جامعہ اُردو ہند

JAMIA
URDU HIND

State's Madrasa Tul Oloom For Research In
Urdu Language Of National Importance

AWESOME REVIEW SERIES OF JAMIA URDU HIND

SCIENCE
(CLASS IX & X)

Preface

Dear Students of Jamia Urdu Hind of past and present,
We understand you don't need the help of anyone ……..,
But we just want to take care of the way you design everything.
Something we want to share with you owing to your association with JUH!!!
We can't find a reason why Allah gave this idea of writing **Awesome Review Series of JUH with mnemonics** to us to present subjects in this review form having complete points touching all competitive exams of respective standard in the shortest form as per your need and desire based on NCERT and Madrasa Board? But that is not the question to be asked; May be…….. The question is how did Allah know that we needed a student like you.
Wonderful students are carefully created by Allah,
Wonderful moments are carefully planned by Allah,
Wonderful innovative truth seeker like you are carefully gifted by Allah!!
Always read between the line……
To educate the children of non-educated persons are tougher than that of educated persons hence **Muslims** are least educated minority community in the country as per Decoded Minority Report since British Imperialism. There is **declining Muslim IAS Officers from 1950 (13 %) to 2000 (2.92 %)** among its 14% population in India. IAS officer is the pillar of governance. Hence, more than 50000 Madarsa and 14% literacy to India are contributed by Muslims **without grants from government**. Madarsa has produced architecture of Taj Mahal, Lal Qila, Qutub Minar along with Abusena in medicine and Khaiyam in mathematics. Madrasa for **Urdu Courses in India is like Dinosaurs with Lal Qila, Qutub Minar, Jama Masjid, Taj Mahal as remnant for scientific research.** In the past, Urdu has gathered a good deal of political dust, which it must shed in the interest of its health & growth. The basic problems of a language are educational, literary or administrative and if we confine ourselves to these spheres, we will discover that solutions become easier to find. India will never be a developed nation until power practice of biased mind will be ceased and surrendered completely and voluntarily.
BP Singhal, MP(RS), Ex-DG, IPS said : Could a community that ruled India for **over 950 years** and belonged to a privileged class even during British Raj, becomes socially handicapped. This now encounters the worst conditions (**worse than SC/ST**) in their own land (as per minority report) and urgently needs emergency educational support to achieve 100% literacy so as to make India a developed nation **(Ref: Problems & Policy of Minority in India)**.

We provide education through literacy campaign in the country and our positive move has empowered the most deprived class to be in the nation's mainstream. Education and Nation are incomplete without Urdu and like Hindi, Urdu is the thread of Bharat's beaded necklace where all super power of the world is quit on the united front. One can use all the superlatives about the literary work of the institution but this won't mean anything to anybody. We state the facts that are verifiable.
You are served by the country as you serve the country because your leaders are exactly like you.
No human society can develop in all its dimensions if it does not produce meaningful literature for its children and young readers. Therefore, the framework of a society should be established around the pillars of knowledge by converting it into a democratic force and take it into every corner of our country. There is a great hunger for knowledge in the country and our motto, therefore, should be all for knowledge and knowledge for all (President of India).

People do not remember what one says but they always remember what one tries to make them feel and nothing is better than honesty and goodness in the world!!! Never expect, do not criticize, do the best you can, surely you will rise very high in your life if you have confidence, trust and hope like Einstein, Newton, Mendal, Aryabhat, Edison, Khaiyam, Abusena and Archemedes.

Confidence:
Once, all villagers decided to pray for rain. On prayer day, all people gathered and only one boy came with an umbrella……
that"s confidence……..
Trust:
Trust should be like the feeling of a one year old baby, when you throw him in air, he laughs....because he knows you will catch him……..
That"s trust....
Hope:
A human being can live for 40 days without water, 8 minutes without air, but not a single second without one thing……
That"s hope.....

-Writer's Union of JUH

A NOTE FOR THE TEACHERS

To make the curriculum learner-centred, students should be made to participate and interact in the learning process directly. Once a week or one out of every six classes would be a good periodicity for such seminars and mutual interaction. Some suggestions for making the discussion participatory are given below, with reference to some specific topics in this book. Students may be divided into groups of five to six. The membership of these groups may be rotated during the year, if felt necessary. The topic for discussion can be presented on the board or on slips of paper. Students should be asked to write their reactions or answers to questions, whichever is asked, on the given sheets. They should then discuss in their groups and add modifications or comments in those sheets. These should be discussed either in the same or in a different class. The sheets may also be evaluated. We suggest here three possible topics from the book. The first two topics suggested are, in fact, very general and refer to the development of science over the past four centuries or more. Students and teachers may think of more such topics for each seminar.

1. Ideas that changed civilisation

Suppose human beings are becoming extinct. A message has to be left for future generations or alien visitors. Eminent physicist R P Feynmann wanted the following message left for future beings, if any.

"Matter is made up of atoms"

A lady student and teacher of literature, wanted the following message left:

"Water existed, so human beings could happen".

Another person thought it should be: **"Idea of wheel for motion"**

Write down what message each one of you would like to leave for future generations. Then discuss it in your group and add or modify, if you want to change your mind. Give it to your teacher and join in any discussion that follows.

2. Reductionism

Kinetic Theory of Gases relates the Big to the Small, the Macro to the Micro. A gas as a system is related to its components, the molecules. This way of describing a system as a result of the properties of its components is usually called **Reductionism**. It explains the behaviour of the group by the simpler and predictable behaviour of individuals. Macroscopic observations and microscopic properties have a mutual interdependence in this approach. Is this method useful? This way of understanding has its limitations outside physics and chemistry, may be even in these subjects. A painting **cannot** be discussed as a collection of the properties of chemicals used in making the canvas and the painting. What emerges is more than the sum of its components.

Question: Can you think of other areas where such an approach is used?

Describe briefly a system which is fully describable in terms of its components.

Describe one which is not. Discuss with other members of the group and write your views. Give it to your teacher and join in any discussion that may follow.

CONTENTS

MATTER IN OUR SURROUNDINGS

- Matter is made up of small particles.
- The matter around us exists in three states— solid, liquid and gas.
- The forces of attraction between the particles are maximum in solids, intermediate in liquids and inimum in gases.
- The spaces in between the constituent particles and kinetic energy of the particles are minimum in the case of solids, intermediate in liquids and maximum in gases.
- The arrangement of particles is most ordered in the case of solids, in the case of liquids layers of particles can slip and slide over each other while for gases, there is no order, particles just move about randomly.
- The states of matter are inter-convertible. The state of matter can be changed by changing temperature or pressure.
- Sublimation is the change of gaseous state directly to solid state without going through liquid state, and vice versa.
- Boiling is a bulk phenomenon. Particles from the bulk (whole) of the liquid change into vapour state.
- Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into the vapour state.
- The rate of evaporation depends upon the surface area exposed to the atmosphere, the temperature, the humidity and the wind speed.
- Evaporation causes cooling.
- Latent heat of vaporisation is the heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point.
- Latent heat of fusion is the amount of heat energy required to change 1 kg of solid into liquid at its melting point.
- Some measurable quantities and their units to remember:

Quantity Unit Symbol
Temperature kelvin K
Length metre m
Mass kilogram kg
Weight newton N
Volume cubic metre m3
Density kilogram per cubic metre kg m–3
Pressure pascal Pa

IS MATTER AROUND US PURE

- A mixture contains more than one substance (element and/or compound) mixed in any proportion.
- Mixtures can be separated into pure substances using appropriate separation techniques.
- A solution is a homogeneous mixture of two or more substances. The major component of a solution is called the solvent, and the minor, the solute.
- The concentration of a solution is the amount of solute present per unit volume or per unit mass of the solution/solvent.
- Materials that are insoluble in a solvent and have particles that are visible to naked eyes, form a suspension. A suspension is a heterogeneous mixture.
- Colloids are heterogeneous mixtures in which the particle size is too small to be seen with the naked eye, but is big enough to scatter light. Colloids are useful in industry and daily life. The particles are called the dispersed phase and the medium in which they are distributed is called the dispersion medium.
- Pure substances can be elements or compounds. An element is a form of matter that cannot be broken down by chemical reactions into simpler substances. A compound is a substance composed of two or more different types of elements, chemically combined in a fixed proportion.
- Properties of a compound are different from its constituent elements, whereas a mixture shows the properties of its constituting elements or compounds.

ATOMS AND MOLECULES

- During a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is known as the Law of Conservation of Mass.
- In a pure chemical compound, elements are always present in a definite proportion by mass. This is known as the Law of Definite Proportions.
- An atom is the smallest particle of the element that can exist independently and retain all its chemical properties.

• A molecule is the smallest particle of an element or a compound capable of independent existence under ordinary conditions. It shows all the properties of the substance.
• A chemical formula of a compound shows its constituent elements and the number of atoms of each combining element.
• Clusters of atoms that act as an ion are called polyatomic ions. They carry a fixed charge on them.
• The chemical formula of a molecular compound is determined by the valency of each element.
• In ionic compounds, the charge on each ion is used to determine the chemical formula of the compound.
• Scientists use the relative atomic mass scale to compare the masses of different atoms of elements. Atoms of carbon-12 isotopes are assigned a relative atomic mass of 12 and the relative masses of all other atoms are obtained by comparison with the mass of a carbon-12 atom.
• The Avogadro constant 6.022 □ 1023 is defined as the number of atoms in exactly 12 g of carbon-12.
• The mole is the amount of substance that contains the same number of particles (atoms/ ions/ molecules/ formula units etc.) as there are atoms in exactly 12 g of carbon-12.
• Mass of 1 mole of a substance is called its molar mass.

STRUCTURE OF THE ATOM

• Credit for the discovery of electron and proton goes to J.J. Thomson and E.Goldstein, respectively.
• J.J. Thomson proposed that electrons are embedded in a positive sphere.
• Rutherford's alpha-particle scattering experiment led to the discovery of the atomic nucleus.
• Rutherford's model of the atom proposed that a very tiny nucleus is present inside the atom and electrons revolve around this nucleus. The stability of the atom could not be explained by this model.
• Neils Bohr's model of the atom was more successful. He proposed that electrons are distributed in different shells with discrete energy around the nucleus. If the atomic shells are
complete, then the atom will be stable and less reactive.
• J. Chadwick discovered presence of neutrons in the nucleus of an atom. So, the three sub-atomic particles of an atom are: (i) electrons, (ii) protons and (iii) neutrons. Electrons are negatively charged, protons are positively charged and neutrons have no charges. The mass of an electron is about 1/2000 times the mass of an hydrogen atom. The mass of a proton and a neutron is taken as one unit each.
• Shells of an atom are designated as K,L,M,N,….
• Valency is the combining capacity of an atom.
• The atomic number of an element is the same as the number of protons in the nucleus of its atom.
• The mass number of an atom is equal to the number of nucleons in its nucleus.
• Isotopes are atoms of the same element, which have different mass numbers.
• Isobars are atoms having the same mass number but different atomic numbers.
• Elements are defined by the number of protons they possess.

THE FUNDAMENTAL UNIT OF LIFE

□ The fundamental organisational unit of life is the cell.
□ Cells are enclosed by a plasma membrane composed of lipids and proteins.
□ The cell membrane is an active part of the cell. It regulates the movement of materials between the ordered interior of the cell and the outer environment.
□ In plant cells, a cell wall composed mainly of cellulose is located outside the cell membrane.
□ The presence of the cell wall enables the cells of plants, fungi and bacteria to exist in hypotonic media without bursting.
□ The nucleus in eukaryotes is separated from the cytoplasm by double-layered membrane and it directs the life processes of the cell.
□ The ER functions both as a passageway for intracellular transport and as a manufacturing surface.
□ The Golgi apparatus consists of stacks of membrane-bound vesicles that function in the storage, modification and packaging of substances manufactured in the cell.
□ Most plant cells have large membranous organelles called plastids, which are of two types – chloroplasts and leucoplasts.
□ Chloroplasts that contain chlorophyll are called chloroplasts and they perform photosynthesis.
□ The primary function of leucoplasts is storage.
□ Most mature plant cells have a large central vacuole that helps to maintain the turgidity of the cell and stores important substances including wastes.

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TISSUES

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DIVERSITY IN LIVING ORGANISMS

▫ Classification helps us in exploring the diversity of life forms.
▫ The major characteristics considered for classifying all organisms into five major kingdoms are:
(a) whether they are made of prokaryotic or eukaryotic cells
(b) whether the cells are living singly or organised into multicellular and thus complex organisms
(c) whether the cells have a cell-wall and whether they prepare
their own food.
▫ All living organisms are divided on the above bases into five kingdoms, namely Monera, Protista, Fungi, Plantae and Animalia.
▫ The classification of life forms is related to their evolution.
▫ Plantae and Animalia are further divided into subdivisions on the basis of increasing complexity of body organisation.
▫ Plants are divided into five groups: Thallophytes, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.
▫ Animals are divided into ten groups: Porifera, Coelenterata, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca, Echinodermata, Protochordata and Vertebrata.
▫ The binomial nomenclature makes for a uniform way of identification of the vast diversity of life around us.
▫ The binomial nomenclature is made up of two words – a generic name and a specific name.

MOTION

▫ Motion is a change of position; it can be described in terms of the distance moved or the displacement.
▫ The motion of an object could be uniform or non-uniform depending on whether its velocity is constant or changing.
▫ The speed of an object is the distance covered per unit time, and velocity is the displacement per unit time.
▫ The acceleration of an object is the change in velocity per unit time.
▫ Uniform and non-uniform motions of objects can be shown through graphs.
▫ The motion of an object moving at uniform acceleration can be described with the help of three equations, namely

$v = u + at$

$s = ut + at2$

$2as = v2$ ñ u2

where *u* is initial velocity of the object, which moves with uniform acceleration *a* for time *t*, *v* is its final velocity and *s* is the distance it travelled in time *t*.

- If an object moves in a circular path with uniform speed, its motion is called uniform circular motion.

FORCE AND LAWS OF MOTION

- First law of motion: An object continues to be in a state of rest or of uniform motion along a straight line unless acted upon by an unbalanced force.
- The natural tendency of objects to resist a change in their state of rest or of uniform motion is called inertia.
- The mass of an object is a measure of its inertia. Its SI unit is kilogram (kg).
- Force of friction always opposes motion of objects.
- Second law of motion: The rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of the force.
- The SI unit of force is kg m sñ2. This is also known as newton and represented by the symbol N. A force of one newton produces an acceleration of 1 m sñ2 on an object of mass 1 kg.
- The momentum of an object is the product of its mass and velocity and has the same direction as that of the velocity. Its SI unit is kg m sñ1.
- Third law of motion: To every action, there is an equal and opposite reaction and they act on two different bodies.
- In an isolated system (where there is no external force), the total momentum remains conserved.

GRAVITATION

- The law of gravitation states that the force of attraction between any two objects is proportional to the product of their masses and inversely proportional to the square of the distance between them. The law applies to objects anywhere in the universe. Such a law is said to be universal.
- Gravitation is a weak force unless large masses are involved.
- Force of gravitation due to the earth is called gravity.
- The force of gravity decreases with altitude. It also varies on the surface of the earth, decreasing from poles to the equator.
- The weight of a body is the force with which the earth attracts it.
- The weight is equal to the product of mass and acceleration due to gravity.
- The weight may vary from place to place but the mass stays constant.
- All objects experience a force of buoyancy when they are immersed in a fluid.
- Objects having density less than that of the liquid in which they are immersed, float on the surface of the liquid. If the density of the object is more than the density of the liquid in which it is immersed then it sinks in the liquid.

WORK AND ENERGY

- Work done on an object is defined as the magnitude of the force multiplied by the distance moved by the object in the direction of the applied force. The unit of work is joule: 1 joule = 1 newton ¤ ¶ metre.
- Work done on an object by a force would be zero if the displacement of the object is zero.
- An object having capability to do work is said to possess energy. Energy has the same unit as that of work.
- An object in motion possesses what is known as the kinetic energy of the object. An object of mass, *m* moving with velocity *v* has a kinetic energy of ½ ***mv2***.
- The energy possessed by a body due to its change in position or shape is called the potential energy. The gravitational potential energy of an object of mass, *m* raised through a height, *h* from the earth's surface is given by ***m g h***.
- According to the law of conservation of energy, energy can only be transformed from one form to nother; it can neither be created nor destroyed. The total energy before and after the transformation always remains constant.
- Energy exists in nature in several forms such as kinetic energy, potential energy, heat energy, chemical energy etc. The sum of the kinetic and potential energies of an object is called its mechanical energy.
- Power is defined as the rate of doing work. The SI unit of power is watt. **1 W = 1 J/s.**
- The energy used in one hour at the rate of 1kW is called 1 Kw h.

SOUND

- Sound is produced due to vibration of different objects.

- Sound travels as a longitudinal wave through a material medium.
- Sound travels as successive compressions and rarefactions in the medium.
- In sound propagation, it is the energy of the sound that travels and not the particles of the medium.
- Sound cannot travel in vacuum.
- The change in density from one maximum value to the minimum value and again to the maximum value makes one complete oscillation.
- The distance between two consecutive compressions or two consecutive rarefactions is called the wavelength, □ □
- The time taken by the wave for one complete oscillation of the density or pressure of the medium is called the time period, *T*.
- The number of complete oscillations per unit time is called the

Frequency = 1/T.

- The speed, frequency□and wavelength□of sound are related by the equation as **Speed= Frequency X Wavelength.**
- The speed of sound depends primarily on the nature and the temperature of the transmitting medium.
- The law of reflection of sound states that the directions in which the sound is incident and reflected make equal angles with the normal to the reflecting surface at the point of incidence and the three lie in the same plane.
- For hearing a distinct sound, the time interval between the original sound and the reflected one must be at least 0.1 s.
- The persistence of sound in an auditorium is the result of repeated reflections of sound and is called reverberation.
- Sound properties such as pitch, loudness and quality are determined by the corresponding wave properties.
- Loudness is a physiological response of the ear to the intensity of sound.
- The amount of sound energy passing each second through unit area is called the intensity of sound.
- The audible range of hearing for average human beings is in the frequency range of 20 Hz – 20 kHz.
- Sound waves with frequencies below the audible range are termed “infrasonic” and those above the audible range are termed “ultrasonic”.
- Ultrasound has many medical and industrial applications.
- The SONAR technique is used to determine the depth of the sea and to locate under water hills, valleys, submarines, icebergs, sunken ships etc.

WHY DO WE FALL ILL

- Health is a state of physical, mental and social well-being.
- The health of an individual is dependent on his/her physical surroundings and his/her economic status.
- Diseases are classified as acute or chronic, depending on their duration.
- Disease may be due to infectious or non-infectious causes.
- Infectious agents belong to different categories of organisms and may be unicellular and microscopic or multicellular.
- The category to which a disease-causing organism belongs decides the type of treatment.
- Infectious agents are spread through air, water, physical contact or vectors.
- Prevention of disease is more desirable than its successful treatment.
- Infectious diseases can be prevented by public health hygiene measures that reduce exposure to infectious agents.
- Infectious diseases can also be prevented by using immunisation.
- Effective prevention of infectious diseases in the community requires that everyone should have access to public hygiene and immunisation.

NATURAL RESOURCES

- Life on Earth depends on resources like soil, water and air, and energy from the Sun.
- Uneven heating of air over land and water-bodies causes winds.
- Evaporation of water from water-bodies and subsequent condensation give us rain.
- Rainfall patterns depend on the prevailing wind patterns in an area.
- Various nutrients are used again and again in a cyclic fashion. This leads to a certain balance between the various components of the biosphere.
- Pollution of air, water and soil affect the quality of life and harm the biodiversity.
- We need to conserve our natural resources and use them in a sustainable manner.

IMPROVEMENT IN FOOD RESOURCES

- There are thirteen nutrients essential for crops. Of these, six are required in large quantities and are known as macronutrients whereas seven nutrients are required in small quantities and are known as micro-nutrients.
- Manure and fertilizers are the main sources of nutrient supply to crops.
- Organic farming is a farming system with minimal or no use of chemicals as fertilizers, herbicides, pesticides etc. and with a maximum input of organic manures, recycled farm wastes, and bio-agents, with healthy cropping systems.
- Mixed farming is a system of farming on a particular farm which includes crop production, raising of livestock etc.
- Mixed cropping is growing of two or more crops simultaneously on the same piece of land.
- Growing two or more crops in definite row patterns is known as inter-cropping.
- The growing of different crops on a piece of land in pre-planned succession is called crop rotation.
- Varietal improvement is required for higher yield, good quality, biotic and abiotic resistance, shortening the maturity duration, wider adaptability and desirable agronomic characteristics.
- Farm animals require proper care and management such as shelter, feeding, breeding and disease control. This is called animal husbandry.
- Poultry farming is done to raise domestic fowls. Poultry production includes egg production and broiler production for poultry meat.
- To enhance poultry production, cross breeding is done between Indian and exotic breeds for variety improvement.
- Fish may be obtained from marine resources as well as inland resources.
- To increase production of fish, they can be cultured in marine and inland ecosystems.
- Marine fish capture is done by fishing nets guided by echosounders and satellites.
- Composite fish culture system is commonly used for fish farming.
- Bee-keeping is done to get honey and wax.

Chemical Reactions and Equations

- A complete chemical equation represents the reactants, products and their physical states symbolically.
- A chemical equation is balanced so that the numbers of atoms of each type involved in a chemical reaction are the same on the reactant and product sides of the equation. Equations must always be balanced.
- In a combination reaction two or more substances combine to form a new single substance.
- Decomposition reactions are opposite to combination reactions. In a decomposition reaction, a single substance decomposes to give two or more substances.
- Reactions in which heat is given out along with the products are called exothermic reactions.
- Reactions in which energy is absorbed are known as endothermic reactions.
- When an element displaces another element from its compound, a displacement reaction occurs.
- Two different atoms or groups of atoms (ions) are exchanged in double displacement reactions.
- Precipitation reactions produce insoluble salts.
- Reactions also involve the gain or loss of oxygen or hydrogen by substances.

Oxidation is the gain of oxygen or loss of hydrogen. **R**eduction is the loss (**R**eduction) of oxygen or gain of hydrogen.

Acids, Bases and Salts

- Acid-base indicators are dyes or mixtures of dyes which are used to indicate thepresence of acids and bases.
- Acidic nature of a substance is due to the formation of H+(aq) ions in solution.

Formation of OH–(aq) ions in solution is responsible for the basic nature of a substance.

- When an acid reacts with a metal, hydrogen gas is evolved and a corresponding salt is formed.
- When a base reacts with a metal, along with the evolution of hydrogen gas a salt is formed which has a negative ion composed of the metal and oxygen.
- When an acid reacts with a metal carbonate or metal hydrogencarbonate, it gives the corresponding salt, carbon dioxide gas and water.
- Acidic and basic solutions in water conduct electricity because they produce hydrogen and hydroxide ions respectively.
- The strength of an acid or an alkali can be tested by using a scale called the Ph scale (0-14) which gives the measure of hydrogen ion concentration in a solution.
- A neutral solution has a pH of exactly 7, while an acidic solution has a pH less than 7 and a basic solution a pH more than 7.
- Living beings carry out their metabolic activities within an optimal pH range.
- Mixing concentrated acids or bases with water is a highly exothermic process.

 Acids and bases neutralise each other to form corresponding salts and water.
 Water of crystallisation is the fixed number of water molecules chemically attached to each formula unit of a salt in its crystalline form.
 Salts have various uses in everyday life and in industries.

Metals and Non-metals

 Elements can be classified as metals and non-metals.
 Metals are lustrous, malleable, ductile and are good conductors of heat and electricity. They are solids at room temperature, except mercury which is a liquid.
 Metals can form positive ions by losing electrons to non-metals.
 Metals combine with oxygen to form basic oxides. Aluminium oxide and zinc oxide show the properties of both basic as well as acidic oxides. These oxides are known as amphoteric oxides.
 Different metals have different reactivities with water and dilute acids.
 A list of common metals arranged in order of their decreasing reactivity is known as an activity series.
 Metals above hydrogen in the Activity series can displace hydrogen from dilute acids.
 A more reactive metal displaces a less reactive metal from its salt solution.
 Metals occur in nature as free elements or in the form of their compounds.
 The extraction of metals from their ores and then refining them for use is known as metallurgy.
 An alloy is a homogeneous mixture of two or more metals, or a metal and a non-metal.
 The surface of some metals, such as iron, is corroded when they are exposed to moist air for a long period of time. This phenomenon is known as corrosion.
 Non-metals have properties opposite to that of metals. They are neither malleable nor ductile. They are bad conductors of heat and electricity, except for graphite, which conducts electricity.
 Non-metals form negatively charged ions by gaining electrons when reacting with metals.
 Non-metals form oxides which are either acidic or neutral.
 Non-metals do not displace hydrogen from dilute acids. They react with hydrogen to form hydrides.

Carbon and its Compounds

 Carbon is a versatile element that forms the basis for all living organisms and many of the things we use.
 This large variety of compounds is formed by carbon because of its tetravalency and the property of catenation that it exhibits.
 Covalent bonds are formed by the sharing of electrons between two atoms so that both can achieve a completely filled outermost shell.
 Carbon forms covalent bonds with itself and other elements such as hydrogen, oxygen, sulphur, nitrogen and chlorine.
 Carbon also forms compounds containing double and triple bonds between carbon atoms. These carbon chains may be in the form of straight chains, branched chains or rings.
 The ability of carbon to form chains gives rise to a homologous series of compounds in which the same functional group is attached to carbon chains of different lengths.
 The functional groups such as alcohols, aldehydes, ketones and carboxylic acids bestow characteristic properties to the carbon compounds that contain them.
 Carbon and its compounds are some of our major sources of fuels.
 Ethanol and ethanoic acid are carbon compounds of importance in our daily lives.
 The action of soaps and detergents is based on the presence of both hydrophobic and hydrophilic groups in the molecule and this helps to emulsify the oily dirt and hence its removal.

Periodic Classification of Elements

 Elements are classified on the basis of similarities in their properties.
 Döbereiner grouped the elements into triads and Newlands gave the Law of Octaves.
 Mendeléev arranged the elements in increasing order of their atomic masses and according to their chemical properties.
 Mendeléev even predicted the existence of some yet to be discovered elements on the basis of gaps in his Periodic Table.

 Anomalies in arrangement of elements based on increasing atomic mass could be removed when the elements were arranged in order of increasing atomic number, a fundamental property of the element discovered by Moseley.
 Elements in the Modern Periodic Table are arranged in 18 vertical columns called groups and 7 horizontal rows called periods.
 Elements thus arranged show periodicity of properties including atomic size, valency or combining capacity and metallic and non-metallic character.

Life Processes

 Movement of various types can be taken as an indication of life.
 The maintenance of life requires processes like nutrition, respiration, transport of materials within the body and excretion of waste products.
 Autotrophic nutrition involves the intake of simple inorganic materials from the environment and using an external energy source like the Sun to synthesise complex high-energy organic material.
 Heterotrophic nutrition involves the intake of complex material prepared by other organisms.
 In human beings, the food eaten is broken down by various steps along the alimentary canal and the digested food is absorbed in the small intestine to be sent to all cells in the body.
 During the process of respiration, complex organic compounds such as glucose are broken down to provide energy in the form of ATP. ATP is used to provide energy for other reactions in the cell.
 Respiration may be aerobic or anaerobic. Aerobic respiration makes more energy available to the organism.
 In human beings, the transport of materials such as oxygen, carbon dioxide, food and excretory products is a function of the circulatory system. The circulatory system consists of the heart, blood and blood vessels.
 In highly differentiated plants, transport of water, minerals, food and other materials is a function of the vascular tissue which consists of xylem and phloem.
 In human beings, excretory products in the form of soluble nitrogen compounds are removed by the nephrons in the kidneys.
 Plants use a variety of techniques to get rid of waste material. For example, waste material may be stored in the cell-vacuoles or as gum and resin, removed in the falling leaves, or excreted into the surrounding soil.

Control and Coordination

 Control and coordination are the functions of the nervous system and hormones in our bodies.
 The responses of the nervous system can be classified as reflex action, voluntary action or involuntary action.
 The nervous system uses electrical impulses to transmit messages.
 The nervous system gets information from our sense organs and acts through our muscles.
 Chemical coordination is seen in both plants and animals.
 Hormones produced in one part of an organism move to another part to achieve the desired effect.
 A feedback mechanism regulates the action of the hormones.

How do Organisms Reproduce?

 Reproduction, unlike other life processes, is not essential to maintain the life of an individual organism.
 Reproduction involves creation of a DNA copy and additional cellular apparatus by the cell involved in the process.
 Various organisms use different modes of reproduction depending on their body design.
 In fission, many bacteria and protozoa simply divide into two or more daughter cells.
 Organisms such as hydra can regenerate if they are broken into pieces. They can also give out buds which mature into new individuals.
 Roots, stems and leaves of some plants develop into new plants through vegetative propagation.
 These are examples of asexual reproduction where new generations are created from a single individual.
 Sexual reproduction involves two individuals for the creation of a new individual.
 DNA copying mechanisms creates variations which are useful for ensuring the survival of the species. Modes of sexual reproduction allow for greater variation to be generated.
 Reproduction in flowering plants involves transfer of pollen grains from the anther to the stigma which is referred to as pollination. This is followed by fertilisation.
 Changes in the body at puberty, such as increase in breast size in girls and new facial hair growth in boys, are signs of sexual maturation.
 The male reproductive system in human beings consists of testes which produce sperms, vas deferens, seminal vesicles, prostate gland, urethra and penis.

 The female reproductive system in human beings consists of ovaries, fallopian tubes, uterus and vagina.
 Sexual reproduction in human beings involves the introduction of sperm in the cervical os of uterus.

Heredity and Evolution

 Variations arising during the process of reproduction can be inherited.
 These variations may lead to increased survival of the individuals.
 Sexually reproducing individuals have two copies of genes for the same trait. If the copies are not identical, the trait that gets expressed is called the dominant trait and the other is called the recessive trait.
 Traits in one individual may be inherited separately, giving rise to new combinations of traits in the offspring of sexual reproduction.
 Sex is determined by different factors in various species. In human beings, the sex of the child depends on whether the paternal chromosome is X (for girls) or Y (for boys).
 Variations in the species may confer survival advantages or merely contribute to the genetic drift.
 Changes in the non-reproductive tissues caused by environmental factors are not inheritable.
 Speciation may take place when variation is combined with geographical isolation.
 Evolutionary relationships are traced in the classification of organisms.
 Tracing common ancestors back in time leads us to the idea that at some point of time, non-living material must have given rise to life.
 Evolution can be worked out by the study of not just living species, but also fossils.
 Complex organs may have evolved because of the survival advantage of even the intermediate stages.
 Organs or features may be adapted to new functions during the course of evolution.
For example, feathers are thought to have been initially evolved for warmth and later adapted for flight.
 Evolution cannot be said to 'progress' from 'lower' forms to 'higher' forms. Rather, evolution seems to have given rise to more complex body designs even while the simpler body designs continue to flourish.
 Study of the evolution of human beings indicates that all of us belong to a single species that evolved in Africa and spread across the world in stages.

Light – Reflection and Refraction

 Light seems to travel in straight lines.
 Mirrors and lenses form images of objects. Images can be either real or virtual, depending on the position of the object.
 The reflecting surfaces, of all types, obey the laws of reflection. The refracting surfaces obey the laws of refraction.
 New Cartesian Sign Conventions are followed for spherical mirrors and lenses.
 Mirror formula, **1/V+1/U=1/F.** *v u f* , gives the relationship between the object-distance (*u*), image-distance (*v*), and focal length (*f)* of a spherical mirror.
 The focal length of a spherical mirror is equal to half its radius of curvature.
 The magnification produced by a spherical mirror is the ratio of the height of the image to the height of the object.
 A light ray travelling obliquely from a denser medium to a rarer medium bends away from the normal. A light ray bends towards the normal when it travels obliquely from a rarer to a denser medium.
 Light travels in vacuum with an enormous speed of 3×108 m s-1. The speed of light is different in different media.
 The refractive index of a transparent medium is the ratio of the speed of light in vacuum to that in the medium.
 In case of a rectangular glass slab, the refraction takes place at both air-glass interface and glass-air interface. The emergent ray is parallel to the direction of incident ray.
 Lens formula, **1/V-1/U=1/F.** *v u f* , gives the relationship between the object-distance (*u*), image-distance (*v*), and the focal length (*f*) of a spherical lens.
 Power of a lens is the reciprocal of its focal length. The SI unit of power of a lens is *dioptre*.

Human Eye and Colourful World

 The ability of the eye to focus both near and distant objects, by adjusting its focal length, is called the accommodation of the eye.
 The smallest distance, at which the eye can see objects clearly without strain, is called the near point of the eye or the least distance of distinct vision. For a young adult with normal vision, it is about 25 cm.
 The common refractive defects of vision include myopia, hypermetropia and presbyopia. Myopia (short-sightedness – the image of distant objects is focused before the retina) is corrected by using a concave lens of suitable power.

Hypermetropia (far-sightedness – the image of nearby objects is focussed beyond the retina) is corrected by using a convex lens of suitable power. The eye loses its
power of accommodation at old age.
 The splitting of white light into its component colours is called dispersion.
 Scattering of light causes the blue colour of sky and the reddening of the Sun at sunrise and sunset.

Electricity

 A stream of electrons moving through a conductor constitutes an electric current. Conventionally, the direction of current is taken opposite to the direction of flow of electrons.
 The SI unit of electric current is ampere.
 To set the electrons in motion in an electric circuit, we use a cell or a battery. A cell generates a potential difference across its terminals. It is measured in volts (V).
 Resistance is a property that resists the flow of electrons in a conductor. It controls the magnitude of the current. The SI unit of resistance is ohm (▫).
 Ohm's law: The potential difference across the ends of a resistor is directly proportional to the current through it, provided its temperature remains the same.
 The resistance of a conductor depends directly on its length, inversely on its area of cross-section, and also on the material of the conductor.
 The equivalent resistance of several resistors in series is equal to the sum of their individual resistances.
▫ A set of resistors connected in parallel has an equivalent resistance *Rp* given by **1/R=1/R1+1/R2+…….**
▫ The electrical energy dissipated in a resistor is given by $W = V It$
▫ The unit of power is watt (W). One watt of power is consumed when 1 A of current flows at a potential difference of 1 V.
▫ The commercial unit of electrical energy is kilowatt hour (kWh). 1 kW h = 3,600,000 J.

Magnetic Effects of Electric Current

▫ A compass needle is a small magnet. Its one end, which points towards north, is called a north pole, and the other end, which points towards south, is called a south pole.
▫ A magnetic field exists in the region surrounding a magnet, in which the force of the magnet can be detected.
▫ Field lines are used to represent a magnetic field. A field line is the path along which a hypothetical free north pole would tend to move. The direction of the magnetic field at a point is given by the direction that a north pole placed at that point would take. Field lines are shown closer together where the magnetic field is greater.
▫ A metallic wire carrying an electric current has associated with it a magnetic field. The field lines about the wire consist of a series of concentric circles whose direction is given by the right-hand rule.
▫ The pattern of the magnetic field around a conductor due to an electric current flowing through it depends on the shape of the conductor. The magnetic field of a solenoid carrying a current is similar to that of a bar magnet.
▫ An electromagnet consists of a core of soft iron wrapped around with a coil of insulated copper wire.
▫ A current-carrying conductor when placed in a magnetic field experiences a force. If the direction of the field and that of the current are mutually perpendicular to each other, then the force acting on the conductor will be perpendicular to both and will be given by Fleming's left-hand rule. This is the basis of an electric motor. An electric motor is a device that converts electric energy into mechanical energy.
▫ The phenomenon of electromagnetic induction is the production of induced current in a coil placed in a region where the magnetic field changes with time. The magnetic field may change due to a relative motion between the coil and a magnet placed near to the coil. If the coil is placed near to a current-carrying conductor, the magnetic field may change either due to a change in the current through the conductor or due to the relative motion between the coil and conductor. The direction of the induced current is given by the Fleming's right-hand rule.
▫ A generator converts mechanical energy into electrical energy. It works on the basis of electromagnetic induction.
▫ In our houses we receive AC electric power of 220 V with a frequency of 50 Hz. One of the wires in this supply is with red insulation, called live wire. The other one is of black insulation, which is a neutral wire. The potential difference between the two is 220 V. The third is the earth wire that has green insulation and this is connected to a metallic body deep inside earth. It is used as a safety measure to ensure that any leakage of current to a metallic body does not give any severe shock to a user.
▫ Fuse is the most important safety device, used for protecting the circuits due to short-circuiting or overloading of the circuits.

Sources of Energy

_ Our energy requirements increase with our standard of living.
_ In order to fulfil our energy requirements, we try to improve the efficiency of energy usage and also try and exploit new sources of energy.
_ We also need to look for new sources of energy because the conventional sources of energy like fossil fuels are in danger of getting exhausted soon.
_ The energy source we select would depend on factors like the ease and cost of extracting energy from the source, the efficiency of the technology available for using that source of energy and the environmental impact of using that source.
_ Many of the sources ultimately derive their energy from the Sun.

Our Environment

▫ The various components of an ecosystem are interdependent.
▫ The producers make the energy from sunlight available to the rest of the ecosystem.
▫ There is a loss of energy as we go from one trophic level to the next, this limits the number of trophic levels in a food-chain.
▫ Human activities have an impact on the environment.
▫ The use of chemicals like CFCs has endangered the ozone layer. Since the ozone layer protects against the ultraviolet radiation from the Sun, this could damage the environment.
▫ The waste we generate may be biodegradable or non-biodegradable.
▫ The disposal of the waste we generate is causing serious environmental problems.

Management of Natural Resources

▫ Our resources like forests, wild life, water, coal and petroleum need to be used in a sustainable manner.
▫ We can reduce pressure on the environment by sincerely applying the maxim of **'Reduce, Reuse and Recycle'** in our lives.
▫ Management of forest resources has to take into account the interests of various stakeholders.
▫ The harnessing of water resources by building dams has social, economic and environmental implications. Alternatives to large dams exist. These are locale-specific and may be developed so as to give local people control over their local resources.
▫ The fossil fuels, coal and petroleum, will ultimately be exhausted. Because of this and because their combustion pollutes our environment, we need to use these resources judiciously.