory system compensate for low levels of oxygen?

Q2. What is Hyperventilation? What are the side effects of hyperventilation?

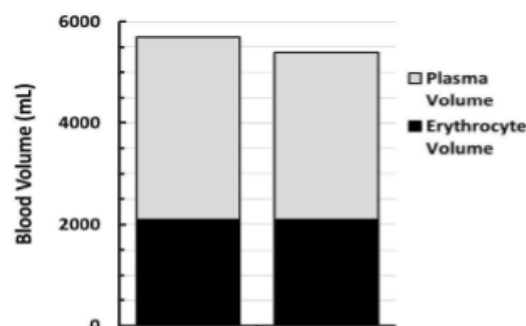
Q3. What is the role of your kidneys in compensating for low levels of oxygen.

Q4. Read the example of phenotypic plasticity and provide another example of this phenomenon. Think about this!

Q5. The following chart compares the haematocrit (the ratio of the volume of red blood cells to the total volume of blood) of blood samples taken from a person at sea level and one at a high altitude and explain your choice

BAR 1-A

BAR 2-B



Some People Didn't Just Acclimate, They Evolved

5 Tibetan highlanders have no trouble living at 13,000 metres, and many of them can climb parts of Mount Everest without supplemental oxygen. How do they do it ? New research makes it clear that Tibetan highlanders haven't just acclimated to their mountain home; they have evolved unique physiological mechanisms for dealing with low oxygen levels.



6 The evolutionary adaptation that allows Tibetans to function at high altitudes are very different from the acclimatization process that most of us go through when we spend time in those places.

7 One of these adaptations is almost exactly the opposite of a lowlander's response to high altitude. Tibetans have **gene** versions that cause to produce *fewer* red blood cells. How is that helpful? It turns out that extra red blood cells make blood thicker-more like honey than water -and after a certain point, this cell – laden blood can actually get so thick that it doesn't pass through capillaries efficiently to oxygenate cells. Having blood with too many red blood cells can be particularly problematic during pregnancy since it is linked to slow foetal growth and high rates of **foetal mortality**.

8 The basis for the Tibetans' adaptation is not a change in a gene that produces a haemoglobin or any one of the other proteins that make up red blood cells. Instead, the key change seems to be in a stretch of **DNA, called EPAS1**, which helps control the process of producing red blood cells. The change in EPAS1 seems to make Tibetans less likely to overproduce red blood cells at extreme altitudes.

9 Biologists compared the genomes (genetic makeup) of ethnic Tibetans to the genomes of Han Chinese individuals. The basic reasoning was that if a particular gene version was found in Tibetans, but not in their close relatives who lived in lowlands (Han), then that gene likely arose from **natural selection**. It was found that the Tibetans were much more likely to have this gene than Han Chinese.

Genetic studies estimate that the **Tibetan's split from the Hans Chinese** and began migrating to the highlands less than 3000 years ago, which means adaptation for living at high altitudes occurred in the population in about a hundred generations. That would represent the fastest example of human evolution ever documented!

Q6 How is adaptation as observed in the Tibetan population different from acclimatization ?

Q7. What are the consequences of having too many red blood cells.

Q8. What is EPAS1 and what is its role in circulatory system?

Q9 Why did scientists want to compare the genes of Tibetans to the genes of Han Chinese?

Q10. Scientists examined Tibetans and Han Chinese to compare average hemoglobin (Hb) amounts the blood. Does the data support the CLAIM that Tibetans have evolved? Or does it provide evidence that the Tibetans have adjusted? Explain your Reasoning. (2 pts)

| Group | Average [Hb] (g/dL) at high elevation | Average [Hb] (g/dL) at sea level |
|--------------------------|---------------------------------------|----------------------------------|
| Lowlanders (Han Chinese) | 18.5 | 15.3 |
| Tibetans | 15.8 | 15.6 |

Item Description:

| Q.No | Q. Type | Competency | Knowledge | Context | Difficulty Level |
|------|--------------------|-----------------------------------|------------|---------|------------------|
| 1 | Closed constructed | Explain Phenomenon scientifically | Content | Global | Low |
| 2 | Closed constructed | Explain Phenomenon scientifically | Procedural | Global | Medium |
| 3 | Closed constructed | Explain Phenomenon scientifically | Procedural | Global | Medium |
| 4 | Open ended | Explain Phenomenon scientifically | Epistemic | Global | High |

| | | | | | |
|----|--------------------|--|------------|--------|--------|
| 5 | Open ended | Interpret data | Epistemic | Global | High |
| 6 | Open ended | Explains phenomenon scientifically | Epistemic | Global | High |
| 7 | Closed constructed | Explains phenomenon scientifically | Procedural | Global | Medium |
| 8 | Closed constructed | Explains phenomenon scientifically | Content | Global | Medium |
| 9 | Open Ended | Explains phenomenon scientifically | Epistemic | Global | High |
| 10 | Open Ended | Evaluate and design scientific enquiry | Epistemic | Global | High |

Answer Key:

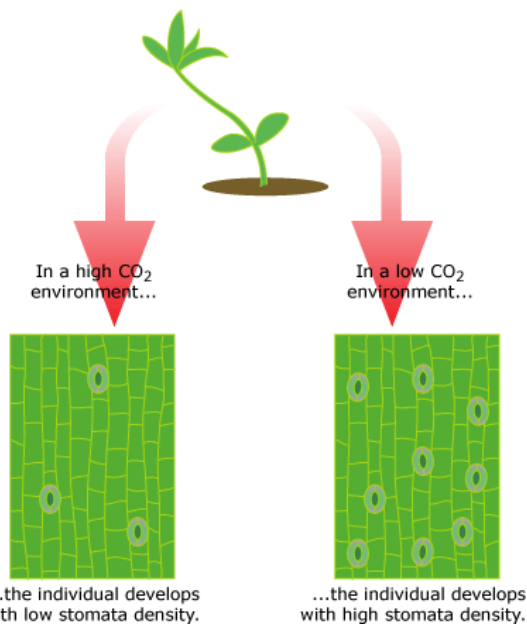
1. To overcome the deficiency. By increasing respiratory rate and heart rate.
2. As the elevation (altitude) increases the **PO₂ in the air drops** which affects the pressure in arterial blood (PAO₂).

The brain detects these changes and sends a message to **increase respiration rate** condition called **hyperventilation**.

Symptoms - dizziness, nausea, fatigue, and headaches.

3. Low arterial PO₂ causes the release of **erythropoietin** from the kidneys.
Erythropoietin stimulates the bone marrow to **produce more red blood cells** to increase the concentration of haemoglobin in the blood. This haemoglobin provides the tissues with more oxygen
4. Phenotypic plasticity refers to the capacity of the same organisms to exhibit different characteristics under varied environmental conditions.
Anyone training for a marathon knows that although the goal may at first seem unattainable, with the correct exercise regime, even the least promising athlete will eventually cross the finish line. This is an e.g of phenotypic plasticity, which allows us to reshape our bodies within the strictures of our genetic make-up.

Change in stomata density in an individual due to phenotypic plasticity



E.g. from plants ...the individual develops with low stomata density.

...the individual develops with high stomata density.

5. The bar A represents that of person high altitude at as blood volume is more. (acclimatisation)

6. Tibetan population have adapted to the high altitude. Tibetans have **gene** versions that cause to produce *fewer* red blood cells. Whereas acclimatization is temporary and takes few days to happen. How is that helpful? Having

7. i. The extra red blood cells make blood thicker-more like honey than water -and after a certain point, this cell – laden blood can actually get so thick that it doesn't pass through capillaries efficiently to oxygenate cells.

ii. Blood with too many red blood cells can be particularly problematic during pregnancy since it is linked to slow foetal growth and high rates of **foetal mortality**

8. **EPAS1** is a stretch of **DNA**, which helps control the process of producing red blood cells

The change in EPAS1 seems to make Tibetans less likely to overproduce red blood cells at extreme altitudes.

9. To study the process of natural selection.

10. The data supports the claim that Tibetans have evolved as

i. The lowlanders (Han Chinese) have increased haemoglobin at high elevation (18.5 g/dl) in comparison to the Tibetans living at high elevation.

ii. The haemoglobin level of Tibetans is almost same at sea level and high levels.

19-QR CODE AND BARCODE SCANNER

Area: Frontiers of Science and Technology

Class: 10

Chapter: 10

Chapter Name: Light: Reflection and Refraction.

Concept: Reflection.

Learning outcomes:

The student will be able to

1. Differentiate between a bar code scanner and a QR code scanner.
2. Discuss and appreciate stories of scientific discoveries like mobile communication QR codes.
3. Conduct simple investigations to seek answers to queries.
4. Explain the process and phenomena of reflection and signal communication scientifically.

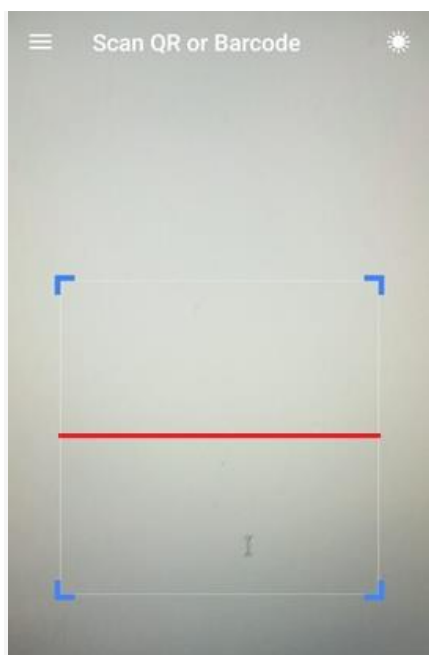


Figure 1



Figure 2

QR code (Quick Response code) is the trademark for a type of matrix barcode first designed in 1994 for the automotive industry in Japan.

Bar code and QR Code technique is fascinating, innovative and very useful to share information. A barcode scanner has three parts: the illuminator, the decoder, and the sensor/convertor. The barcode scanner first illuminates the barcode with red light and sensor/convertor part of the scanner then detects the reflected light. Once the light is detected, an analog signal is produced. This signal is electrical in nature and contains varying voltage based on the intensities of the reflected light. Next the analog signal is converted into a digital signal by the sensor. Decoder interprets the digital signal, finally the decoder then sends the information to the computer attached to the scanner.

There is one difference that in QR code scanner, the decoder sends the information to your mobile phone instead of a computer. The mobile application which you download for your phone from Google play store that is a QR code scanner contains the illuminator, which is the red light that runs across the screen when you open the app (screen shot shown in figure No 1).The sensor and decoder then work to decode the QR code. Then the decoder sends the information to your phone, and you will be able to see where the QR code was supposed to take you.

The way the scanner reads the reflected light it actually a lot more complicated than the way that it is simply described here, but it's very interesting that all you have to do is download a free application and now your phone is a Barcode/QR code scanner. Since this scanning technology is so easily accessible with most phones, QR codes as a marketing tool seems like they will be around for a while.

Activity: Scan the QR Code provided above in figure 2 and discuss with your teacher (Optional)

(Source : Wikipedia and <http://www.qrcodestickers.org/>)

Q 1 What are the differences between Barcode scanner and QR Code scanner ?

Q 2 Which of the optical phenomenon is applied in Barcode scanner and QR Code scanner respectively :-

- | | |
|----------------------------|----------------------------|
| a) Reflection , Refraction | b) Refraction, Reflection |
| c) Reflection, Reflection | d) Refraction, Refraction |

Q 3 State true or false for the following :-

- a) A barcode scanner is composed of two parts: the illuminator, and the sensor/convertor
- b) A QR Code scanner is composed of three parts: the illuminator, the decoder, and the sensor/convertor
- c) Smart phone can read both QR Code and Bar Code
- d) Sensor/convertor part of the scanner detects the reflected light and then , an analog signal is generated.

Q 4 Steps of procedures take place in Bar Code Scanner are given below, arrange them in correct sequence

- 1. Barcode scanner illuminates the barcode with red light
- 2. The sensor/convertor part of the scanner then detects the reflected light
- 3. Once the light is detected, an analog signal is generated
- 5. The analog signal is converted by the sensor into a digital signal
- 6. The digital signal is then interpreted by the decoder
- 7. The decoder then sends the information to the computer attached to the scanner.

- | | |
|------------------|-------------------|
| a) 1,3,2,4,5,6,7 | b) 1,2,3,4,5,6,7 |
| c) 2,1,3,4,6,5,7 | d) 3,1,2,4,5,6,7 |

Q 5 Which colour light is used in Barcode scanner and QR Code scanner respectively :-

- a) Red Light, White Light b) Red Light, Red Light
c) White Light , Red Light d) White Light, White Light

Q 6 Write brief information which you have received by performing Activity of scanning QR code

Item Description:

| Q.No. | Q.Type | Competency | Knowledge | Context | Difficulty Level |
|-------|------------------------|--|------------|----------|------------------|
| 1 | Open Ended | Interpret Data and evidence Scientifically | Content | Personal | M |
| 2 | Simple Multiple Choice | Interpret Data And Evidence Scientifically | Content | Personal | M |
| 3 | Closed Constructed | Explain Phenomenon Scientifically | Procedural | Personal | M |
| 4 | Simple Multiple Choice | Evaluate And Design Scientific Enquiry | Procedural | Personal | H |
| 5 | Simple Multiple Choice | Interpret Data And Evidence Scientifically | Procedural | Personal | M |
| 6 | Open Ended | Evaluate And Design Scientific Enquiry | Procedural | Personal | M |

Answer/Scoring Key

Q 1 Full marks for two differences, Partial marks for one difference. No marks for irrelevant and vague responses.

Q 2 Ans c, Full credits for correct answer, No credit for any other response.

Q 3 Ans F,T,T,T Full credits for all correct answers, Partial credits for less than four correct answer in ratio.

Q 4 Ans b, Full credits for correct answer, No credit for any other response.

Q 5 Ans b, Full credits for correct answer, No credit for any other response.

Q 6 Optional

20-POWER OF LENS

Area: Frontiers of Science and Technology

Class: 10

Chapter: 10

Chapter Name: Light: Reflection and Refraction.

Concept: Refraction.

Learning outcomes:

The student will be able to

1. Calculate the power of a combined lens system.
2. Apply the scientific concepts in daily life to understand the working of optical instruments based on refraction.

Many optical instruments consist of a number of lenses. They are combined to increase the magnification and sharpness of the image. The net power (P) of the lenses placed in contact is given by the algebraic sum of the individual powers P_1, P_2, P_3, \dots as

$$P = P_1 + P_2 + P_3 + \dots$$

The use of powers, instead of focal lengths, for lenses is quite convenient for opticians. During eye-testing, an optician puts several different combinations of corrective lenses of known power, in contact, inside the testing spectacles' frame. The optician calculates the power of the lens required by simple algebraic addition. For example, a combination of two lenses of power $+2.0\text{ D}$ and $+0.25\text{ D}$ is equivalent to a single lens of power $+2.25\text{ D}$. The simple additive property of the powers of lenses can be used to design lens systems to minimise certain defects in images produced by a single lens. Such a lens system, consisting of several lenses, in contact, is commonly used in the design of camera lenses and the objectives of microscopes and telescopes.

(Source : NCERT X Science Text Book)

Concept of power of lens is very useful in many areas of science and technology and solves problems of everyday life. Read text given above and answer the following questions

Q 1 Combination of two lenses having power of $+2\text{ D}$ and -3 D is constructed what is the net power and nature of resultant lens so formed ?

a) $+1\text{ D}$ Convex Lens b) -1 D , Convex Lens c) -1 D , Concave lens d) $+5\text{ D}$, Convex Lens

Q 2 Combination of lenses helps in :-

- a) Minimizing Defects in Image Produced by a Single Lens b) Increasing Power of Lens
c) Decreasing Power of Lens d) All of the above

Q 3 "This is better to combine lenses to get a lens of desired power instead of using a single lens" Justify this statement

Q 4 Technique of combination of lenses is used in designing :-

a) Cameras b) Telescope c) Microscopes d) All of the above

Q 5 “Use of powers instead of focal lengths is preferred by opticians” Justify

Item Description:

| Q.No. | Q.Type | Competency | Knowledge | Context | Difficulty Level |
|-------|------------------------|--|------------|----------|------------------|
| 1 | Simple Multiple Choice | Interpret Data and evidence Scientifically | Content | Personal | M |
| 2 | Simple Multiple Choice | Interpret Data and evidence Scientifically | Content | Personal | M |
| 3 | Open ended | Explain Phenomenon Scientifically | Procedural | Personal | M |
| 4 | Simple Multiple Choice | Interpret Data And Evidence Scientifically | Content | Personal | M |
| 5 | Open Ended | Explain Phenomenon Scientifically | Procedural | Personal | M |

Answer/Scoring Key:

Q 1 Ans c, Full score for correct option , No score for any other option

Q 2 Ans d, Full score for correct option , No score for any other option

Q 3 Full Score for answer “Combination of lenses increase magnification and sharpness of image and reduce many defects in images formed by single lens”. Partial score if answer is relevant but not to the point. No score for irrelevant or vague answer.

Q 4 Ans d, Full score for correct option , No score for any other option

Q 5 Full Score for answer “Use of powers instead of focal lengths is convenient” , Partial score if answer is relevant but not to the point. No score for irrelevant or vague answer.

21-UNCORRECTED VISION PROBLEM

Area : Health

Class: 10

Chapter: 11

Chapter Name: The Human Eye and the Colourful World.

Concept: Defects of Vision.

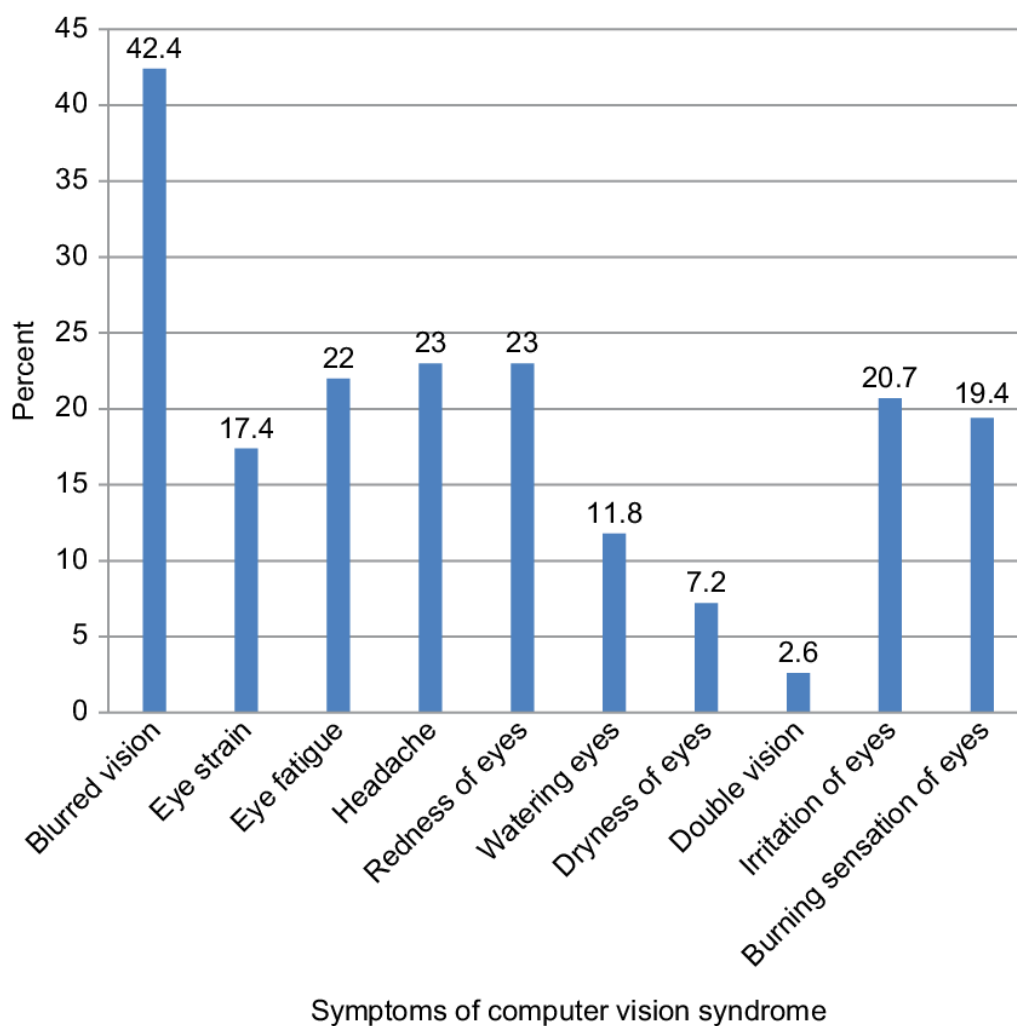
Learning outcomes:

The student will be able to

1. Explain the defects of vision.
2. Analyze and interpret the data in the given graph.
3. Differentiate between uncorrected and under corrected vision.

The presence of even minor vision problem can often significantly affect work comfort and performance at a computer .Uncorrected and farsightedness, astigmatism presbyopia can be major contributing factor to computer related eye stress.

A high percentage of computer operators have been found to have uncorrected or under corrected vision problems that may affect their visual performance and comfort .All computer workers should have a comprehensive eye examination, should include careful analysis of the functioning of the eye.



1 From the graph it can concluded

- a) Those computer operators who have headache will definitely have redness of eye.
- b) The major symptom of computer vision syndrome is blurred vision.

A) a B) b C) a&b both D) none of these

2. Uncorrected and undercorrected vision effects the performance of the child not only in academics but in other fields also .What according to you are the necessary visual skills needed for a child to be good in sport?

.....
.....

3. What are the signs which can help to detect whether a child has a vision problem or not ?

.....

4. Holding reading material too close to eyes can lead to a refractive error in the eye .Which defect it can be ? What changes occur in the eye due to it ? How it can be corrected?

.....
.....

Item Description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|-------------------|--|-----------|----------|------------------|
| 1. | close constructed | Interpret data and evidence scientifically | content | Global | Medium |
| 2. | open ended | Explain phenomenon scientifically | content | global | Medium |
| 3. | close constructed | Explain phenomenon scientifically | content | personal | Low |
| 4. | open ended | Explain phenomenon scientifically | epistemic | global | high |

Answer key:

1 B

2. Clear distant vision, wide field of vision, good depth perception, effective eye hand coordination (any of them)

3 frequent eye rubbing /blinking/seeing doubling/losing place when reading /frequent headaches

4. Myopia elongation of eye ball, excessive curvature of eye lens

22-HUMAN BATTERY

Area: Frontiers of Science and Technology

Class: 10

Chapter: 12

Chapter Name: Electricity.

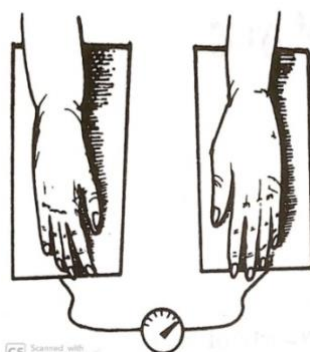
Concept: Electricity.

Learning outcomes:

The student will be able to

1. Measure the strength of current using appropriate apparatus.
2. Compare the electrical conductivity of different metals.
3. Exhibit creativity in designing a model of a battery.

A battery that consists of a pair of electrode and a person, as an electrolyte, produces a measurable voltage, but only if electrodes are made of different metals.



Connect the terminals of the voltmeter to the copper and zinc sheets, and put one hand on each sheet. The voltmeter should read about 0.7 V. Other pairs of metals will yield different values, depending on the metal's relative electrochemical potential. If you replace the zinc sheet by the second copper sheet, and place each hand on a copper sheet, the voltmeter will of course read zero, since two different metals are required for a battery. In order for the battery to function, the surface of your hands must have plenty of ions (this is generally the case). If copper and zinc strips cut from the sheets are placed in a beaker of distilled water, the voltage reading will be zero, showing that electrolyte (ions in solution) is necessary, as well as two different metals, for a battery to work.

Q1. If two copper electrodes cannot work, then two zinc electrodes should also not work. Can you point out the reason behind it?

.....

Q2. A voltmeter in the above context measures

- a. Electrochemical potential of metal plates
- b. Relative electrochemical potential of metal plates
- c. Relative electrochemical potential of electrolyte
- d. Relative electrochemical potential of human hands

Q3. Distilled water has no free ions, hence it's

- a. Insulator
- b. Conductor
- c. Electrolyte
- d. Semiconductor

Q4. The voltmeter reading must be 0.7 V. What 'V' stands for?

Q5. The reading on the voltmeter in above mentioned situation

- a. Must depend upon the person's age
- b. Must depend upon body weight
- c. Must depend only upon the pair of metal sheets not on person
- d. Must be a constant for a person for any pair of metal sheets

Q6. Any justification behind plenty of ions on human hands as mentioned in the above paragraph?

Item Description

| Q.No | Q. Type | Competency | Knowledge | Context | Difficulty Level |
|------|--------------------|-----------------------------------|------------|----------|------------------|
| 1 | Closed constructed | Explain Phenomenon scientifically | Epistemic | Personal | Medium |
| 2 | Simple MCQ | Explain Phenomenon scientifically | Procedural | National | Medium |
| 3 | Simple MCQ | Explain Phenomenon scientifically | Procedural | National | Medium |
| 4 | Closed constructed | Explain Phenomenon scientifically | Content | Global | Low |
| 5 | Simple MCQ | Explain Phenomenon scientifically | Epistemic | Global | Medium |
| 6 | Open ended | Explain Phenomenon scientifically | Epistemic | Global | High |

Answer Key:

Q1. Same electrochemical potential for same metal plates

Q2. b.

Q3. a.

Q4. volt

Q5. c.

Q6. Like any matter, human skin also has chemical consistency. It has mainly Carbon, Nitrogen, Hydrogen, Oxygen and traces of many other mono-valent ions of Sodium, Potassium, Chlorine etc.

23-ELECTRICAL PARADOX

Area: Frontiers of Science and Technology

Class: 10

Chapter: 12

Chapter Name: Electricity.

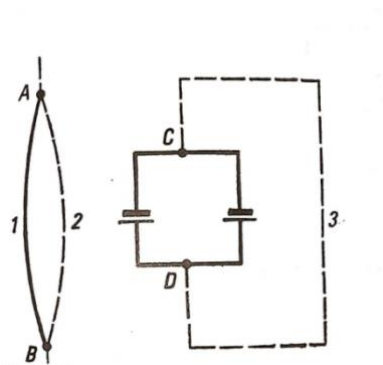
Concept: Series and Parallel Combination.

Learning outcomes:

The student will be able to

1. Draw and interpret a simple electrical circuit.
2. Differentiate between a series and a parallel circuit.
3. Explain the advantages and disadvantages of series and parallel circuits.

Let us consider the two electrical circuits shown in figure. If the current does not flow along conductor $A1B$, it will also be absent in conductor $A2B$, since they are both connected to the same points A and B .



If two identical galvanic cells are connected in parallel there will be no current in parallel there will be no current in either cell. Thus, there is no current between points C and D , as we saw occurs between A and B in the first case. However, by reasoning in an analogous fashion, we would conclude that there should also be no current in the battery, i.e. points C and D . Does this not contradict experience?

Q1. If current is not flowing along $A1B$ then what would be reason behind that?

Q2. When do you say cells are connected in parallel?

Q3. What do you think, the analogy contradict the experience? Also justify.

Q4. If conductor $C3D$ is not connected, then

- a. C and D will be at different potential and current will flow through the cells
- b. C and D will be at same potential and current will flow through the cells
- c. C and D will be at different potential and current will not flow through the cells
- d. C and D will be at same potential and current will not flow through the cells

Q5. The e.m.f of parallel connection of two identical cells

- a. Becomes double of single cell
- b. Becomes half of that of single cell
- c. Equal to that of single cell
- d. Complete data not given

Item Description

| Q.No | Q. Type | Competency | Knowledge | Context | Difficulty Level |
|------|--------------------|--|------------|----------|------------------|
| 1 | Closed constructed | Explain Phenomenon scientifically | Epistemic | Global | Medium |
| 2 | Closed constructed | Explain Phenomenon scientifically | Content | Global | Low |
| 3 | Closed constructed | Evaluate and design Scientific enquiry | Procedural | Global | High |
| 4 | Simple MCQ | Explain Phenomenon scientifically | Procedural | National | Medium |
| 5 | Simple MCQ | Explain Phenomenon scientifically | Epistemic | National | Medium |

Answer Key:

Q1. A and B are at same electric potential

OR

no source of potential difference is connected with A and B.

Q2. When same polarity ends of cells are connected together.

Q3. YES.

When C and D would be connected via 3. The combination of cells will act as source of potential difference. Two cells will act as a single cell with larger (electrode) plate area.

Q4. c

Q5. c.

24-ELECTRIC FUSE

Area: Frontiers of Science and Technology.

Class: 10

Chapter: 13

Chapter Name: Magnetic Effects of Electric Current.

Concept: Magnetic Effects of Electric Current.

Learning outcomes:

The student will be able to

1. Differentiate between a short circuit and overloading.
2. Relate the rating of the electric fuse required for a particular circuit.
3. Explain the working of an electric fuse.
4. Apply the knowledge of working of fuse in day to day life.

Electric fuse is a safety device used in electric circuits to protect the circuit and appliances from damage due to overloading and short circuiting. It is a wire having high resistance and low melting point. If excess current flows through the circuit, the fuse wire melts and breaks the circuit. Fuse wire is made of a metal or an alloy of metals like lead, tin, aluminium and copper. Fuse wire is connected in series with the live wire.



FUSE



MCB

These days more and more houses are using 'Miniature Circuit Breakers' (MCBs) to protect the household wiring from the excessive flow of electric current through it. If the current becomes too large, the miniature circuit breaker puts off a switch cutting off the electric supply. The MCB can be re set when the fault has been corrected.

Fuses are also used to protect the individual domestic electrical appliances from damage which may be caused due to excessive current flow through them. Costly electrical appliances like T.V. sets and refrigerators have their own fuses which protect them against damage by too much current. The fuse used for each electrical appliance should be slightly larger than the normal current drawn by it.

- At the time of short circuit, the current in the circuit:
 - Reduces substantially
 - Does not change
 - Increases heavily
 - Varies continuously
- Which of the following statements is not true?
 - In a house circuit, lamps are used in parallel.
 - Switches, fuses and circuit breakers should be placed in the neutral wire.
 - An electric iron has its earth wire connected to the metal case to prevent the user receiving a shock.
 - When connecting a three core cable to a 13 A three pin plug, the red wire goes to the live pin.
- Which of the following would be most suitable for protecting an amplifier rated at 240V, 180W?
 - 250mA
 - 500mA
 - 1 A
 - 5 A
- An MCB which cuts off the electricity supply in case of short circuiting or overloading works on the:
 - Magnetic effect of current
 - Chemical effect of current
 - Heating effect of current
 - Electroplating effect of current
- Daksh was given two thin wires X and Y in the science laboratory. The teacher asked him to find out (by performing suitable activities) which wire was 'fuse wire' and which one a 'nichrome wire'. Daksh was given batteries of 3 V and 12 V, and some copper connecting wires along with crocodile clips. The teacher also advised Daksh to put off fan while performing the activities and take necessary precautions to avoid burns. Daksh performed the activities and concluded that wire X is a fuse wire whereas wire Y is a nichrome wire.
 - Describe briefly the activity which Daksh could have performed to conclude that wire X is a fuse wire.
 - Describe briefly the activity which Daksh could have performed to conclude that wire Y is a nichrome wire.

Item description:

| Q. No. | Q Type | Competency | Knowledge | Context | Difficulty Level |
|--------|------------------|---|------------|---------|------------------|
| 1. | MCQ | Explain phenomena scientifically | Content | Global | Low |
| 2. | MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 3. | MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 4. | MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 5. | Close structured | Evaluate and design scientific enquiry. | Procedural | Global | High |

Answer key:

- (C) Increases heavily
- (B) Switches, fuses and circuit breakers should be placed in the neutral wire.

3. (C) 1 A
4. (A) Magnetic effect of current
5. (A) Daksh first connected the wire X in series circuit with 3 V battery. The wire got heated a little but did not glow. Daksh then connected wire X in series with 12 V battery. He found that wire X got heated too much, melted and broke into two pieces. So wire X is a fuse wire.
(B) Daksh first connected the wire Y in series circuit with 3 V battery. He found that the wire got heated and became dull red. Daksh then connected wire Y in series with 12 V battery. He found that wire Y got heated too much and started glowing bright red. This shows that the wire Y is like the heating element of an electric heater and hence made of nichrome.

Scoring key:

1. Full credit: option (C)
No credit: any other response.
2. Full credit: option (B)
No credit: any other response.
3. Full credit: option (C)
No credit: any other response.
4. Full credit: option (A)
No credit: any other response.
5. (a) Full Credit: Daksh first connected the wire X in series circuit with 3 V battery. The wire got heated a little but did not glow. Daksh then connected wire X in series with 12 V battery. He found that wire X got heated too much, melted and broke into two pieces. So wire X is a fuse wire.
No credit: Any other response.
(b) Daksh first connected the wire Y in series circuit with 3 V battery. He found that the wire got heated and became dull red. Daksh then connected wire Y in series with 12 V battery. He found that wire X got heated too much and started glowing bright red. This shows that the wire Y is like the heating element of an electric heater and hence made of nichrome.
No credit: Any other response.

25-AN ELECTROMAGNETIC CRANE

Area: Frontiers of Science and Technology.

Class: 10

Chapter: 13

Chapter Name: Magnetic Effects of Electric Current.

Concept: Magnetic Effects of Electric Current.

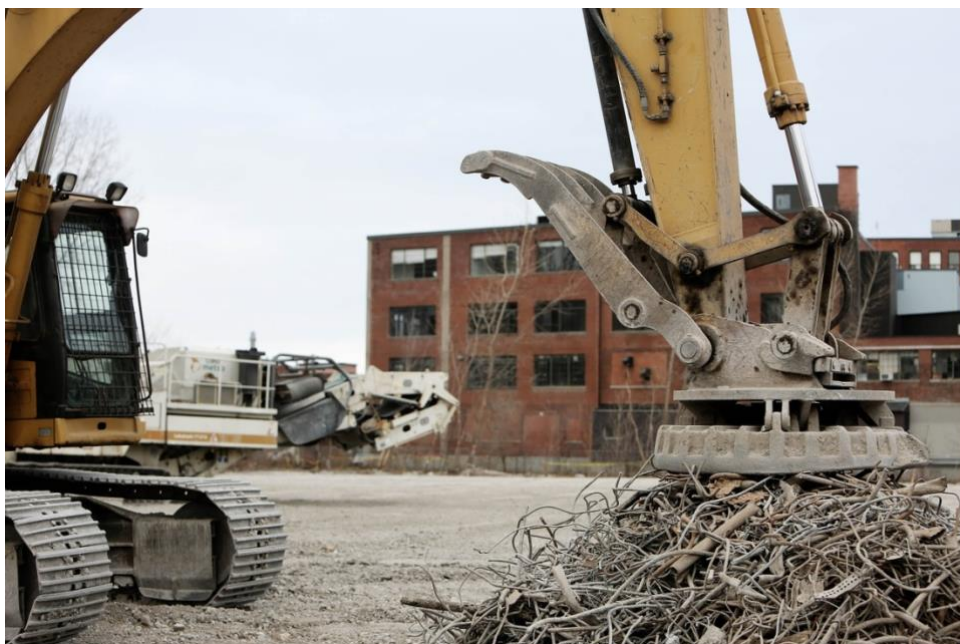
Learning outcomes:

The student will be able to

1. Explain what an electromagnet is.
2. Differentiate between a natural magnet and an electromagnet.
3. Exhibit creativity in designing simple models showing applications of an electromagnet in daily life.

An electromagnetic crane is a type of crane in which we use an electromagnet (which is made up of a soft iron core and a copper wire is wound around its periphery) to lift heavy material (magnetic material). An electromagnet does all the things that ordinary magnets can do, but you can switch them on and off. Strength of electromagnets can be varied.

The magnetic strength of an electromagnet depends on the number of turns of the wire and the current through the wire, and the size of the iron core. This allows electromagnets to be made much larger and stronger than a natural magnet, such that they can pick up very large objects. Also, when you turn off the electricity to an electromagnet, the magnetism is also turned off. Thus, an electromagnet can be used to pick up a piece of iron and then drop it at some desired place.



Now answer the following questions:

- An electromagnetic crane makes use of:
 - Chemical effect of electric current
 - Heating effect of electric current
 - Magnetic effect of electric current
 - All of the above.
- The most suitable material for making the core of an electromagnet is:
 - Brass
 - soft iron
 - aluminium
 - steel
- The magnetic field lines in the middle of the current carrying solenoid are:
 - circles
 - spirals
 - parallel to the axis of the tube
 - perpendicular to the axis of the tube.
- The strength of the magnetic field between the poles of an electromagnet would be unchanged if:
 - Current in the electromagnet winding is doubled
 - Direction of current in electromagnet winding is reversed
 - Distance between the poles of the electromagnet is doubled
 - Material of the core of the electromagnet is changed.
- Explain what will happen if we replace soft iron with steel as the core of the electromagnet?
- Can the following conclusions be drawn from the information given above? Circle 'Yes' or 'No' for each conclusion.

| Conclusion to be drawn from the passage | Yes or No |
|---|-----------|
| An electromagnet is temporary magnet. | |
| An electromagnet can be switched on and switched off. | |
| An electromagnetic crane can also make use of a permanent magnet. | |

Item description:

| Q. No. | Q Type | Competency | Knowledge | Context | Difficulty Level |
|--------|------------------|--|-----------|---------|------------------|
| 1. | MCQ | Explain phenomena scientifically | Content | Global | Low |
| 2. | MCQ | Explain phenomena scientifically | Content | Global | Low |
| 3. | MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 4. | MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 5. | Close structured | Explain phenomena scientifically | Content | Global | Medium |
| 6 | Close structured | Interpret data and evidence scientifically | epistemic | Global | Medium |

Answer key:

- (C) Magnetic effect of electric current.
- (B) soft iron
- (C) parallel to the axis of the tube

4. (B) Direction of current in electromagnet winding is reversed
5. The core of an electromagnet must be of soft iron because soft iron loses all of its magnetism when current in the coil is switched off. On the other hand if steel is used for making the core of an electromagnet, it does not lose all its magnetism when the current is stopped and it becomes a permanent magnet.
6. Yes, yes, no. (in this order).

Scoring key:

6. Full credit: option (C)
No credit: any other response.
7. Full credit: option (B)
No credit: any other response.
8. Full credit: option (C)
No credit: any other response.
9. Full credit: option (B)
No credit: any other response.
10. Full credit: The core of an electromagnet must be of soft iron because soft iron loses all of its magnetism when current in the coil is switched off. On the other hand if steel is used for making the core of an electromagnet, it does not lose all its magnetism when the current is stopped and it becomes a permanent magnet.
Partial credit: The core of an electromagnet must be of soft iron because soft iron loses all of its magnetism when current in the coil is switched off / if steel is used for making the core of an electromagnet, it does not lose all its magnetism when the current is stopped and it becomes a permanent magnet.
No credit: any other response.
11. Full credit: Yes, yes, no. (in this order).
No credit: any other response.

26-CAN SOLAR POWER COMPETE WITH FOSSIL FUELS?

Area: Natural Resources.

Class: 10

Chapter: 14

Chapter Name: Sources of Energy.

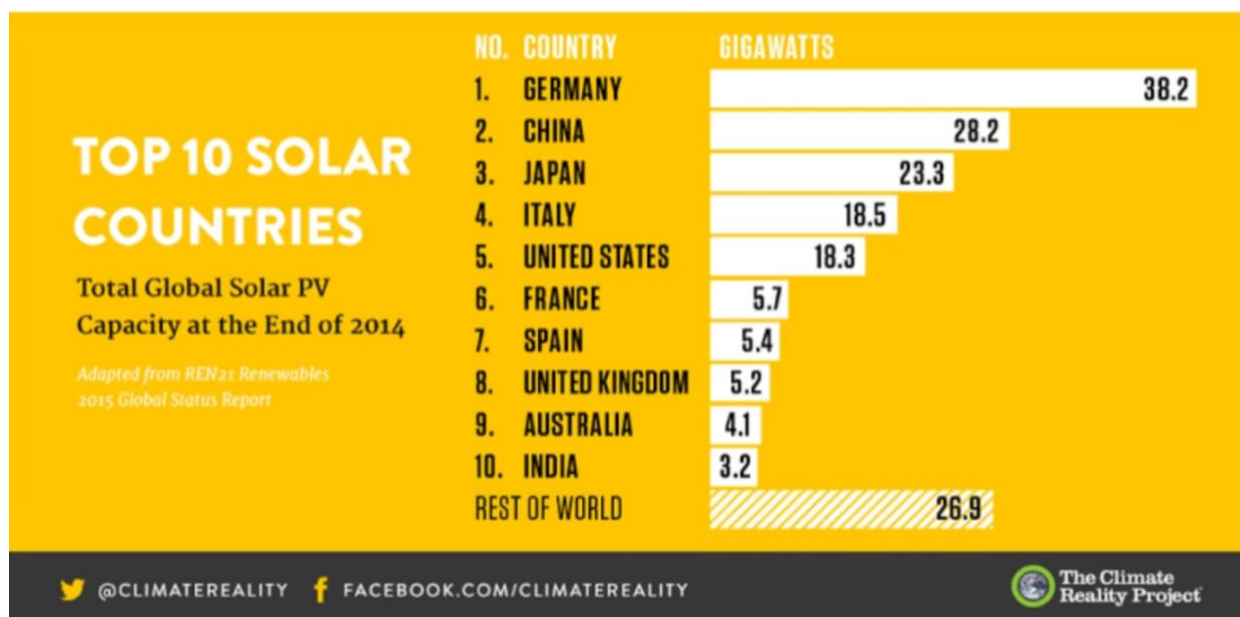
Concept: Sources of Energy.

Learning outcomes:

The student will be able to

1. Differentiate between solar energy and electric energy.
2. Classify renewable and non renewable resources.
3. Interpret data from the given graph.
4. Make efforts to conserve environment by appreciating and promoting renewable resources.

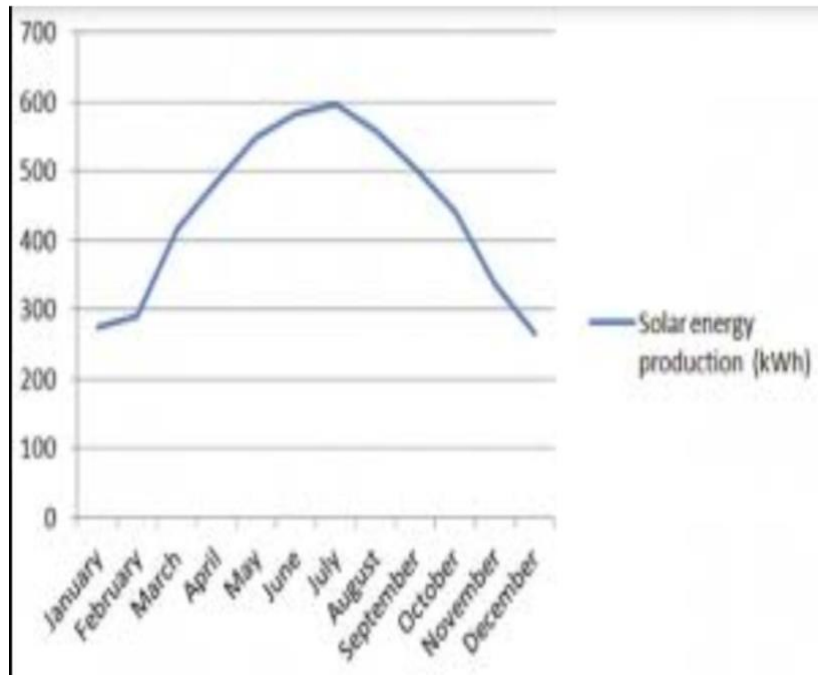
Electricity from sunlight costs less, a hopeful sign for developing nations building out their power grids. BHADLA in India, a solar power plant is producing some of the world's cheapest energy. It was built in 2018 by India's Acme Solar Holding Limited. It can generate 200 MW of electricity. It sells the electricity to distributors for Rs 2.44 per kWh. India has pledged as a climate goal that 40% of its electric capacity will come from non fossil fuels by

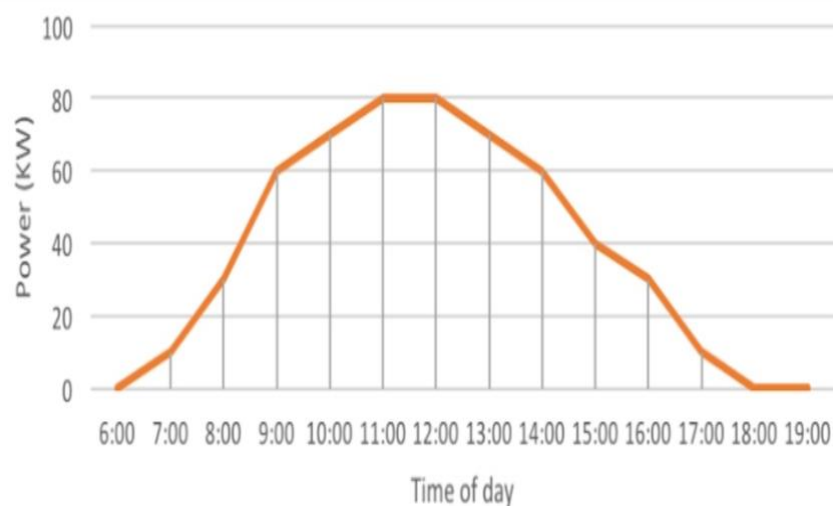


2030. Across Asia, a region expected to account for 2/3rd of the world's new power demand during the next two decades, price declines will make wind and solar energy combined 17% cheaper than coal by 2030 on a levelized basis. In India solar power generation will be almost 50% cheaper by 2030.

Now answer the following questions:

1. On the basis of the data given which country ranks highest and second lowest in the use of alternate sources of energy?
2. Find out from the graph the difference in the power used by China and India?
3. Why are renewable energy sources not used as much as fossil fuels?
4. Which type of energy is not derived from the sun?
C) Nuclear energy B) Geothermal energy C) Biomass D) None of the above
5. Does use of solar panels reduce carbon footprint? How?





6. From the above graphs find out at what time of the day and during which months we can harness the maximum solar energy.

Item description:

| Q. No. | Q Type | Competency | Knowledge | Context | Difficulty Level |
|--------|------------------|--|-----------|---------|------------------|
| 1. | Close structured | Explain phenomena scientifically | Content | Global | Low |
| 2. | Close structured | Explain phenomena scientifically | Content | Global | Low |
| 3. | Open Ended | Explain phenomena scientifically | Content | Global | Medium |
| 4. | MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 5. | Open Ended | Explain phenomena scientifically | Content | Global | Medium |
| 6. | Close structured | Interpret data and evidence scientifically | Content | Global | Medium |

Answer key:

- Full credit:
Highest: Germany
Second lowest: Australia
No credit: any other response.
- Full credit: 25 Giga watts.
No credit: any other response.
- Full credit: Fossil fuels provide much more amount of energy in comparison to renewable energy sources and at a steady rate. Also fossil fuels are convenient to use, store and handle.
No credit: any other response.
- Full credit: option A

No credit: any other response.

5. Full credit: yes. Use of solar energy does not involve any carbon compounds. So it reduces carbon foot print.

No credit: any other response.

6. Full credit: from the graph it can be seen that maximum amount of solar energy is available during 11am to 12 noon and during June and July.

No credit: any other response.

27-GREEN POWER

Area: Natural Resources

Class: 10

Chapter: 14

Chapter Name: Sources of Energy.

Concept: Sources of Energy

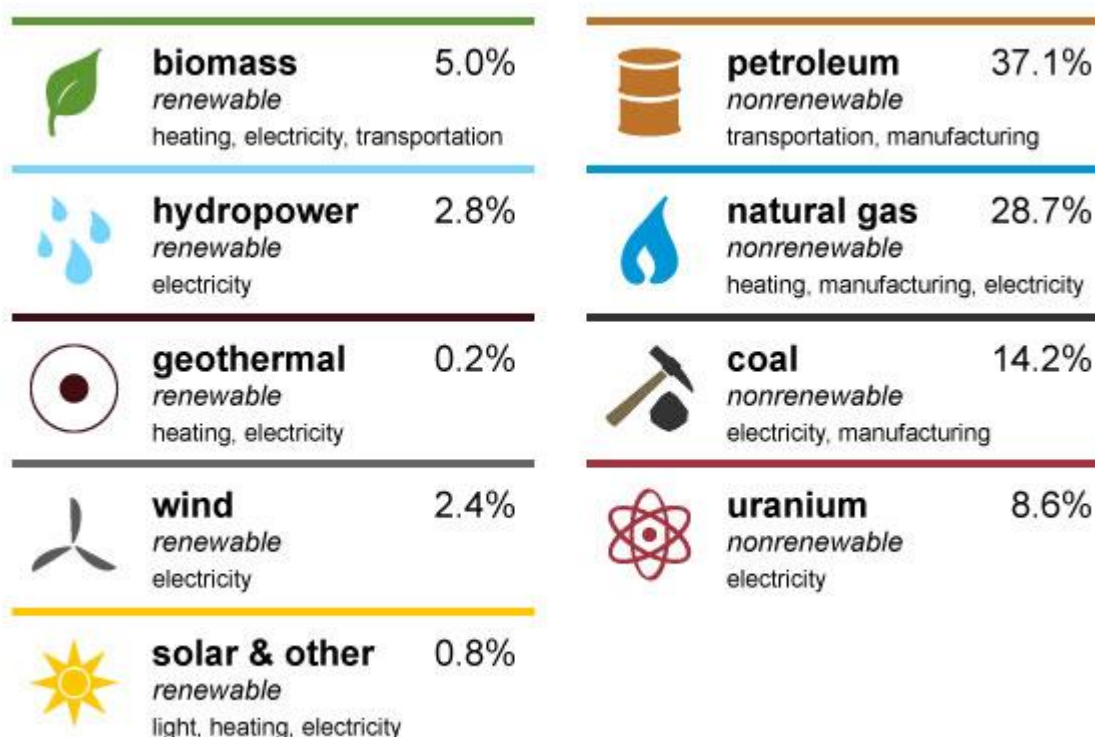
Learning outcomes:

The student will be able to

1. Explain phenomena scientifically.
2. Apply learning of scientific concepts in daily life.
3. Classify green power, non renewable and secondary energy sources.
4. Make efforts to conserve environment.

Energy is the capacity of a physical system to perform work. Energy exists in several forms. Renewable and non renewable energy can be converted into secondary energy sources. Secondary energy sources are those sources which are derived from the naturally available resources. More and more people want to use clean renewable energy. It is also called green power. In the United States most of the energy comes from non renewable sources.

U.S. energy consumption by source, 2017



Sum of individual percentages may not equal 100 because of independent rounding.

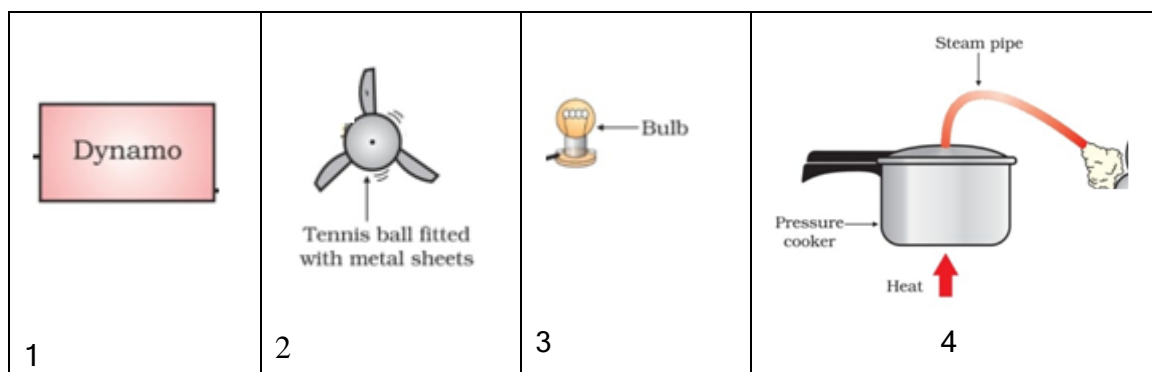
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3, April 2018, preliminary data

Now answer the following questions:

1. In U.S. which energy source is used maximum and minimum?
2. List out the energy sources in green power, non renewable and secondary energy sources.

The flowing water and the tides in the sea are sources of energy. India is endowed with large hydro power potential of 145320 MW. Heavy investments are made on large and small hydropower plants. The estimated potential of small hydro power is about 15000 MW in the country. As on May 2019, the installed capacity of small hydro projects amount is 460375 MW. Total identified potential of tidal energy is about 12455 MW.

3. Which of the two has high hydro power potential? Why?



4. Select the correct sequence for a model to demonstrate the process of thermoelectric production.
 - (A) 2, 3, 1, 4
 - (B) 4, 2, 1, 3
 - (C) 1, 2, 3, 4
 - (D) 4, 2, 3, 1
5. Read the statements given below and answer:

| S. No. | STATEMENT | AGREE | DISAGREE |
|--------|--|-------|----------|
| 1. | Replace light bulbs with CFLs | | |
| 2. | Don't unplug electronic gadgets when not in use. | | |
| 3. | Adjust the thermostat of your A. C. 5° higher than normal. | | |
| 4. | Nuclear power is a carbon free energy source. | | |

6. Write the environmental consequences of coal based thermal power plants.

Item description:

| Q. No. | Q Type | Competency | Knowledge | Context | Difficulty Level |
|--------|------------------|----------------------------------|-----------|---------|------------------|
| 1. | Close structured | Explain phenomena scientifically | Content | Global | Low |
| 2. | Close structured | Explain phenomena scientifically | Content | Global | Low |
| 3. | Close structured | Explain phenomena scientifically | Content | Global | Medium |
| 4. | Complex MCQ | Explain phenomena scientifically | Content | Global | Medium |
| 6. | Open Ended | Explain phenomena scientifically | Content | Global | Medium |

Answer key:

1. Full credit:
Maximum: Petroleum
Minimum: Solar and other.
No credit: any other response.
2. Full credit:
Green Power: Biomass, Hydro Power, Geothermal, Wind, Solar.
Non renewable: Petroleum, Coal, Uranium, Natural Gas.
Secondary: Hydrogen, electricity, gasoline etc.
No credit: any other response.
3. Full credit:
From the given information above, it can be clearly seen that the potential of flowing water is 145320MW, whereas that of tidal energy is 12455 MW. So the potential of flowing water is more.
No credit: any other response.
4. Full credit:
Option (B).
No credit: any other response.
5. Full credit:
Agree, disagree, agree, agree (in this order).
No credit: any other response.
6. Full credit:
Coal based thermal power plants pollute atmosphere, cause green house effect, cause acid rain, hot water from these plants adversely affects aquatic life, is expensive etc.
Partial credit: two or more of the above/any other relevant responses.

No credit: any other response

28-FOOD CHAIN

Area: Environment

Class: 10

Chapter: 15

Chapter Name: Our Environment.

Concept: Components of Eco System

Learning outcomes:

The student will be able to

1. Classify organisms as producers and consumers.
2. Apply learning to hypothetical situations.
3. Connect biodiversity with food chain.



Various steps/links representing organisms in a food chain at which transfer of food and energy takes place are called trophic levels. In this chain of food, organisms consume other organisms and they in turn consumed by others.(Sequential process)At every level there is 10%transfer of energy.

Q.1 Which of the following belongs to the third trophic level?

- a) Grass b) snake c) grasshopper d) frog

Q.2 Herbivores are also known as:-

- a) Secondary consumers
b) Consumers
c) Producers
d) Primary consumers

Q.3 What is a food chain?

.....
.....Q.

4 Given below are two food chains:-

1. Grass \Rightarrow Rabbit \Rightarrow Hawk
2. Grass \Rightarrow Grasshopper \Rightarrow Frog \Rightarrow Snake \Rightarrow Hawk

In which food chain does Hawk get more energy? Give reasons.

.....

Q.5 Please reply in Yes or No

- | | | |
|-------|--|--------|
| (i) | Shorter food chains are more advantageous. | Yes/No |
| (ii) | If there is no sunlight does it affect the food chain? | Yes/No |
| (iii) | There can be more than four trophic levels. | Yes/No |

Item description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|--------------------|--|-----------|---------|------------------|
| 1. | MCQ | Interpret data and evidence scientifically | content | Social | Low |
| 2. | MCQ | Interpret data and evidence scientifically | Epistemic | Global | Medium |
| 3. | close constructed | Explain phenomenon scientifically | content | Global | Low |
| 4. | close constructed | Explain phenomenon scientifically | Epistemic | global | Medium |
| 5. | Closed constructed | Evaluate and design Scientific enquiry | Content | Global | Low |

Answer key

Q1. d

Q2. d

Q4. First food chain (with correct reason)

Q5. Yes, Yes, Yes

29-ZERO EMISSION

Area : Environment

Class: 10

Chapter: 14

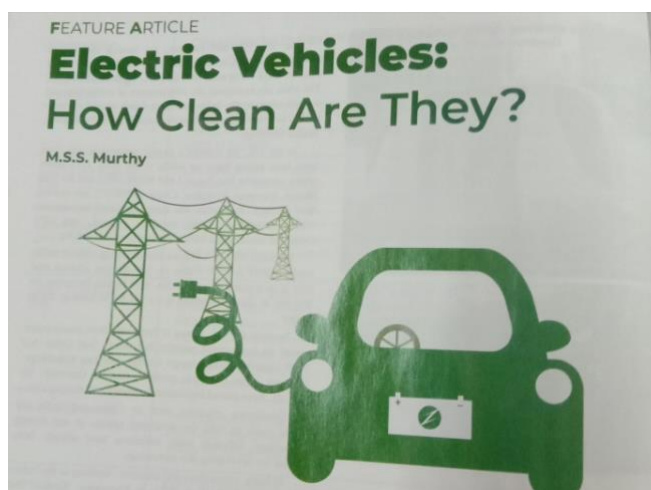
Chapter Name: Our Environment.

Concept: Waste materials added to the environment.

Learning outcomes:

The student will be able to

1. Advocate the use of energy efficient electrical devices to reduce air pollution.
2. Compare the pollution levels created by electricity driven vehicles and fossil fuel driven vehicles.
3. Make efforts to conserve environment.



The government of India, as a part of its commitment to reduce green house gas emission and also in view of the recurring episodes of high air pollution in major cities, has an ambitious plan to shift from petrol/diesel vehicles to electric vehicles for both public and private sector by 2030. Instead of petrol/diesel we can use electric vehicles. There is no petrol tank.

Q.1 Which two types of pollutions are caused by vehicular emission?

.....

Q.2 What are the advantages of electric vehicle over petrol/diesel vehicle?

.....

Q.3 “The electric vehicle has zero emissions.” Are they really so? Comment.

.....

Q.4 Is it possible to replace all diesel/petrol cars with electric cars by 2030? Justify by giving reasons.

.....
Q.5 Give your view:

| S.No. | Conditions/facts | agreed | Strongly agreed | disagreed | Strongly disagreed |
|-------|--|--------|-----------------|-----------|--------------------|
| (i) | Electric vehicle are cost effective. | | | | |
| (ii) | Electric cars can be used for long distance driving. | | | | |

Item description:

| Q. No. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|--------|--------------------|--|------------|---------|------------------|
| 1. | Closed constructed | Interpret data and evidence scientifically | content | Global | Low |
| 2. | close constructed | Explain phenomenon scientifically | Epistemic | Global | Medium |
| 3. | open ended | Evaluate and design Scientific enquiry | Procedural | Global | Medium |
| 4. | open ended | Explain phenomenon scientifically | Epistemic | Global | Medium |

Answer key

Q1. Air Pollution and noise pollution

Q2. Answer contains answers which include following (any two):-

1. Pollution free
2. Fossil fuel will be exhausted soon.
3. Cost effective can be charged with solar energy

Q3. Zero emission if charged with solar power otherwise there will be emission due thermal power plants.

Q4. Correct if answered with scientific reasoning.

30-SUSTAINABLE FOREST MANAGEMENT

Area: Natural Resources

Class: 10

Chapter: 16

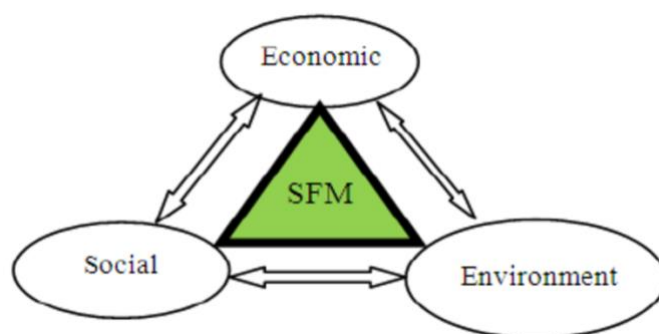
Chapter Name: Management of Natural Resources.

Concept: Management of Natural Resources

Learning outcomes:

The student will be able to

1. Make efforts to promote sustainable management of resources in daily life.
2. Explain the adverse effects of large scale deforestation.
3. Relate the contribution of forests in meeting the society's daily needs.



Sustainable forest management (SFM) a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations. Forests and trees, when sustainably managed, make vital contributions both to people and the planet, bolstering livelihoods, providing clean air and water, conserving biodiversity and responding to climate change.

Managing forests sustainably means optimizing their benefits, including timber and contributions to food security, to meet society's needs in a way that conserves and maintains forest ecosystems for the benefit of present and future generations.

Answer the Questions:

1. Define Sustainable forest management (SFM)
2. Among the statements given below select the ones that correctly describe the concept of sustainable development :
 - (i) Planned growth with minimum damage to the environment
 - (ii) Growth irrespective of the extent of damage caused to the environment
 - (iii) Stopping all developmental work to conserve the environment
 - (iv) Growth that is acceptable to all the stakeholders
 - (a) (i) and (iv)
 - (b) (ii) and (iii)

- (c) (ii) and (iv)
- (d) (iii) only
- 3. 7-Sustainable development can be thought of in terms of three spheres i.e.
 - (a) environment, economy and society
 - (b) environment, economy and equity
 - (c) environment, ecology and society
 - (d) environment, economy and ecology
- 4. Large-scale deforestation decreases _____
- 5. Select the incorrect statement
 - (a) Economic development is linked to environmental conservation
 - (b) Sustainable development encourages development for current generation and conservation of resources for future generations
 - (c) Sustainable development does not consider the view points of stakeholders
 - (d) Sustainable development is a long planned and persistent development

Answer key:

Answer 1: Sustainable forest management (SFM) is defined as a “dynamic and evolving concept, which aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations.

Answer 2: (a)

Answer 3: (a)

Answer 4: Rainfall

Answer 5: (c)

Area: Natural Resources

Class: 10

Chapter: 16

Chapter Name: Management of Natural Resources.

Concept: Management of Natural Resources.

Learning outcomes:

The student will be able to

1. Make efforts to use water judiciously.
2. Investigate better ways to store water for future use.
3. Exhibit creativity in designing an innovative model of rain water harvesting.

All living things including, plants, animals and human beings need water to live and to carry out different cellular activities. We all use water for a different day to day activities, such as cleaning, washing, bathing, cooking, drinking and other domestic and industrial uses. Today we all are heading toward the scarcity of water, and this is mainly because of the lack of water conservation and pollution of water bodies.

The global warming is taking its toll on the climate pattern across the world. Rains have become unpredictable in nature with some regions suffering with usual than longer dry spells, while some region are hit by incessant rain. Rain hit regions are unable to utilise or control the excess waters, that leads to flood-like situation. Rainwater harvesting can help overcome the problem of flood, while also helping in storing excess water that can help in providing water to the water scarce region. This renewable source of water management can help in overcoming major water-related problems, that are not only plaguing the world right now but can have a severe impact on the global population and environment in the future.

Rainwater harvesting systems consists of Catchment- Used to collect and store the captured Rainwater, Conveyance system – It is used to transport the harvested water from the catchment to the recharge zone, Flush- It is used to flush out the first spell of rain, filter – Used for filtering the collected Rainwater and remove pollutants. Tanks and the recharge structures: Used to store the filtered water, which is ready to use.

The process of rainwater harvesting involves the collection and the storage of rainwater with the help of artificially designed systems that run off naturally or man-made catchment areas like- the rooftop, compounds, rock surface, hill slopes, artificially repaired impervious or semi-pervious land surface. Quite obviously, several factors play a vital role in the amount of water harvested. Some of these factors are the quantum of runoff, features of the catchments, impact on the environment, availability of the technology, the capacity of the storage tanks, types of the roof, its slope and its materials, the frequency, quantity and the quality of the rainfall, the speed and ease with which the Rainwater penetrates through the subsoil to recharge the groundwater. The soak pit project in Punjab in Mansa village deals with waste water



management to make the village drain free, and was started in 2015 as a pilot with support from a multinational company. Under the project, soak pits of 4 feet by 10 feet with a septic tank of 3 feet by 4 feet were constructed at cost of Rs 3.29 lakh Rs in all 65 houses. It solved the problem of flow of waste water to the pond.

Answer the following questions :

Q1. What are the different methods of rainwater harvesting?

- a. Rooftop rainwater harvesting.
- b. Surface runoff harvesting.
- c. Catchment
- d. All of above

Q2. What is the importance of rainwater harvesting?

Q3. The factors affecting the amount of rainwater harvested?

- a. Quantum of runoff
- b. Impact on the environment
- c. Quantity and the quality of the rainfall.
- d. All the above

Q4. Taking inspiration from the above paragraph think of solutions to water harvesting in your area?

Q5. What are man-made catchment areas?

Item Description:

| Q.no. | Q. Type | Competency | Knowledge | Context | Difficulty level |
|-------|-------------------------|--|-----------|---------|------------------|
| 1 | Simple Multiple Choice | Interpret data and evidence scientifically | Content | Global | low |
| 2 | Close Constructed | Explain Phenomenon Scientifically | Content | Global | medium |
| 3 | Complex Multiple Choice | Evaluate and design scientific enquiry | Epistemic | Global | medium |
| 4 | Close Constructed | Explain Phenomenon Scientifically | Content | Global | high |
| 5 | Close Constructed | Explain Phenomenon Scientifically | Content | Global | high |

Answer/scoring Key:

- 1. d

Scoring: Full credit -2 No Credit -0

2. Rainwater harvesting can help overcome the problem of flood, while also helping in storing excess water that can help in providing water to the water scarce region. This renewable source of water management can help in overcoming major water-related problems, that are not only plaguing the world right now but can have a severe impact on the global population and environment in the future.

Scoring: Full credit -2 Partial Credit -1 No Credit -0

3. d

Scoring: Full credit -2 No Credit -0

4. Scoring: Full credit -2 (any workable idea for Chandigarh) Non Workable Idea -No Credit -0

5. The rooftop, compounds, rock surface, hill slopes, artificially repaired impervious or semi-pervious land surface.

Scoring : All names- Full Credit -2 any two names –Partial Credit -1 No name: No Credit -0

32.SOIL POLLUTION

Area : Hazards

Class: 10

Chapter: 16

Chapter Name: Management of Natural Resources.

Concept: Soil Pollution

Learning Outcomes:

The Student will be able to:-

1. Appreciate and promote segregation of biodegradable and non biodegradable waste
2. Make efforts to promote sustainable management of resources in day to day life.
3. Advocate use of fuels which produces fewer pollutants.



Any undesirable change in the physical, chemical and biological properties of the land(soil) is called soil pollution.

Sources of Soil Pollution :

1. Waste Dumps –
 - The main source of the soil pollution is the dumping of the industrial waste, municipal waste and medical or hospital waste.
 - Industrial solid waste and sludge contain toxic , organic and inorganic chemical compounds and heavy metals which can severely affect the fertility of the soil.
2. Agro Chemicals –
 - Excessive use of agro chemicals like pesticides and weedicides can significantly reduce the fertility of the soil in the long run.

- The excessive use of inorganic fertilizers not only contaminate the soil but also adversely affect the quality of ground water.
- Excess of nitrate ions in the soil may also pollute the ground drinking water.

Q. No. 1. Which of the answers below is not considered a pollutant ?

- Chemical in batteries
- Fertilizers
- Compost
- Trash

Q. No. 2. Which of the answers below is not an effect of soil pollution ?

- Sever illness in living things
- Plant grow in soil filled with toxic chemicals
- Ocean get polluted
- New Trees will grow healthy and strong

Q. No. 3. Soil pollution is when there are harmful changes in the soil due to the adding or dumping of -

- Recycling
- Pollutants
- Pollutions
- Weather

Q. No.4. Does your house lie in the region near to any industry or factory ? If yes, then does it create any adverse effect on the nearby land and locations .How?

Q. No.5. What is the dominant industrial and commercial activity that has caused soil pollution?

Answer Key

Ans 1 C

Ans2. D

Ans3.B.

Ans4 yes or no. If yes

Long term exposure to polluted air and water causes chronic health problems making the issue of industrial pollution into a severe one .it also lowers the air quality in surroundings areas which causes many respiratory disorders.

Ans5.The incorrect way of chemical waste disposal from different types of industries can cause contamination of soil. Commercial activities like this have led to acidification of soil and contamination due to the disposal of industrial waste ,heavy metals ,toxic chemicals ,dumping oil and fuel ,etc.

Item Description:

| Q No | Q Type | Competency | Knowledge | Context | Difficulty level |
|---------|------------|--|-----------|----------|------------------|
| Q NO 1. | Simple MCQ | Explain phenomenon scientifically | Content | Personal | low |
| Q NO 2 | Simple MCQ | Interpret data and evidence scientifically | Content | global | low |
| Q NO 3 | Simple MCQ | Explain phenomenon scientifically | Content | personal | medium |
| Q NO 4 | Open ended | Interpret data and evidence scientifically | epistemic | global | medium |
| Q NO 5. | Open ended | Interpret data and evidence scientifically | epistemic | global | medium |

33. FIVE IMPORTANT R'S OF OUR LIFE

Area: Natural resources

Class: 10

Chapter: 16

Chapter Name: Management of Natural Resources.

Concept: Sustainable management of natural resources

Learning Outcomes:

The Student will be able to:-

1. Apply scientific concepts in daily life.
2. Communicate the importance of five R's
3. Make efforts to conserve environment realizing the interdependency and interrelationship in the biotic and abiotic factors of environment.



Reduce:Reducing the amount of waste you produce is the best way to help the environment. This means that you use less. You save electricity by switching off unnecessary lights and fans. You save water by repairing leaky taps. You do not waste food.

Recycle: This means that you collect plastic, paper, glass and metal items and recycle these materials to make required things instead of synthesizing or extracting fresh plastic, paper, glass or metal. In order to recycle, we first need to segregate our wastes so that the material that can be recycled is not dumped along with other wastes. In some towns you can leave your recyclables in bins outside your home, and a truck will come and collect them regularly.

Reuse:This is actually even better than recycling because the process of recycling uses some energy. In the 'reuse' strategy, you simply use things again and again. Instead of throwing away used envelopes, you can reverse it and use it again. The plastic bottles in which you buy various food-items like jam or pickle can be used for storing things in the kitchen. Don't throw out clothes, toys, furniture, and other things that you don't want anymore. Somebody else can probably use them. You can bring them to a center that collects donations, give them to friends, or even have a yard sale.

Refuse: This means to say **No** to things people offer you that you don't need.eg say **No** to plastic

Rot: To undergo decomposition from the action of bacteria or fungi

Q.1 What does mean to reuse?

- A. Throw things away.
- B. Try to find new ways to use something again.
- C. Buy more of something.

Q.2 What are the 5 R's in sustainable development?

The Volume of e-waste generated in India is growing 21% annually. In 2016, newly launched e-waste management rules mandated manufacturers to register and collect e-waste and channel it to authorized recyclers.

Q.3(i) How e-waste is contaminating our environment?

(ii) Suggest measures to dispose-off e-waste.

Q. 4 How much do you agree with the following statements?

Tick only one box in each row

| | Strongly agree | Agree | Disagree | Strongly Disagree |
|--|----------------|-------|----------|-------------------|
| Reducing the amount of waste you produce is the best way to help the environment | | | | |
| Reuse creates less air and water pollution than making a new item or recycling. | | | | |

Answer Key:

Ans 1 B

Ans2. Refuse, Reduce, Reuse ,Recycle ,Rot

Ans3.1)e-waste breaks down ,it releases toxic heavy metals .When there toxins leach into the soil ,they influence the plants and trees that are growing from this soil .

Ans4 strongly agree, agree

Item Description:

| Q No | Q Type | Competancy | Knowledge | Context | Difficulty level |
|---------|--------------------|--|-----------|----------|------------------|
| Q NO 1. | Open ended | Interpret data and evidence scientifically | Content | Personal | low |
| Q NO 2 | Open ended | Interpret data and evidence scientifically | Content | global | low |
| Q NO 3 | Closed constructed | Explain phenomenon scientifically | Content | global | medium |
| Q NO 4 | Open ended | Interpret data and evidence scientifically | Content | global | medium |