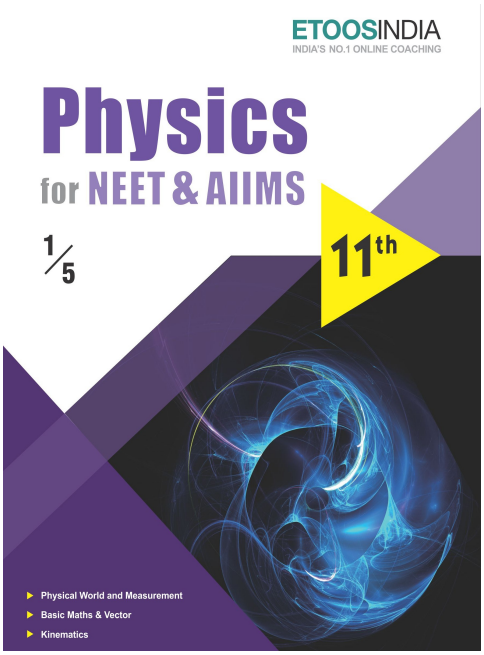
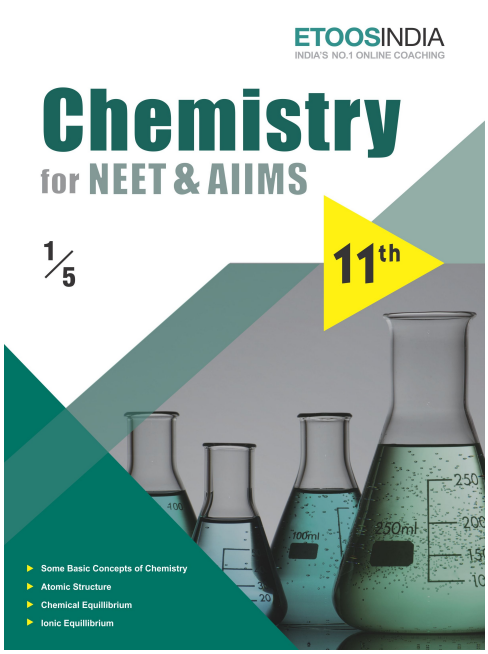
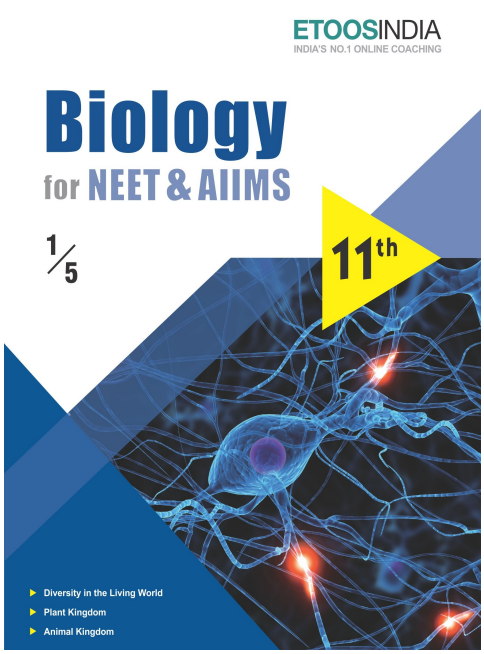
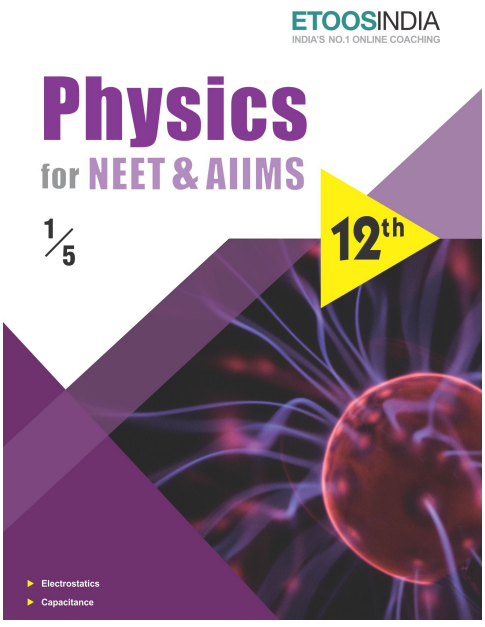
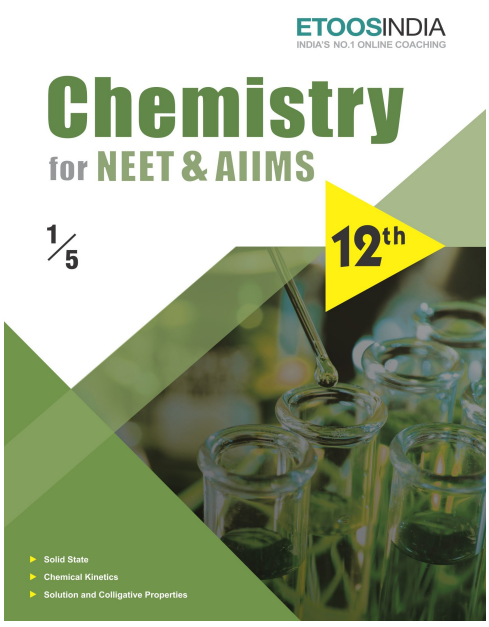
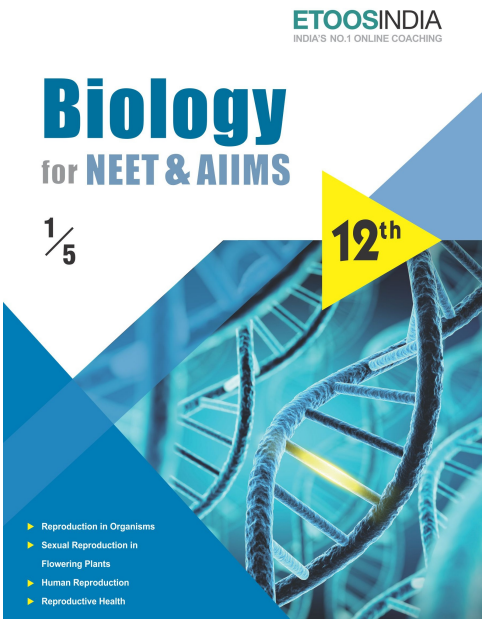












CHAPTER 17

ENVIRONMENTAL CHEMISTRY & ANALYSIS OF ORGANIC COMPOUNDS

We won't have a society if we destroy the environment.

"MARGARET MEAD"

INTRODUCTION

The branch of science which deals with the chemical phenomena occuring in the environment is called as environmental chemistry.

Environmental studies deal with the sum of all social, economical, biological, physical and chemical interrelations with our surroundings. In this unit of the focus will be on environmental chemistry. Environmental chemistry deals with wth study of the origin, transport, reactions, effects and fates of chemical species in the environment.

The environment means surroundings. It has 4 following component.

(i) **Atmosphere**

(A) Function of the atmosphere

- It contain all the gases which are essential for the life on the earth.
- It is a carrier of water vapour which are needed for all life.
- O_3 is present in it which absorbs harmful U.V. radiations.
- It maintain heat balance of the earth by absorbing infrared radiation coming from the sun and remitted from the earth.

(B) Pressure, weight and temp of the atmosphere

- Pressure of atm = $10^5 N/m^2$
- Mass of atm = 5×10^{15} tonnes.
- Temp. of atm = – 100° C to 1200° C
- Increases in altitude of 5 km, the pressure and the density of air decrease by one half.

(C) Composition of air (or atmosphere)

- It is divided in 3 categories.
- Major component = N_2, O_2, water vapour.
- Minor component = Ar, CO_2
- Traces component = He, Ne, Ar, Kr, CH_4, H_2, CO, N_2O, SO_2, NO, NO_2, HCHO, NH_3, O_3.

(D) Regions (or structure) of the atmosphere :- It has 4 region. These regions are defined by the temp.

Region	Altitude from earth's surface	Temp. range	Species present or gasses present
Troposphere	0 - 11 km	decrease from 15 to – 56°C	N_2, O_2, CO_2, H_2O vapour
Stratosphere or coroyones sphere	11 - 50 km	increase from – 56° to – 2°C	N_2, O_2, O_3, 0-atm
Mesosphere	50 – 85 km ionosphere	decrease from – 2° to – 92°C	N_2, O_2, NO^+, O_2^+
Thermosphere	85 – 500 km ionosphere	increase from – 92° to 1200°C	O_2^+, O^+, NO^+, e^-

(ii) **Hydro sphere (75% of earth) :** The part in which contain water in the form of sea, oceans, rivers, lakes, ponds.

(iii) **Lithosphere :** It is solid component of the earth consisting of soil, rocks, mountains.

(iv) **Biosphere :** It is the part of the lithosphere, hydrosphere and atm. Where living organism interact with these parts and lived together. **Ex.** Green plants.

Etoos Tips & Formulas

ACID RAIN : The rain containing H_2SO_4, HNO_3 (and small amount of HCl) which are formed from the oxide of S and N_2 present in the air is called as acid rain. The pH of acid rain is 4-5.

GREEN HOUSE EFFECT

The warming of earth due to remission of sun's energy absorbed by the earth. The remission of earth's energy is absorbed by CO_2 molecules and H_2O vapour present near the earth's surface and then its radiation back to the earth, is called as green house effect. So the temp. of the earth is increased is called as global warming.

Calculation of % of C

$$\% \text{ of C in W gm organic substance} = \% \text{ of C} = \frac{12}{44} \times \frac{m}{W} \times 100$$

Calculation of % of N

$$\% \text{ of Nitrogen in W gm organic substance} = \% \text{ of N} = \frac{28}{22400} \times \frac{V}{W} \times 100$$

Calculation of % of Halogen

$$\% \text{ of halogen} = \frac{\text{Atomic mass of X}}{\text{Molar mass of AgX}} \times \frac{m}{W} \times 100$$

Calculation of % of Sulphur

$$\% \text{ of S} = \frac{32}{233} \times \frac{m}{W} \times 100$$

Calculation of % of Phosphorous

$$\% \text{ of P} = \frac{62}{222} \times \frac{m}{W} \times 100$$

SOLVED EXAMPLE

Ex. 1 How can domestic waste be used as manure ?

Sol. Domestic waste comprises of two types of materials, biodegradable such as leaves, rotten food, etc., and non-biodegradable such as plastics, glass metal, scrap, etc. The non-biodegradable waste is sent to industry for recycling The biodegradable waste should be deposited in the land fills. With the passage of time, it is converted into compost manure.

Ex. 2 For your agricultural field or garden, you have developed a compost producing pit. Discuss the process in the light of bad odour, files and recycling of wastes for a good produce.

Sol. The compost producing pit should be set up at a suitable place or in a tin to protect ourselves from bad odour and files. It should be kept covered so that files cannot make entry into it and the bad odour is minimized. The recyclable material like plastics, glass, newspapers, etc.. should be sold to the vendor who further sells it to the dealer. The dealer further supplies it to the industry involved in recycling process.

Ex. 3 A large number of fish are suddenly found floating dead on a lake. There is no evidence of toxic dumping but you find an abundance of phytoplankton. Suggest a reason for the fish kill.

Sol. Excessive phytoplankton (organic pollutants such as leaves, grass, trash, etc.) present in water is biodegradable. A large population of bacteria decomposes this organic matter in water. During this process they consume the oxygen dissolved in water. Water has already limited dissolved oxygen (= 10 ppm) which gets is further depleted. When the level of dissolved oxygen falls below 6 ppm, the fish cannot survive. Hence, they die and float dead in water.

Ex. 4 What would have happened if the greenhouse gases were totally missing in the earth's atmosphere ? Discuss.

Sol. The solar energy radiated back from the earth surface is absorbed by the greenhouse gases (i.e. CO_2, CH_4, O_3, CFC's and water vapour) present near the earth's surface. They heat up the atmosphere near the earth's surface and keep it warm. As a result, they keep the temperature of the earth constant and help in the growth of plants and existence of life on the earth. If there were no greenhouse gases, there would have no vegetation and life on the earth.

Ex. 5 **(i)** Name two important sinks of CO_2.
(ii) What is marine pollution
(iii) What is humification ?
(iv) What are viable and non-viable particulates ?

Sol. **(i)** Oceans (which dissolve it) and plants (which use it for photosynthesis)
(ii) Pollution of sea water due to discharge of wastes into it is called marine pollution.
(iii) The decomposition of organic material (leaves, root etc.) in the soil by microorganism to produce humus is called humification.
(iv) Viable particulates are small size living organisms such as bacteria, fungi, moulds, algae, etc. Non-viable particulates are formed by disintegration of large size materials or condensation of small size particles or droplets e.g. mist, smoke, fume and dust.

Ex. 6 Answer the following subparts
(i) What is loam soil ?
(ii) What are asbestosis and silicosis ?
(iii) What are particulates and what is their approximate size ?
(iv) Name three natural source of air pollution
(v) How are flue gases from industries feed from oxides of nitrogen and sulphur ?

Sol. **(i)** Soil containing 34% air, 66% water along with humus is called loam soil is best for crops.
(ii) Asbestosis and silicosis is lung disease caused by particulates.
(iii) Particulates are finely divided solid or liquid particles suspended in air. Their size varies from 2×10^{-4} μ to 500 μ
(iv) Volcanic erruptions, forest fires and pollen grains of flowers.
(v) The flue gases are subjected to scrubbing with conc. H_2SO_4 or with alkaline solutions such as $Ca(OH)_2$ or $Mg(OH)_2$ etc.

Ex. 7 **(i)** Why does rain water normally have a pH of about 5.6 / When does it become acid rain ?
(ii) Why is acid rain considered as a threat to Taj mahal ?
(iii) Explain giving reason " The presence of CO reduces the amount of haemoglobin available in the blood for carrying oxygen to the body cells."
(iv) State briefly the reactions causing ozone layer depletion in the stratosphere.

Exercise # 1 SINGLE OBJECTIVE NEET LEVEL

1. Air pollutants that produce photochemical oxidants include :
(A) CO_2, CO and SO_2 (B) N_2O, NO and HNO_3
(C) O_2, Cl_2 and HNO_3. (D) O_3, Cl_2 and SO_2

2. Atmosphere of big/metropolitian cities are polluted most by :
(A) automobile exhausts. (B) pesticide residue.
(C) household waste. (D) radio-active fall out.

3. Ozone layer of upper atmosphere is being destroyed by :
(A) chlorofluorocarbon
(B) SO_2
(C) photochemical oxidants/O_2 & CO_2
(D) smog

4. Carbon monooxide is pollutant as it :
(A) inactivates nerves
(B) inhibits glycolysis
(C) combines with oxygen
(D) combines with haemoglobin

5. Pollution is :
(A) removal of top soil
(B) release of toxic/undesirable materials in environment
(C) conservation of energy
(D) all of above

6. Burning of fossil fuels is the main source of, which of the following pollutants ?
(A) Nitrogen oxide (B) Nitric oxide
(C) Nitrous oxide (D) Sulphur dioxide

7. SO_2 and NO_2 produce pollution by increasing :
(A) alkalinity (B) acidity
(C) neutrality (D) buffer action

8. The aromatic compounds present as particulates are :
(A) benzene
(B) toluene
(C) nitrobenzene
(D) polycyclic hydrocarbons

9. Classical smog occurs in places of :
(A) excess CO_2 (B) cool and humid
(C) warm, dry and sunny (D) excess NH_3

10. Acid rains are produced by :
(A) excess NO_2 and SO_2 from burning fossil fuels
(B) excess production of NH_3 by industry and coal gas
(C) excess release of carbon monoxide by incomplete combustion
(D) excess formation of CO_2 by combustion and animal respiration.

11. Spraying of DDT produces pollution of the type:
(A) air (B) air and water
(C) air and soil (D) air, water and soil

12. Most hazardous metal pollutant of automobile exhausts is :
(A) mercury (B) cadmium
(C) lead (D) copper

13. Chlorofluorocarbon releases which of the following chemical harmful to ozone :
(A) fluorine (B) chlorine
(C) nitrogen peroxide (D) sulphur dioxide

14. Which of the following statements is true about photochemical smog ?
(A) It is reducing in nature.
(B) it is formed in winter.
(C) It is a sulphurous smog.
(D) Components of the smog, NO and O_3, irritate the nose and throat and their high concentration causes headache, chest pain, dryness of the throat, cough and difficulty in breathing.

15. Which of the following is not a part of green chemistry ?
(A) Photochemistry (B) Sonochemistry
(C) Nuclear chemistry (D) Biochemistry

Exercise # 2

SINGLE OBJECTIVE | AIIMS LEVEL

1. Ultraviolet radiation from sun causes a reaction that produces :
(A) fluorides (B) carbon monooxide
(C) sulphur dioxide (D) ozone

2. Ozone depletion in stratosphere shall result in :
(A) forest fires
(B) increased incidence of skin burns and skin cancer
(C) increase in biological oxygen demand
(D) global warming

3. Incomplete combustion of petrol or diesel oil in automobile engines can be best detected by testing the fuel gases for the presence of ?
(A) CO and water vapour (B) CO
(C) NO_2 (D) SO_2

4. Which of the following statements is true about ozone layer ?
(A) It is harmful because ozone is dangerous to living organism.
(B) It is beneficial because oxidation reaction can proceed faster in the presence of ozone.
(C) It is beneficial because ozone cuts off the ultra violet radiation of the sun.
(D) It is harmful because ozone cuts out the important radiation of the sun which are vital for photosynthesis.

5. Besides CO_2, the other green house gas is :
(A) CH_4 (B) N_2
(C) Ar (D) O_2

6. Which of the following statements is true ?
(A) London smog is oxidising in nature.
(B) London smog contains H_2SO_4 droplets.
(C) London smog is mixture of smoke, fog and SO_2.
(D) London smog causes bronchitis.

7. Which of the following processes does not increase the amount of CO_2 in atmosphere ?
(A) Decay of animals (B) Breathing
(C) Photosynthesis (D) Burning of petrol

8. Consider the following statement and select the correct option :
S_1 : Dust is the non-viable particle.
S_2 : Particulates acquire negative charge and are attracted by the positive electrode.
S_3 : O_2 is a green house gas.
S_4 : Algae is a viable particulate.
(A) S_1 and S_2 only (B) S_1, S_2 and S_3 only
(C) S_1, S_2 and S_4 only (D) S_2, S_3 and S_4

9. Drained sewage has biological oxygen demand (BOD) :
(A) more than that of water
(B) less than that of water
(C) equal to that of water
(D) none of the above

10. Eutrophication causes reduction in :
(A) dissolved hydrogen (B) dissolved oxygen
(C) dissolved salts (D) all the above

11. Sewage water is purified by :
(A) microorganism (B) light
(C) fishes (D) aquatic plants

12. Which of the following will increase the BOD of water supply ?
(A) CO_2 (B) O_3
(C) H_2O (D) C_2H_5OH

13. Which causes water pollution ?
(A) Pathogens
(B) Automobile exhausts
(C) PCBs
(D) (A) and (C)

14. Water pollution is less if BOD is :
(A) less than 5 ppm (B) less than 15 ppm
(C) less than 50 ppm (D) less than 100 ppm

15. Most abundant water pollutant is :
(A) detergents (B) pesticides
(C) industrial wastes (D) ammonia

Exercise # 3 PART - 1 MATRIX MATCH COLUMN

1. Match the entries of column-I with appropriate entries of column-II. Each entry in column-I may have one or more than one correct option(s) from column-II.

Column-I	Column-II
(A) Classical smog	(p) SO_2
(B) Photochemical smog	(q) NO_2
(C) Particulate Pollutants	(r)) bacteria
(D) Gaseous pollutants	(s) smoke
	(t) Fe_3O_4

2. Match the entries of column-I with appropriate enteries of column-II. Each entry in column-I may have one or more than one correct option(s) from column-II.

Column-I	Column-II
(A) Acid rain	(p) Oxides of nitrogen
(B) Green house effect	(q) Oxides of sulphur
(C) Ozone hole	(r) Carbon dioxide
(D) Eutrophication	(s) Phosphate fertilizer i.e. plant nutrient (excess).
	(t) Chlorofluorocarbon (CFCs)

Exercise # 4

PART - 1 PREVIOUS YEAR (NEET/AIPMT)

1. Green chemistry means such reactions which
[CBSE AIPMT 2008]
(A) produce colour during reactions
(B) reduce the use and production of hazardous chemicals
(C) are related to the depletion of ozone layer
(D) study the reaction in plants

2. Which one of the following statements regarding photochemical smog is not correct ?
[CBSE AIPMT 2012]
(A) Carbon monoxide does not play any role in photochemical smog formation
(B) Photochemical smog is an oxidising agent in character
(C) Photochemical smog is formed through photochemical reaction involving solar energy
(D) Photochemical smog does not cause irritation in eyes and throat

MOCK TEST

1. Domestic waste mostly constitutes :
(A) non-biodegradable pollution (B) biodegradable pollution
(C) effluents (D) air pollution

2. Measurement of rate oxygen utilisation by a unit volume of water over a period of time is to measure :
(A) fermentation (B) biogas generation
(C) biosynthetic pathway (D) biological oxygen demand.

3. Fishes die in water bodies polluted by sewage due to :
(A) pathogens (B) clogging of gills by silt (C) reduction in oxygen (D) foul smell

4. Phosphate pollution is caused by :
(A) weathering of phosphate rock only (B) agriculture fertilizers only
(C) phosphate rocks and sewage (D) sewage and agricultural fertilizers.

5. Which of the following statements is false ?
(A) The lower the concentration of dissolved oxygen, the more polluted is the water sample.
(B) The tolerable limit of lead in drinking water is 50 ppm.
(C) Water is considered pure if it has BOD less than 5 ppm.
(D) None of the above

6. Which of the following statements is false ?
(A) The industrial and domestic sewage discharge is the main reason for river water pollution.
(B) Surface water contains a lot of organic matter and mineral nutrients.
(C) Oil spill in sea water causes heavy damage to fishery.
(D) Oil slick in sea water increases dissolved oxygen.

7. Modes of controlliing pollution in large cities includes :
(A) cleanliness and less use of insecticides
(B) proper disposal of organic wastes, sewage and industrial effluents.
(C) use of liquefied carbondioxide with a suitable detergent in place of tetrachloroethene for dry cleaning.
(D) all the above

8. Which of the following is not a herbicide ?
(A) Sodium chlorate (B) Sodium arsenate (C) Phosphate (D) Triazines

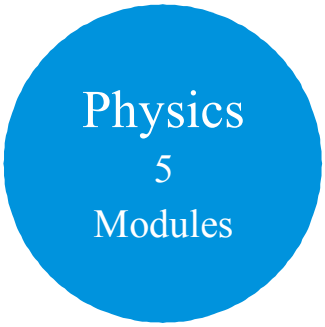
9. DDT is :
(A) green house gas (B) biodegradable pollutant
(C) non-biodegradable pollutant (D) none of above

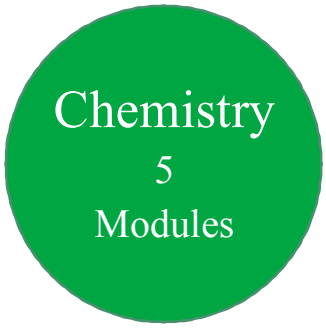
10. In stratosphere, which of the following radical retards the formation of O_3 ?
(A) $\dot{C}H_3$ (B) $\dot{C}I$ (C) $\dot{F}$ (D) Cl_2

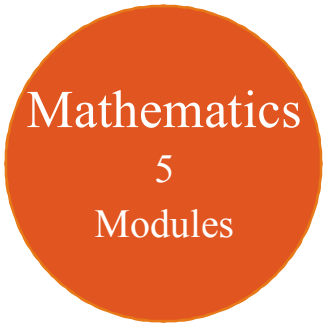
11. Which of the following helps in creating ozone over antractia ?
(A) Radioactive clouds (B) Polar stratospheric clouds
(C) Spring clouds (D) Smoke clouds

12. Which are natural sinks for $\dot{C}lO$ radicals in other parts of stratosphere ?
(A) SO_2 and NO_2 (B) NO and NO_2 (C) CH_4 and NO_2 (D) Cl_2 and F_2

11th Class Modules Chapter Details

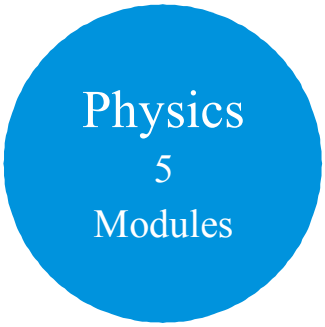


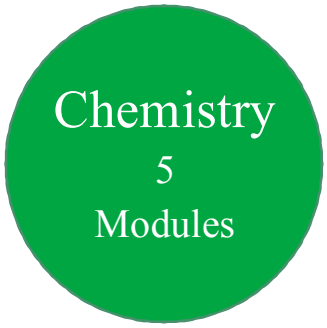


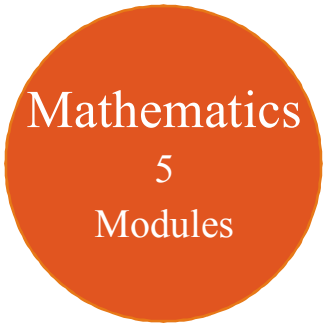


PHYSICS	CHEMISTRY	BIOLOGY
Module-1 1. Physical World & Measurements 2. Basic Maths & Vector 3. Kinematics **Module-2** 1. Law of Motion & Friction 2. Work, Energy & Power **Module-3** 1. Motion of system of particles & Rigid Body 2. Gravitation **Module-4** 1. Mechanical Properties of Matter 2. Thermal Properties of Matter **Module-5** 1. Oscillations 2. Waves	**Module-1(PC)** 1. Some Basic Conceps of Chemistry 2. Atomic Structure 3. Chemical Equilibrium 4. Ionic Equilibrium **Module-2(PC)** 1. Thermodynamics & Thermochemistry 2. Redox Reaction 3. States Of Matter (Gaseous & Liquid) **Module-3(IC)** 1. Periodic Table 2. Chemical Bonding 3. Hydrogen & Its Compounds 4. S-Block **Module-4(OC)** 1. Nomenclature of Organic Compounds 2. Isomerism 3. General Organic Chemistry **Module-5(OC)** 1. Reaction Mechanism 2. Hydrocarbon 3. Aromatic Hydrocarbon 4. Environmental Chemistry & Analysis Of Organic Compounds	**Module-1** 1. Diversity in the Living World 2. Plant Kingdom 3. Animal Kingdom **Module-2** 1. Morphology in Flowering Plants 2. Anatomy of Flowering Plants 3. Structural Organization in Animals **Module-3** 1. Cell: The Unit of Life 2. Biomolecules 3. Cell Cycle & Cell Division 4. Transport in Plants 5. Mineral Nutrition **Module-4** 1. Photosynthesis in Higher Plants 2. Respiration in Plants 3. Plant Growth and Development 4. Digestion & Absorption 5. Breathing & Exchange of Gases **Module-5** 1. Body Fluids & Its Circulation 2. Excretory Products & Their Elimination 3. Locomotion & Its Movement 4. Neural Control & Coordination 5. Chemical Coordination and Integration

12th Class Modules Chapter Details







PHYSICS

Module-1

1. Electrostatics
2. Capacitance

Module-2

1. Current Electricity
2. Magnetic Effect of Current and Magnetism

Module-3

1. Electromagnetic Induction
2. Alternating Current

Module-4

1. Geometrical Optics
2. Wave Optics

Module-5

1. Modern Physics
2. Nuclear Physics
3. Solids & Semiconductor Devices
4. Electromagnetic Waves

CHEMISTRY

Module-1(PC)

1. Solid State
2. Chemical Kinetics
3. Solutions and Colligative Properties

Module-2(PC)

1. Electrochemistry
2. Surface Chemistry

Module-3(IC)

1. P-Block Elements
2. Transition Elements (d & f block)
3. Co-ordination Compound
4. Metallurgy

Module-4(OC)

1. HaloAlkanes & HaloArenes
2. Alcohol, Phenol & Ether
3. Aldehyde, Ketone & Carboxylic Acid

Module-5(OC)

1. Nitrogen & Its Derivatives
2. Biomolecules & Polymers
3. Chemistry in Everyday Life

BIOLOGY

Module-1

1. Reproduction in Organisms
2. Sexual Reproduction in Flowering Plants
3. Human Reproduction
4. Reproductive Health

Module-2

1. Principles of Inheritance and Variation
2. Molecular Basis of Inheritance
3. Evolution

Module-3

1. Human Health and Disease
2. Strategies for Enhancement in Food Production
3. Microbes in Human Welfare

Module-4

1. Biotechnology: Principles and Processes
2. Biotechnology and Its Applications
3. Organisms and Populations

Module-5

1. Ecosystem
2. Biodiversity and Conservation
3. Environmental Issues