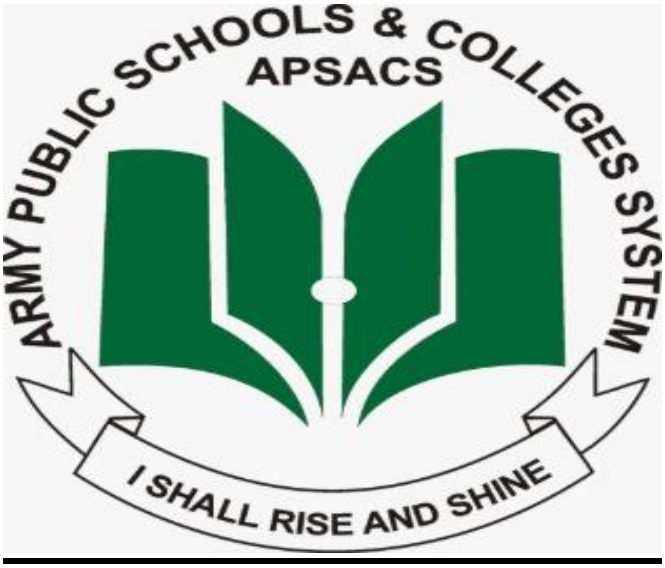

G.SCIENCE NOTES

FOR CLASS - IX

PREPARED BY

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CHAPTER # 1

INTRODUCTION AND ROLE OF SCIENCE

BRIEF HISTORY OF SCIENCE

Meaning of Science:

Science is a Latin word which means "to know".

Definition:

It is an organized form of knowledge, which is obtained by observation and experimentation. A knowledge, which is systematic, tested and brought under general principles.

Benefits of science:

It helps us in understanding and describing the various processes and phenomena that take place around us. It can answer "Hows" and "Whys".

CONCEPT OF SCIENCE IN ISLAM

Islam is a religion for all times. Its teachings are simple, natural and produces deep impact on individuals and on society as well. The basic of the Holy Book is "The man".

The basic laws that govern the vital processes of life were explained in the Holy Quran 1400 years ago. Following a few verses from Holy Quran will reveal the importance to the acquisition of knowledge and research in the field of science that is given in Islam.

"Allah is the Creator Who has made everything between the Earth and the heavens. He has made everything subsequent to man and there is a great incentive for man to exploit these hidden treasures for the mankind"

"And He is the Allah, Who created every living thing from water. Out of them, some crawl, some are tetra pods, (Four legged animals) and some bipedal (Two legged animals). He is the Almighty and the Creator"

GROWTH OF SCIENCE

The growth of science is a continuous process and it has taken a very long period of time to reach the present status.

TYPES OF PERIODS

The growth of scientific process can be divided into four periods.

1) GREEK PERIOD

Range:

Greek period ranges from third sixth century B.C.

Contribution:

During this period great philosophers and scientists contributed a lot to the knowledge of science.

Important scientist:

Aristotle, Archimedes, Galen and Pythagoras are few important names of that period.

2) MUSLIM PERIOD

Range:

It ranges from seventh to thirteenth century A.D.

Achievements:

The Muslim thinkers and scientist made valuable and original contributions in the fields of chemistry, physics, medicines, mathematics and astronomy.

Important Scientist:

They also took full benefits of the Greek philosophers. Jabar bin Hayyan, Muhammad Bin Zikaria Razi, Ibn-ul-Haitham, Al-Beruni, Bu-Ali-Sina are few great names of this period.

3) MODERN PERIOD

Range:

The advancement in the field of science and technology has deeply influenced the best with an awakening. During seventeenth century to nineteenth century most of the scientific research work was carried out by the west.

Achievements: Many books of Muslim scientist and scholars were translated in English, French and German languages. New theories had been introduced false believes were rejected.

New laws were discovered. New inventions have been made in almost every field during this period.

Important scientists:

This was the period of discoveries and inventions. Galileo, Issacnewton, Micheal Darwan, Maxwell edition, Marconi were some of the few important scientist of that period.

4) RECENT PERIOD

Range:

In the twentieth century the growth of scientific knowledge has been revolutionized the human life.

Achievements:

Electronics, telecommunication, Computers, Lasers, Space exploration, genetic engineering, Surgery and transplantation of human organs are the major achievements of twentieth century. Nuclear energy and space invasion have opened new fields of science and technology.

Important scientist:

Some of the important scientist of this period are Maxplanks, Eienstein, Medame Curie, Yukawa and Dr. Abdus salam.

BRIEF CONTRIBUTION OF MUSLIM SCIENTIST

From seventh to thirteenth century, the Muslim scientists and philosophers made valuable contributions in various fields of science and technology. Brief contribution of a few Muslim scientists is given below:

JABAR BIN HAYYAN (722-803)

Father of chemistry:

He is considered as the father of chemistry.

Contributions:

i. He established his own laboratory where he worked devotedly.

ii. He invented sulphuric acid, nitric acid, hydrochloric acid and several other important compounds.
iii. His contributions to chemistry also include some important scientific techniques such as crystallization, distillation, sublimation and evaporation.

MUHAMMAD IBNE ZAKARIYA AL-RAZI (861-930)

Great physician:

He was a great physician of his times.

Famous books:

His great works are **AL-HAVI** and **AL-MANSOORI**. In these books he has written the history of some medical cases with symptoms and treatment. His books were translated into Latin, French and English languages. **AL-HAVI** was the greatest encyclopaedia of tenth century.

Contributions:

i. He was the first to discuss the details of small pox and measles.
ii. He was the first to use opium for anaesthesia.

IBN-UL-HAITHAM (965-1039 AD)

Renowned physicist:

He was a renowned physicist of all times. In Europe he is known as **Al-Hazem**.

Famous book:

His famous book **Kitab Al-Mana-Zir** was translated into latin.

Contributions:

i. He gave the basic principles of reflection and refraction.
ii. He worked on lenses and explained the working of eye.
iii. He is considered the father of optics.

AL-BAIRUNI (973-1048AD)

Great scholar:

He was a great scholar of Physics, Mathematics, Geography and Astronomy.

Famous books and Contributions:

He travelled through India and recorded his observations in his famous book **Kitab-ul-Hind**. In another famous book **Qanoon-i-Masoodi** he has discussed Astronomy, Solar and Lunar motions. He has written more than **150** books on varied topics.

BU ALI SINA

Greatest scientist:

He was the greatest scientist of his times. He is known as **Avicenna** in Europe.

Famous Books:

He wrote more than **100** books in medicines, science, philosophy and literature. His famous book on medicine, **AL-Qanun Filtib** was prescribed as a text book in medical institutes of Europe till seventeenth Century.

In another famous book **AL-Shifa**, he made useful contributions to Physics, Chemistry, Arithmetic's, Biology and even music.

IBNE BAITER

Introduction:

He was a great botanist and pharmacist of his time. He is known for his studies in plants. He travelled a lot and collected a large number of plants.

Contribution:

i. He discovered many new plant.
ii. He is also famous for the study of medicinal plants.

IBN-E-AFEES

Contribution:

i. He was the first scientist who described the circulation of blood in human body in 13^{th} century.
ii. He was also the first to describe the constitution of lungs.

CONTRIBUTION OF PAKISTANI SCIENTISTS

Introduction:

The land of Pakistan has also produced a galaxy of scientist, some of which have gained international recognition and contributed to the advancement of science.

Brief contribution of Pakistani Scientists is given below:

DR. ABDUS SALAAM

Achievement:

Theory of Unification

i. A word fame physicist, proposed a Theory of Unification of two of basic four physical forces governing the universe. It was a great achievement in the world of physical science.
ii. He also worked very hard for the improvement of science education in the 3rd world countries.

Nobel Prize:

On this contribution he along with two other scientists was awarded the Nobel Prize.

DR. MUNIR AHMAD KHAN

Well-known scientist:

A well-known scientist of Pakistan.

Contributions:

i. He participated in various courses of international institute of nuclear Technology.
ii. He has also served the International Atomic Energy commission and worked very hard to establish and consolidate the **Atomic Energy Commission of Pakistan**.

DR. ASHFAQ AHMAD

Introduction:

Dr. Ashfaq Ahmad is an eminent atomic scientist of Pakistan, who remained Chairman of Pakistan Atomic Energy Commission for 10 years.

Contributions:

He established Global Change Impact Studies Center (GCISC). In recognition of his services, he was awarded by the Govt. of Pakistan, the highest civil award of **Nishan-i-Imtiaz.**

DR. ABDUL QADEER KHAN

Introduction:

A world fame Pakistani Atomic scientist who excelled in the field of enrichment of uranium.

Contributions:

i. Dr. Qadeer brought the technology of enrichment of Uranium to Pakistan and devised new methods in this field.
ii. He established Kahuta Research Laboratories which has now named after name i.e. Dr. A.Q. Khan Laboratories.
iii. He always worked for his motto i.e. Atom for peace.

DR. SAMAR MUBARAK MAND

Introduction:

A famous Atomic scientist who joined Pakistan Atomic Energy Commission and became member technology.

Contributions:

i. During his professional carrier he earned specialization in Application of Lasers, Fiber Optics Technology, Nuclear Instrumentation, Nuclear Diagnostics and Missile Technology. He was awarded **Sitara-e-Imtiaz and Hilal-e-Imtiaz**.
ii. At present he is the Chairman of the National Engineering and Scientific Commission **(NESCOM).**

DR. ATA-UR-REHMAN

A famous scientist of Pakistan who joined Hussain Ibrahim Jamal Institute of Chemistry Karachi.

Contributions:

He has published about **200 research papers** which are part of the syllabi in various universities of the world. He was awarded **Sitara-e-Imtiaz**.

SCIENCE AS AN INTEGRATED DISCIPLINE

Introduction:

Science is an integrated and organized knowledge about problems, objects or processes of nature. In the scientific process observation, reasoning and experimentation or physical verification are the basic tools.

It is because of scientific way of thinking that the scientists have been able to widen their knowledge and scope of their research.

BRANCHES OF SCIENCE

Science have been mainly divided into two main categories:

- Physical Sciences
- Biological Sciences

Physical Sciences

Definition:

It is the main category of science that deals with earth, universe, mountains, oceans etc.
Branches Physical science:

Physical science is further divided into following branches such as Astronomy, Chemistry, Geology and physics.

Astronomy

Definition:

It is the one of the oldest branch of physical science that deals with the study of heavenly bodies.

Astronomer's achievement:

Chinese, Egyptians, Babylonians and Muslim astronomers made a thorough study of those heavenly bodies which could be seen with the naked eye. On the basis of these observations, they framed the calendars. The concept of year, months, weeks and days was an important achievement of these astronomers.

Modern astronomy:

The modern astronomy starts with the invention of telescope. The first telescope was made by Galileo in 1610.

Advantages of telescope:

The telescope has made our studies, about the heavenly bodies more factual and accurate. With the help of telescope various heavenly bodies, which were not known before have been now discovered. Such as black hole, and clusters of galaxies etc. Physics and mathematics play an important role in Astronomy.

Chemistry

Definition:

The branch of physical science that deals with the nature, composition and properties of matter. It also deals with the study of various chemical reactions taking place in the universe.

Biochemistry:

Various chemical reactions taking place inside the living bodies are also considered part of chemistry and called biochemistry.

Examples: The digestion of food, the burning of candle, the rusting of iron, release of oxygen from plants are the common examples of chemical reactions.

Geology

Definition:

It is also known as the science of earth. It deals with the study of soil, rocks, minerals, oil and gas deposits.

Importance:

This branch of science is getting great importance because it is directly associated with the exploration and excavation of fossil fuels i.e. oil, gas and coal.

Sub-branches:

Its related sub-branches are geophysics and geography. Pakistani geologists are exploring oil and gas fields in Pakistan.

Geological survey:

Geological survey of Pakistan is an important organization which undertakes investigation and exploration of underground resources, to determine their location, nature and recoveries.

Physics

Definition:

It is an important branch of physical science that deals with the physical properties of matter and energy and the interactions between them. It helps to study the basic properties of matter under different conditions.

Sub-disciplines:

It is a vast subject that can be divided into sub-disciplines such as mechanics, heat, sound, light, electricity, magnetism and atomic structure.

Examples:

All the modern equipment's like radio, televisions, telephones, tape recorders, digital watches, calculators, computers, laser machines and etc. are the products of physics. The equipment's made by the physicist are used in different discipline of science.

BIOLOGICAL SCIENCES

Definition:

This main division of science deals with the living things. It includes the study of the structure, function and development of living things.

Branches of biological science:

It is divided into two main branches.

1) **Botany**

It deals with the scientific study of plants.

2) **Zoology**

It deals with the scientific study of animals.

Agriculture and medicine are the integral part of biological science and both have a relationship with chemistry.

ROLE OF SCIENCE AND TECHNOLOGY

Introduction:

Technology is the outcome of scientific knowledge, which has not only helped us to understand our physical world but also gave the laws that govern the various phenomena. Application of these laws have helped in the invention of new devices for the welfare of society.

Role of Science:

The science has played the basic role to improve the standard of living. In the field of agriculture, industry, transport, communication, computers, television, drugs and construction, the technology has brought a drastic advancement affected the human society.

AGRICULTURE

Use of machines:

The use of machines like tractors, scrapers, harvesters, thrashers and tube wells have greatly helped the man to get maximum production.

Use of pesticides:

The use of pesticides, insecticides and fungicides has saved the crops from conventional diseases.

Use of fertilizers: Fertilizers are in two way less important than other technologies. The use of fertilizers have increased the fertility of the soils and produced better crops.

MEDICINE

Introduction:

Up to the 19^{th} century, the medicines were obtained from natural sources i.e. plants, animals or minerals.

Advancement in Biochemistry:

With the advancement in the field of Biochemistry the drugs are being synthesized in the laboratories. Many antibiotics and vaccines are now being synthesized in the laboratories. These drugs are then produced at a large scale for prevention and treatment of various diseases.

Major biological problems:

Now a days the major biological problems are **cancer, aids** and **hepatitis**.

ENGINEERING

Advancements in engineering field:

With the awakening of human society the man has constructed and created great structures like Pyramid of Egypt and Great Wall of China. These are the symbols of advancements in the field of engineering.

Contribution of mechanical engineering:

- With the help of mechanical engineering a great variety of machines have been invented which have made the production of thousands of utility goods, possible.
- The construction of factories, bridges, dams, computers and various machines have changed the human society.
- Modern communication has brought the whole world up to the level of a global village.

LIMITATIONS OF SCIENCE

Introduction:

The knowledge that is based on physical and chemical properties of matter. It has made great advancements in all the fields.

Moral and spiritual values:

But science has failed to calculate or evaluate the moral and spiritual values. In spite of a lot of achievements in different fields of science we are still unaware of numerous things around us.

Telescope:

Telescope, for example, has made distant objects visible but still numerous heavenly bodies are out of reach for the scientists.

Human body:

Similarly human body itself is partly understood. Many diseases have still to be cured or even discovered. This clearly indicates that science and its products have their own limitations.

CHAPTER # 2

OUR LIFE AND CHEMISTRY

Three basic elements

Introduction:

Life of all living organisms depends on food they eat, water they drink and air they breathe.

Composition:

All of these elements are composed of hydrogen, oxygen and carbon. These elements combine with one another to form air, water and food.

Percentages:

The human body has all of these elements present in it. The percentage of elements present in body is:

Hydrogen **10%,** carbon **18%,** oxygen **65%**

Respiration

Definition:

In this process animals inhale air containing oxygen and exhale air containing carbon dioxide.

Process:

The oxygen from the lungs is taken up by the lungs. It is taken into the blood stream and transported to the cells where the oxygen reacts with the food components e.g. carbohydrates to release energy, carbon dioxide and water. It is called the food breaking and energy releasing process.

Uses:

The released energy is used by our body o keep us warm and active. The released carbon dioxide is used by plants for photosynthesis.

Photosynthesis

Definition:

Photosynthesis occurs in the green leaves of the plants in the presence of sunlight.

Process:

In this process carbon dioxide and water react in the presence of light and chlorophylls to form carbohydrates and release oxygen. The formation of carbohydrates takes place by absorption of solar energy. During this process solar energy is converted into chemical energy.

Uses:

The carbohydrates formed by the plant are sources of food for animals; hence they depend on it for existence. The released oxygen is used by animals. The respiration is the reverse process of photosynthesis.

Different allotropic forms of carbon

Definition of allotropy:

The existence of an element in different physical forms due to different arrangement of atoms in space is called allotropy.

Definition of allotropes:

These different allotropic crystalline forms are known as allotropes. The physical properties of allotropes are different but chemical properties are same.

Carbon:

Carbon exists in nature in different allotropic forms; diamond and graphite are two main allotropes.

Diamond:

Diamond is the purest form of carbon.

Diamond is the hardest natural occurring substance.

It has a very high melting point of 3500C.

It is non conductor of electricity.

Because of its hardness it is used in drilling tools, for cutting glass and other grinding devices.

The transparent diamond is used in jewelry as gem.

It is colorless in pure state.

It is transparent and shiny.

It is very hard in nature.

At high temperature changes into graphite.

Graphite

Grayish is a soft, black and solid in nature with metallic luster.

It is used in lead pencil.

Graphite is a good conductor of electricity.

Being soft, it can also be used as lubricant in machines.

It is grayish black in color.

It is opaque.

It is soft and slippery.

Good conductor of electricity.

At high temperature remains unchanged.

Types of carbon compounds and their Abundance

Organic compounds:

Carbon atoms can combine with other elements in a variety of ways thus forming different types of compounds. These are known as organic compounds.

First organic compound:

It was believed that carbon was only present in living organisms.

In 1828 Fredrick Wohler prepared urea in a laboratory, since then thousands and thousands of compounds containing carbon are being prepared by mankind.

Presence of organic compounds:

1: **living organisms**

2: **Food we eat, and clothing we** wear e.g. carbohydrates, fats, proteins, vitamins and synthetic fiber (nylon, silk etc)

3: **Drugs and dyes:** all types of medicine, every type of colours used to dye cloths, leather etc

4: **Paper and ink:** all type of paper is made of cellulose. Writing material is also composed of carbon containing compounds.

5: **Paints and plastic** used for protection and decoration.

6: **Soap and detergents** used for washing purposes.

7: **Rubber and leather** used for tires

8: **Polymers** used for making shopping bags, household articles, casing for electronic etc.

9: **Fuel** for combustion, coal, petroleum and gas.

Water as a universal solvent

Solvent:

A compound that can dissolve a solute to form a solution is known as a solvent.

Universal solvent:

Water is called a universal solvent as it has the property to dissolve and substance to form a solution.

Uses of water:

Aquatic life: All aquatic life depends upon waters solvent property. Gases are soluble in water, which are used for respiration by animals.

Plants: All plants depend upon salts present in the soil; these solids in the solid form cannot be directly absorbed by plants. Water can dissolve mineral salts and fertilizer and make them available to be absorbed by plants. Had there been no water, plants would have not existed.

Agriculture: Rainy water dissolves useful mineral salts from the earth surface of hills and mountains and carries them up to hundreds of miles to the agriculture fields in plains. This process proved the required elements to the plants and plants grow and develop properly. They produce good yield.

Industrial use: In industry water is used to dissolve chemical compound.

Laboratories: In laboratories water is the most important solvent to carryout chemical reactions. No other solvent can be used instead of it as it can dissolve all polar sources.

Domestic level: At domestic level all sort of cooking is carried out with water as it is the cheapest and easily available item in our foods.

Property: Water dissolves O_2 and CO_2 from air. This property of water makes the aquatic animal and plants to survive; otherwise they would die.

Density of water and ice

Unique property:

Water has a unique property of having maximum density of 4^0c.

When temperature decreases down from 4.c water molecules begin to form crystalline structure.

As a result the large intermolecular space of ice increase and its volume increase than pure water.

Thus ice has lower density than water.

Example of unique property:

In winter when temperature falls, the upper layers of water become denser and move downward. The low layers having high density moves upwards. When temperature further falls and upper layer become denser this can't go down as the low layers have the same density. Now with the further decrease of temperature the surface of the lake freezes and converts into ice. Therefore ice floats on the liquid water below it. The surface layers of ice act as an insulator and do not allow the low layers to freeze.

Conclusion

If the ice were denser than water, as is true nearly substance, the surface of a lake would freeze and sink repeatedly until the entire lake was frozen solid. The aquatic life would not survive. Thus difference in density of water and ice is the reason for survival of aquatic life in winter.

Composition of air

Component gas	**% by volume**
Nitrogen	78.03%
Oxygen	20.99
Argon and other gases	0.94
Carbon dioxide	0.03
Ammonia and ozone	traces
Water vapors	Amount varies

Role of nitrogen:

Role in combustion

1) It is a least reactive gas and controls the combustion process. If there had been no nitrogen, it would have been impossible to out any fire; till all the materials was burned into ashes.

Role in plants/nitrogen fixation:

2) Nitrogen present cannot be used directly by plants. The process of converting nitrogen into compounds that plants can use is called nitrogen fixation. Nitrogen in the atmosphere is converted into oxides of nitrogen form nitric acid when react with rain water. The nitrogen thus reaches the ground and is used up land and water plants

Biological nitrogen fixation:

3) Biological fixation of nitrogen is carried by the bacteria present in roots of legume plants. The bacteria fix nitrogen by reduction and oxidation process into nitrate ions.
4) The nitrate ions are water soluble and are used by plants to make proteins. Animals eat the plant and use the proteins to make their own proteins and excrete nitrogenous waste, such as urea.

Role and use of oxygen:

Role in energy release by respiration

1) In respiration, the air is inhaled and brought in contact with the blood in the lungs. The oxygen present in the air reacts with the haemoglobain of blood to form oxy-haemoglobain in lungs. This oxy-haemoglobain blood is then transported from lungs to cells through arteries.
2) In the cells the oxygen is used for oxidation of food to produce energy, carbon dioxide and water, hence oxygen is the essential gas in air, used to produce energy from food. Thus energy keeps us warm and enables us to do work. If there had been no oxygen there would have been no life.

Role in combustion:

3) Oxygen is responsible for burning all types of fuels e.g. coal, petrol and gas. In burning process, oxygen of air reacts with fuel and produce energy. Burning gas liberates energy; this is used for cooking purposes and other activities.
4) Oxygen is also responsible for fermentation and rusting process.

Role and use of carbon dioxide:

Role in photosynthesis:

1) It is used up by plants during photosynthesis. Plants prepare foods by using carbon dioxide and water vapors in the presence of sunlight.

Role in maintaining temperature of earth

2) Carbon dioxide plays very important role in maintaining the temperature of earth. It does not allow the radiations going out of the atmosphere. The heats of these radiations warm up the atmosphere.

Role and use of ozone:

1) It lays about 31 km above the surface of earth.
2) Ozone is present in air.
3) It acts as a shield and absorbs the ultraviolent radiations coming from sun to earth.
4) Ultraviolent radiations are dangerous and produce skin cancer and other diseases.

Importance and functions of elements for maintenance of our health

Sodium:

Requirement:

Our body requires sodium in large amount.

Deficiency:

Its deficiency can cause certain ailments to the body such as sun stroke and irregularity in heart beat.

Sources:

In daily; life we table salt in our food. It consists of sodium and chlorine elements and is called sodium chloride.

Calcium:

Requirements:

Calcium is necessary for the formation and growth of the bones and teeth in our body. In growing age it is required in large quantity.

Percent:

99% of the calcium in the body is found in the skeletal system.

Sources:

The requirements of calcium are provided through milk and milk products, vegetables, meat and fruits.

Deficiency:

Deficiency of it causes pain in muscles and increases the softening of bones.

Phosphorus:

Requirement:

It is an essential element like calcium for the formation and proper growth of bones and teeth. It hardens and strengthens the bones. It is necessary and controls the joints and muscles activity.

Sources:

It is found in fish dry fruit and in eggs

Deficiency:

Its deficiency stiffens the joint, makes brittle and growth of the bones is affected adversely.

Iron:

Requirement:

Iron is an important component of haemoglobain found in blood of animals. It acts as an oxygen carrier and transports oxygen to the body cells.

Deficiency:

Deficiency of iron reduces the formation of blood, which cause anemia.

Sources:

Iron is found in liver in large quantity. Iron is also found in meat and yellow of eggs.

Iodine:

Requirement:

Iodine is required in very small amounts in our body.

Deficiency:

Deficiency of iodine hinders mental growth. The body dries up and skin thickens. Body gives ugly look in old age, face gets disfigured and wrinkled. Goiter disease is especially due to deficiency of iodine.

Function:

Thyroid gland functions in the presence of iodine and produce thyroxin. Thyroxin plays a very important role in proper growth of body.

Importance and functions of elements for the maintenance of agriculture.

Potassium:

1) Potassium is essential for plants as sodium is for animals.
2) Its quantity in soil often inadequate.
3) Therefore chemical fertilizer such as potassium chloride known as potash is often used for these purpose.
4) The other fertilizers often used are potassium sulfate and potassium nitrate.
5) Potassium-sulfate is preferred for horticultural crops, tobacco and potatoes.
6) Potassium nitrate is used for fruits, vegetable and tobacco

Calcium

1) Calcium is the major nutrient element in soil.
2) Plants require calcium for their growth.
3) In soil where calcium is required gypsum is used as fertilizer.

Phosphorus:

Presence:

Phosphorus is found in soil, plants and in micro organisms.

Functions:

It plays important role in the accumulation and release of energy during cellular metabolism.

Deficiency:

Its deficiency effects adversely the production of crop. Deficiency is made up by using phosphorus fertilizers

Magnesium:

Presence:

Magnesium element is found in chlorophyll, present in leaves of plants. Chlorophyll pigment is necessary for photosynthesis in plants.

Deficiency:

Thus deficiency of magnesium element retards the photosynthesis process.

Iron:

Presence:

It is present in some vegetables and cereals.

Quantity:

Iron is a minor nutrient in soil.

Deficiency:

In plants deficiency of iron results in yellowing of leaves that is called chlorosis.

Importance and functions of elements in daily life

Iodine:

1) It is used in making dyes for colour photography.
2) It is used in pharmaceutical chemicals.
3) Iodine tincture is used as anti septic
4) Other compounds of iodine such as sodium iodide and potassium iodide are used in medicines.

Chlorine:

1) chlorine is mostly used for purification of water
2) it is used as germicide
3) Certain compounds of chlorine are used in medicine such as sodium chloride and calcium chloride.
4) It is used as bleaching agent for cotton, lennin and wood pulp
5) Organic compounds such as chloroform and carbon-tetrachloride are prepared using chlorine
6) It is used to form the manufacturing of insecticide D.D.T
7) It is also used to prepare plastics such as polyvinylchloride and synthetic rubber.

Iron:

Types of iron	Properties	uses	Nature
Pig iron	It is the most impure form of iron and contains impurities like phosphorus, sulphur and manganese	It is usually converted to cast iron and steel	Pig iron is hard and brittle
Cast iron	It is obtained from pig iron	It is used to prepare stoves, cookers, radiators, lamp posts and railing etc	It is also brittle and cannot be welded or forged. It has low tensile strength
Wrought iron	It is the purest commercial form of iron. It is obtained by heating cast iron in a furnace. Impurities are removed	It is used to make nails and chains. Iron rods and sheets, agriculture implements	It is a soft, but very tough and malleable. It can be welded and forged.
steel	It is an alloy of iron. It is made from pig iron.	It is used to make stainless steel which can resist rusting. Stainless steel is used to make cutlery, scissors, saws, machinery and permanent magnets.	Steel is hard, tough and strong.

Calcium:

1) Calcium oxide (quick lime) commonly called un-bujhachuna is used for the preparation of bleaching powder. It is used largely for the manufacturing of cement and glass. It is used to purify sugar.
2) Calcium carbonate (lime stone and marble) used to prepare glass, washing soda and quicklime.
3) Calcium sulphate (gypsum) is used to prepare plaster of Paris and calcium super phosphate.

Magnesium:

Magnesium is used to prepare alloys such as magnalium and duralumin. These alloys are light in weight but strong. They are used to prepare balances, pistons of motor engines, electric equipment and aircrafts.

Magnesium powder is used in flashlights, military light shells and other light signals.

The compounds of magnesium such as magnesium oxide commonly called magnesia are used to prepare fire bricks.

It is used in medicines as hyperacidity controller.

Magnesium sulphate is used in medicines as purgative.

Magnesium chloride is used as filter for teeth

Sodium:

1) Molten sodium is used as coolant in some types of reactors.
2) Sodium vapour lamps are used for street lighting
3) It is also used to prepare different chemicals such as sodamide and sodium-cyanide sodium

A few important compounds of sodium and their uses

Compounds	**Common names**	**Uses**
Sodium hydroxide	Castic soda	Used in manufacturing of soap, paper and artificial silk to purify petroleum and vegetable oil. Used for softening of hard water to prepare glass, paper soap and detergents
Sodium carbonate	Washing soda	Used for softening of hard water to prepare glass, paper soap and detergents
Sodium bicarbonate	Baking soda	Used as fertilizer and for manufacturing of nitric acid and used for baking
Sodium nitrate	Chile salt peter	Used for developing and printing of photographic films.

Potassium:

Potassium compounds	Uses of compound
Potassium bromide and potassium iodide	Used in medicine as sedative to remove nerves ness and to induce sleep. It is also used in photography
Potassium cyanide	Used for extraction of gold
Chrome alum	Used as mordant in dying of fibers and in chrome tanning
Potassium dichromate	Used for manufacturing of other important compounds which are used in tanneries

Chapter 5

Microorganisms and Diseases

Diseases and their causes

Causative Agent:

Human diseases are caused by different organisms.

Microorganisms:

Microorganisms are very minute and can only be seen by microscope.

Examples:

Bacteria's, viruses, malarial parasite, fungi, ascariasis, and thread worm are some examples of microorganism.

Bacterial Diseases

Several harmful human diseases are caused by bacteria.

Examples:

1. T.B (Tuberculosis)
2. Whooping cough
3. Diphtheria
4. Tetanus
5. Typhoid
6. Cholera

1) T.B (Tuberculosis)

Causative Agent:

This disease is caused by bacterium called Mycobacterium Tuberculosis.

Spread of disease:

It is a wide spread and long lasting disease.

Symptoms: Chest pain

Blood in sputum

Prolonged coughing

Constant fever

Loss of body weight

Causes of disease:

The disease is common in those people who live under unhygienic condition, take poor food and breathe dust loaded air.

Spreading of disease:

The disease spreads by coughing, sneezing and spitting of T.B patient. Raw or un-boiled milk also carries T.B bacteria's.

Affected area:

In this disease mostly the lungs are affected. In severe cases patient might spit blood along with sputum or during coughing.

Control of disease:

This disease can be controlled by improving living conditions of the people specially the patient by adopting and providing the following facilities:

a. Proper food, fresh air, and proper rest can improve the recovery of the patient.
b. The victims of this disease be kept in isolation or sanatoria to control further spreading of disease.
c. This disease is curable but prolonged treatment is must.
d. Infants must be immunized with B.C.G (Bacillus Calmative Gaurine) against T.B.

2) Whooping Cough

Occurrence:

It is a disease of infants.

Symptoms: The symptoms are:

a. Infants actually for a minute after which air rushes into the lungs producing a whistling sound called "whoop"
b. Due to acute linings of the lungs and capillaries are damaged.
c. The infant gradually gets weaker and reduced to skeleton.

Control of disease:

This disease can only be controlled by immunizing the infants by the DPT injections. The injections are administered in a typical method.

Doses of DPT:

1st Dose	06 WEEKS
2nd Dose	10 WEEKS
3rd Dose	14 WEEKS
Booster dose	18 MONTHS

Composition of DPT Vaccine:

DPT contains three vaccines:

D for **Diphtheria**
P for **Purtussis** (whooping cough)
T for **Tetanus**

3) Diphtheria

Type of disease:

It is a contagious disease.

Occurrence:

It is also a disease of infants.

Mode of action:

The bacteria attacks on the epithelial of the throat and the bacteria produces toxic substances which kills the neighboring cells.

Effects:

The trachea and larynx of the patient becomes non-functional. The heart muscles get weak which may lead to death.

Prevention:

Infants should be immunized against this disease by vaccination.

4) Tetanus

Source of bacteria:

It is a rare but dangerous disease. The disease causing bacteria are found on animal dung, where they reproduce rapidly.

Mode of action:

They enter the human body through the wounds or cuts. Once inside the body they reproduce rapidly and produce a toxic substances that affects the nervous system of the patient.

Symptoms:

In the early stage of disease the patient feels head ache and becomes lazy. Later on patient feels difficulty in the opening of mouth, his neck becomes stiff and feels difficulty in urination.

Prevention:

There is no remedy of this disease and the patient faces death. This disease can be avoided by administering the injections of ATS i.e. Anti-Tetanus Serum at the time of injury. Artificial immunity can be achieved by periodic use of vaccines.

5) Typhoid

Type of disease:

It is common disease.

Treatment of disease:

Now a days the use of anti-biotics has helped to control the disease.

Control of disease:

A vaccine is also available which gives artificial immunity against typhoid.

6) Cholera

Prevalence of diseases:

It is an infectious disease of digestive tract. The bacterium is transmitted through contaminated food and water.

Sources of bacteria:

House flies play an important role in the spread of bacteria.

Symptoms:

The main symptoms are vomiting and diarrhea. It causes dehydration and loss of salts from the body. Severe attack may cause the death of the patient.

Treatment:

The attack of the disease can be avoided by vaccine. In case of attack, the use of ORS (oral rehydration salt) and anti-diarrheal drugs are most important.

Virus

Characteristics:

They are ultra-microscopic organisms and much smaller than bacteria. They are measured in mill microns (1milli micron=1/1000 micron) and cannot be seen with compound microscope. They can be seen under electron microscope only.

Composition:

They are not composed of cell but their body has outer coat of protein and inner part of nucleic acid i.e. DNA OR RNA. Ordinarily they are found in the form of crystal. They become active and reproduce inside the living cells only. Some biologist do not consider them even living organisms because of their crystalline nature. They are of various shapes and sizes.

Viral diseases

Type of disease:

It is a contagious disease.

Causative Agent:

Several harmful human diseases are caused by viruses. Some of them are mentioned below.

1. Small pox

Occurrence:

It is a fatal disease but fortunately it has now been eliminated from the world including Pakistan.

Symptoms:

During this disease the small boils appear on the whole body of the patient each filled with pus cell.

Prevention:

The patient must be isolated from the rest of the family members.

Treatment:

The remedy or control is the use of vaccine. The vaccine against small pox was the first to be discovered.

2) Polio

Occurrence: This is also a disease of infants.

Symptoms:

In this disease the lower limbs are damaged making them disable. Other main symptoms are:

1. Fever
2. Head ache
3. Stiffness in neck.
4. Under severe attack the legs are paralyzed.

Spread of disease:

The polio virus spreads through:

1. Air
2. Water

The children below the age of 5 years are the victims.

Treatment:

The only treatment is the use of polio vaccine at regular intervals up to the age of 5 years. Its vaccine is available in the form of oral drops.

UNICEF Campaign:

A campaign has been lodged by the government of Pakistan with the collaboration of UNICEF to vaccinate as many infants as against polio.

3) Influenza:

Type of disease:

It is a contagious disease. It is a disease of humans. It is not a dangerous disease.

Causative Agent:

It is caused by the influenza virus.

Spread of disease:

The virus spreads through air and by the sneezing of the influenza patient.

Symptoms:

The main symptoms are:-

1. Mild fever
2. Redness of eyes
3. Irritation in nasals
4. Flow of nose

Cure of disease:

The disease automatically diminishes after 4-5 days.

Treatment:

Complete rest and use of drugs reduce the intensity of attack.

4) Measles:

Occurrence:

It is also a common disease of infants.

Symptoms:

The patient suffers from cough and fever but after wards small boils appears on the whole body i.e. face and chest. These boils are light gray in color with red circles around them.

Cure of disease: The disease gradually diminishes after 10 days.

Immunization:

After the disease is over the patient becomes immune to this disease for the rest of his life. The infants are now immunized by the use of vaccines which has greatly reduced the rate of occurrence of this disease.

5) AIDS:

Occurrence:

This is a fatal viral disease which has threatened the mankind.

Abbreviation:

AIDS stands for Acquired Immuno Deficiency Syndrome.

Cause of disease:

It is caused by a virus called HIV (Human Immuno Deficient Virus).

Mode of action:

This virus kills the white blood cells of the patient with the result the immune system of the patient is destroyed.

Effects of AIDS:

The patient becomes the victim of various other diseases, mentioned below:

1. T.B(Tuberculosis)
2. Pneumonia
3. Typhoid & etc

In AIDS because of loss of natural resistance. This multiple attack proves fatal.

Spread of disease:

The disease spreads mostly through:

a. Blood transfusion
b. Contaminated syringes
c. Direct contact

Treatment:

A vaccine against this disease is in the experimental stage.

5) Hepatitis:

Occurrence:

It is a disease of the liver caused by a virus.

Types of hepatitis:

It is mainly of three types:

1. Hepatitis A
2. Hepatitis B
3. Hepatitis C

Mode of action:

The virus invades the liver cells and destroys them at a very fast pace.

Symptoms:

It is characterized by Jaundice, abdominal pain, liver enlargement, fatigue, loss of appetite and sometimes fever.

Spread of disease:

The disease is spread through blood, saliva and mothers milk. Hepatitis A can also spread through the contact of faces from the infected person.

Treatment:

Vaccines are now available for Hepatitis A and B and not for C.

Some Other Important Diseases

There are several other important diseases which are not caused by bacteria or viruses, but some other organisms. Some of them are under:

Diseases	Causative Organism
i. Cancer	Not clearly known
ii. Malaria	Plasmodium(a unicellular organism)
iii. Ring Worm	A fungus
iv. Ascariasis	Intestinal worm (Ascaris)
v. Thread worm	Intestinal worm (Enterobios)

Cancer

Occurrence:

It is a strange disease that can trap people of any age group. Cancer can occur in any part of the body but lungs, mouth, skin, intestine and breasts are the common targets.

Mode of Action:

Cancer is the uncontrolled growth of cells which form a cyst or a tumor. These cancerous cells may stay at one place of the body or they may spread in the whole body through the blood and may cause tumors in other parts of the body.

Causes of Cancer:

Cancer can be caused by many factors that may be physical, chemical or biological.

The following factors can cause cancer:

i. Sunrays may cause skin cancer.
ii. Certain drugs may cause cancer.
iii. Viruses have also been found to cause cancer.
iv. Smoking can cause the cancer of mouth and lungs.
v. Certain chemicals have been found to cause cancer.
vi. Tin packed food materials are also considered to cause cancer.

Symptoms of Cancer:

Following symptoms can help to identify the disease:

i. A persistent open wound.
ii. A cyst or tumour under the skin.
iii. Constant headache with vomiting.
iv. Prolonged indigestion with the loss of weight.
v. Persistent cough and swelling in the throat.

Diagnosis of Cancer: We should confirm the disease with help of clinical tests which include a blood test, biopsy analysis and sonography.

Treatment of cancer:

In the present time, there are three methods to control/cure cancer:

Chemotherapy:

Several medicines have been devised and discovered to treat the cancer.

Surgery:

A tumor can be removed, with the help of surgery, at its early

Radio Therapy:

Special radiations are used to kill the cancerous cells or tumors.

Malaria:

Occurrence:

It is a common disease of the third world i.e. Asia and Africa where the living conditions are not up to mark.

Mode of Action:

The disease is caused by a unicellular microorganism called Plasmodium. It belongs to the animal kingdom and phylum Protozoa.

It is transmitted through the mosquito called Anopheles. The female mosquito carries the germs in its saliva and when they bite a person to suck the blood, some saliva is left at the wound. The plasmodia in the saliva enter the human body through the cut surface. Once in the blood stream, it enters the red blood cells and destroys them at a very fast pace.

Symptoms:

If the drug (quinine) is not administered the patient becomes weak and pale in a few days.

Treatment:

The disease can be controlled by following precautions:

i. Remove standing water ponds or ditches or fill them completely, remove the breeding places of mosquitos.
ii. Regular spraying of DDT in the house and drains to kill the mosquitos.

iii. Taking anti-malarial drugs immediately in case of attack. Nowadays very safe and effective drugs are available in the market.
iv. Getting the houses screened.

Ring Worm:

Occurrence:

It is a skin disease caused by a fungus.

Mode of action:

The fungal hyphae penetrate into the skin, generally in the legs and form ring like structures on the skin.

Symptoms:

It causes itching and un-comfort to the body.

Treatment:

The disease can be avoided by:

i. Keeping your environment clean.
ii. Don't move barefooted in the fields.
iii. Bathe regularly.

The disease can also be cured by the use of proper anti-fungal creams and ointments.

Ascariasis

Occurrence:

Ascariasis is a universal disease of human intestine found in dirty and unhygienic areas. It is more common in children under the age of 8 years.

Mode of action:

It is caused by a round worm called Ascaris lumbricoides and therefore the disease is called Ascariasis. The worm is long and cylindrical with pointed ends. The infection is caused by the ingestion of small eggs along with the food, water or dirty or dusty hands.

Symptoms:

The children with this disease become weak and pale. They also undergo the shortage of Vitamin A which may be a problem for the eyes and affect the vision. These worms keep on moving in the body from one part to the other and may cause Jaundice, Pneumonia and appendicitis.

Treatment:

Following precautions can save our children from this disease:

i. To wash our hands before every meal.
ii. To use boiled water for drinking purpose.
iii. Proper disposal of the feces and sewage.
iv. Overall cleanliness in the house and surrounding areas.

In case of attack of the disease the patient may be taken to the doctor.

Thread Worm

Occurrence:

The threadworm causes disease mostly in children.

Mode of action:

The threadworm lays eggs around the anus, the last part of alimentary canal where the female threadworm is resting. This condition causes itching and the patient cannot live without scratching the affected area. The eggs get attached to the fingers of the infected child and may cause re-infection in the child. The best indication is the scratching habit of a child in the anal part of the body.

Treatment:

Following precautions may help to reduce the occurrence of this disease:

i. To wash the hands before every meal.
ii. Immediate treatment of the infected child.
iii. The bed and clothes of the infected child be washed with antiseptic drugs.
iv. Nails should be trimmed properly.
v. Faeces and sewage be disposed of properly.

SPREADING OF GERMS

1) **Air:**

Air is a very good medium for the dispersal of germs. The dust in the air contains a large number of spores of germs. T.B is mainly caused by the germs that travel through the air. Fresh and dust free air is essential for good health.

2) **Water:**

Water is also a good source for the spread of germs. Germs can easily live and grow in water. The germs of cholera and diarrhoea may spread through the water. It is advisable that the drinking water may be boiled.

3) **Food:**

Rotten fruit, vegetables and spoilt and contaminated food is a good source of spread of germs. Never keep your edibles uncovered. Such spoilt food is toxic or poisonous and cause great trouble in the alimentary canal.

4) **Touch or Direct Contact:**

Several diseases spread due to direct contact with the patient e.g. T.B. and plague. The direct contact with such patients should be avoided.

5) **Faeces:**

Many germs spread through the faeces of the patient. If the faeces are not properly disposed of, they after getting dry, spread in the air and transmit to other healthy people.

6) **Animals:**

Various germs get attached to the animal's body and reach you. The pet animals should be given a regular bath with antiseptic.

7) **Cuts and Wounds:**

Cuts and wounds should never be left open. They are the gates of germs. Every cut or wound should immediately be washed with some antiseptic material and covered properly with a bandage.

8) **Blood Transfusion:**

The germs of AIDS and Hepatitis are transferred through the blood. The blood must be checked for its germs from recognized laboratory before transfusion, when needed.

PROTECTION FROM GERMS/DISEASES:

1) **Sterilization:**

Most of the germs are killed by boiling water. Our surgical instruments must be sterilized otherwise there is every chance of an infection. We must use disposable syringes. Milk or any other liquid that we drink should be boiled before consuming.

2) **Pet Animals:**

Animals carry the germs of the diseases. Such animals must be washed regularly. Animals carrying diseases must be killed and buried in soil.

3) **Isolation:**

The patients suffering from infectious diseases should be isolated from rest of the family members. Their clothes and utensils should also be isolated. It will help to save the life and health of rest of the family members.

4) **Cleanliness:**

A very effective and simple way to have a healthy life is to keep yourself clean. Bathe regularly, wash your hands before every meal, brush your teeth regularly and above all, keep your surroundings clean.

5) **Water Supply:**

Water is one of the major sources for the spreading of germs. If the water is boiled, all of its germs are killed and it becomes suitable for drinking.

6) **Sewage Disposal:**

Proper disposal of the sewage is very essential to keep the area clean. If not properly disposed of, it mixes with our drinking water and food which is very dangerous for our health.

7) **Immunization:**

Proper use of vaccines especially at the infant stage makes the bodies immune against many fatal diseases.

8) **Antibiotics:**

It is a type of medicine that kills or stops the growth of germs. Antibiotics have saved the man from various fatal diseases.

SMOKING: A BAD HABIT

Occurrence:

Smoking is injurious to health. It has now been realized all over the world, and smoking causes a lot of fatal diseases.

Mode of Action:

During smoking we inhale toxic gases in our lungs which then diffuse into the blood and taken to all parts of the body.

Fatal diseases caused by smoking:

Smoking can cause following fatal diseases:

i. **Respiratory:** The disease of the throat, wind pipe and lungs are called respiratory disease. It may cause the cancer of lungs.
ii. **Heart Diseases:** The rate of occurrence of heart attack and other cardiac disorders is much more in people with the habit of smoking.

Cancer, blood pressure and skin diseases are caused by smoke.

MENTAL ILLNESS

Occurrence:

It is a condition in which the behaviour of a person is considered abnormal as it deviates from the general norm of the society. Such people are called mentally ill or abnormal.

Types:

Mental illness is basically of two types:

i. Neurosis
ii. Psychoses

Neurosis:

It is mild disorder in which the person is not functionless in the society. Their behaviour is not injurious to them or the society. Simple psychotherapy can cure the patient and they do not need to be hospitalized.

Psychoses:

It is a severe disorder in which the patient becomes functionless to some extent in the society. The patient loses sense of responsibility. Their behaviour may become injurious for them or to the society. Such patients should be hospitalized for the use of drugs or shocks.

Factors of Mental Illness:

There are several factors for such mental disorders, only a few are mentioned here:

i. **Biological factors:** Such as secretions of certain hormones or neurotransmitters.
ii. **Inherited factors:**
They are due to a change in the gene or part of the chromosome.
iii. **Social factors:**
Economic stresses and social stresses. It also includes depersonalization.
iv. **Physiological factors:**
Prolonged illness, some medical disorder. Toxic drugs can change the brain chemistry. Brain injury may also cause mental illness.

DRUG AND DRUG ABUSE:

Occurrence:

Every drug has its effect on the person's mind, body, life and those around him. It is important for us to know what a drug is, what its uses are, how they are used and when the same drug becomes harmful to the person using it. A drug can be defined as "any substance which, when taken in the body, changes the functioning of our body. A substance that can lead to addiction. To kill the severe pain, doctors will give us an injection of Morphine to relieve the discomfort. Morphine is manufactured from **OPIUM.** If these injections are used during normal days just to get a state of comfort, a stage will come when we will be addicted to the drug and a state of discomfort will have to be faced without using it. Alcohol is also a common drug used by a large number of large.

Heroin:

Heroin is a white or a brown powder with a bitter taste. It is diluted by adding powder, milk, sugar, sleeping pill and such other substances. It can be smoked or injected.

Effects of heroin on body:

The main effects of heroin on the body:

i. Breathing and heart rate slows down.
ii. Blood pressure becomes low.
iii. Eye pupil becomes small.
iv. The person gets very sleepy.
v. Health gradually declines.

vi. Ultimately the person dies.

Charas/Cannabis/Hashish:

Occurrence:

These are in the form of hemp or Bhang plant (Cannabis sativa) commonly found as a wild plant on the waste lands. Charas includes the green leaves of the plant and Hashish (Marijuana) includes the flower tops of the plant. Hashish also comes from the plant juice.

Effects:

The effects of Charas/Cannabis/Hashish:

i. It reduces the body coordination.
ii. It reduces the ability to make decisions.
iii. The person gets dizzy, hungry and sleepy.
iv. Eyes become red and the throat becomes dry.
v. Above all, one becomes a useless member of the society and loses interest in all social activities.
vi. There is a risk of damage to the mouth, throat and lungs.
vii. It may cause loss of fertility.

Alcohol:

Occurrence:

It is produced by fermentation of fruits, vegetables or grains. It is present in some tonics and cough syrups.

Effects of alcohol on body:

The main effects of alcohol on the body are:

i. It causes drowsiness and dizziness.
ii. It causes staggering and loss of balanced movement and concentration.
iii. A continuous consumption may cause headache, nausea and vomiting.
iv. It may damage the liver or brain.
v. It leads to heart diseases and cancer.

Narcotics:

Occurrence:

The term is applied to all such compounds that produced insensibility to external stimuli as well as internal pains and unrests. They may be obtained from OPIUM, Charas or Bhang. It is the official and moral duty of the state as well as members of the society to check this drug movement. The Government of Pakistan has established a comprehensive organization called ANF (Antinarcotics Force) which has offices all over the country.

Fill in the blanks

1. HIV stand for _____
2. Full form of AIDS is _____
3. The disease effect liver _____
4. Jaundice, abdominal pain, liver enlargement are symbols of _____ disease.
5. For which hepatitis vaccine is available_____.
6. Cancer is caused by _____.
7. Name the factors that don't cause cancer_____
8. Method which is not use for cancer treatment_____
9. Organism cause malaria_____
10. DDT is an insecticide which is used for controlling _____
11. Ringworm belongs to_____ kingdom.
12. When a person plays /exposed to dirty or unhygienic environment he is susceptible to_____ disease.
13. Name of worm which causes ascariasis is_____
14. Shape of round worm _____
15. Thread worm lays eggs in_____
16. The disease spread by air is_____
17. The disease spreads through water is_____
18. The disease spread through blood transfusion is _____
19. Which disease is caused by smoking_____
20. Neuroses and psychoses are types of _____ illness
21. _____ is a mild disorder in which the person functionless in the society
22. What are different factors which cause psychosis?
23. A sub which leads to addiction is called _____.
24. Chars includes _____ by plants and hashish [marijuana] includes _____ of plants
25. Sources of alcohol are_____
26. Narcotics obtain from _____
27. ANF stand for _____

CHAPTER #7

ENERGY

Introduction: Sometimes you feel that you do not have enough energy to continue whatever you are doing. Energy in a body is its ability to perform some activity. Without energy there would be no motion, no change. A car or a motorcycle needs energy to move. This energy comes from the fuel. We need food, which provides us energy to carry out various activities such as to play to run to speak.

ENERGY

Definition:

The energy is an important and fundamental concept in science. When we say that a body has energy, we mean that it has an ability to do work.

Examples:

Water running down the stream has the ability to do work, so it possesses energy. The energy of running water can be used to run water mills or water turbines. Running water gets this ability due to its height where it is stored.

Main forms of energy:

The main forms of energy are as under:

1. Mechanical Energy
2. Electrical Energy
3. Light Energy
4. Nuclear Energy
5. Chemical Energy
6. Sound Energy
7. Heat Energy

Mechanical Energy:

Definition: The energy possessed by a body both due to its motion or position is called mechanical energy.

Example: Water running down a stream wind, moving car, lifted hammer, stretched bow or a catapult or a compressed spring etc. possesses mechanical energy. Any form of energy that a body possesses is of two kinds. These are kinetic or potential energy.

Kinetic Energy:

Definition: The energy that a body possesses due to its motion is called kinetic energy.

Examples: The faster a body move, the more the kinetic energy it has. Running water and a falling stone have kinetic energy because they are capable to do work due to their motion.

Potential Energy:

Definition: The energy that a body possesses due to its motion is called the potential energy
Examples: Stored water before it runs down possesses potential energy. A stretched bow has potential energy due to its position. When released, the stored energy of the bow pushes out the arrow in it.

Heat Energy:

Definition: Heat is a form of energy given out by hot bodies in the form of radiations.
Examples: The foods we take provide us heat energy.

Sources: Large amount of heat is obtained by burning fuel. Heat is also produced when motion is opposed by frictional forces.

Electrical Energy:

Definition: Electricity is one of the widely used **pollution free** form of energy.
Uses of electrical energy: Electrical energy can be sent through wires easily to any desired place. We get energy from batteries and also from electric generators. Most of the electric generators are run by hydro or thermal power.

Sound Energy

Definition: Sound is produced when a body vibrates.

Examples:

Vibrating diaphragm of a drum, vibrating strings of a sitars or guitars and vibrating air column of wind, instruments such as flute pipe etc.

Light Energy

Importance of Light Energy:

Light is an important form of energy. Plants produce food in the presence of sunlight. We also need light to see things.

Sources:

We get light from candles, electric bulbs, fluorescent tubes and also by burning fuel. However most of the light comes from the SUN.

Chemical Energy

Sources:

Chemical is present in food, fuels and other substances.

Production:

The energy is released from these substances during chemical reactions. The burning of wood, coal or natural gas in air is a chemical reaction which releases energy as heat and light.

Nuclear Energy:

Production:

Nuclear energy is the energy released in the form of nuclear radiations in addition to heat, light and sound during nuclear radiations such as fission and fusion reactions.

Use of nuclear energy:

Heat energy released in nuclear reactors is changed into electrical energy. The energy coming from the sun for the last billions of years is the result of nuclear reactions taking place on the sun.

INTER CONVERSION OF ENERGY

Definition:

We cannot create or destroy energy, but energy can be converted from one form to another form.

Example:

rub your hands together quickly. You will feel them warm. You have used your muscular energy in rubbing as a result heat is produced by rubbing hands which makes the hands warm. In this process the kinetic energy of hands was converted into heat energy.

Energy Changes during Rainfall:

Processes in nature are the result of energy changes. For example some of the heat energy from the sun is absorbed by water in the oceans. This increases the thermal energy. Thermal energy causes water to evaporate from the surface to form water vapour. These vapours rise up and form clouds. As they cool down, they form water drops. These water drops fall down as rain. Potential energy changes to kinetic energy as the rain falls. If the rain water falls down its kinetic energy changes into thermal energy while parts of the kinetic energy of flowing water is used to wash away soil particles of rocks that changes the landscape.

Inter conversion of energy to make electricity:

Energy of flowing water can also be used to run water mills or turbines. Turbines move generators which produce electrical energy. Rain water is stored in dams has potential energy. Water stored in dams is allowed to pass through tunnels to turn the turbines. These turbines then turn electric generators to produce electricity. The electrical energy can be converted into light, heat or mechanical energy. **During the inter-conversion of energy from one form to another the total energy at any time remains constant.**

ENERGY DEMANDS

Energy Resources: Life on earth needs energy for its survival. Nature has blessed us with plenty of energy resources.

Sources of energy: Wind, flowing water, coal, fire wood, petroleum, natural gas and sun are the sources of energy.

Technology Advancements:

For thousands of years' heat was only the form of energy used by man. After the invention of steam engine, the use of mechanical energy increased gradually in transport and industry.

Discovery of Petroleum:

The discovery of petroleum is accompanied by the invention of internal combustion engines driven by petroleum products. These engines are used for transportation and generation of electricity.

Requirement of energy:

We need energy in our homes to run appliances such as lamps, fans, gas/electrical ovens, heaters, air-conditioners, telephone, radio, television, etc.

Energy requirement in school and offices:

In schools and offices we use electrical appliances such as tube lights, telephones and computers etc.

Energy requirement in hospitals:

In hospitals we also need electrical energy to operate medical equipment's.

Importance of energy:

We need energy in every field of life in trade, in transportation, telecommunication, research, and even for entertainment. We need energy to run our factories. We also need energy in agriculture for tube-wells and tractors etc.

The use of energy is increasing day by day due to increase in population and also due to the increase in energy need of every individual. The energy is needed at national level to meet the requirements of industry and agriculture needs.

METHODS OF ACQURING ENERGY

Exploitation of energy resources:

Industrial agriculture and scientific development of a country of a country depends upon higher rate of use of energy in the most economical way. The process and prosperity of a country depends upon the exploitation of its energy resources.

Heat Energy:

Energy exists in various forms. Heat is a form of energy we use comes directly from the sun.

Heat can also be produced by burning wood, coal, natural gas or petroleum.

Electricity:

Electricity is a familiar form of energy. It is produced by generators run by thermal, hydro or nuclear power. Electrical energy is the backbone of industry.

Mechanical Energy:

Mechanical energy is an important form of energy that runs industry, transport and agriculture. Mechanical energy is obtained using fossil fuels in combustion engines. Mechanical energy is also obtained from electrical motors that convert electric energy into mechanical energy. Energy of flowing water and wind is first converted into mechanical energy by turbines or wind mills. The mechanical energy of water or wind can also be used directly converted into electrical energy.

SOURCES OF ENERGY

Energy sources:

The energy we use, come from sun, wind, water power etc. Energy we use today comes either directly or indirectly from the sun.

Fossil Fuels:

Definition: Fossil fuels form due to conversion of plants and animals that died million of years ago.

Examples:

We use fossil fuels such as coal, oil and gas to heat our houses and run industry and transport.

We are using fossils fuels at a very fast rate. Their use is increasing day by day to meet our energy needs. If we continue to use them at present rate, then they will be exhausted soon.

Nonrenewable energy sources:

Fossil fuels are known as nonrenewable resources because it took millions of years for them to attain the present form. Moreover, they also release harmful waste products. These wastes include carbon mono oxide and carbon dioxide etc, which pollute the environment and causes health problems.

Energy Crises:

Using fossil fuels cause serious problem. Once their supply is exhausted, the World will face energy crisis. Thus nonrenewable fossil fuels will not meet our future energy needs. We must use them wisely and at the same time develop new energy sources necessary for our survival.

NUCLEAR FUELS

Use of uranium:

In nuclear power plants we get energy using uranium.

Process of nuclear fission:

The process taking place in nuclear reactors is known as nuclear fission. During fission reaction the nucleus of an atom splits up into smaller parts releasing a large amount of energy. Some uranium atoms and atoms of few other materials are used in fission because they split up easily.

Harmful effects of using nuclear fuels:

Nuclear fuel has dangerous waste. No complete safe method has yet far been discovered for their disposal. Nuclear power plants give off a lot of waste heat, which can be harmful to the environment.

RENEWABLE ENERGY SOURCES

Introduction:

Water evaporates from lakes, seas and oceans to form clouds from which we can get rain and snow. Rain water and water formed by melting ice runs down to stream from hills and mountains.

Definition: Renewable energy resources are the resources that can be used again.

Example:

Sunlight and water power are the renewable sources of energy. They will not run out like coal, oil and gas.

ENERGY FROM WATER

Introduction:

Water power is becoming more popular. Dams are being constructed at suitable locations in different parts of the World.

Uses of dams:

Dams serve many purposes. They help to control floods by storing water. The water stored in dams is used for irrigation and also to generate electric energy without creating much environmental problems.

ENERGY FROM THE SUN

Definition:

Solar energy is the energy coming from the sun. Sunlight does not pollute the environment in any way. The energy coming up from the sun is used directly and indirectly.

Importance of solar energy:

The sun's rays are the ultimate source of life on earth. We are dependent on the sun for all our food and fuels. Solar energy reaching earth is thousand times more than the energy consumption of mankind.

Solar House Heating

Introduction:

The use of solar energy is not new. However, its use in houses and offices as well as for commercial industrial purposes is quite recent. Complete solar house heating systems are successfully used in areas with a minimum amount of sunshine in winter.

Components of Solar House Heating System: A heating system consist of:

- A collector
- A storage device
- A distribution system.

Process: A solar collector make up of glass panels over blank metal plates. The plates absorb the sun's energy which heats liquid flowing in the pipes at the back of the collector.

Uses: The hot water can be used for cooking, washing and for heating the building. Solar energy is used in solar cookers, solar distillation plants, solar power plant etc.

Solar Cells

Introduction: Solar energy can also be converted directly into electricity by solar cells.

Composition: A solar cell is made from silicon wafers. When sunlight falls on a solar cell, it converts the light directly into electrical energy.

Uses: Solar cells are used in calculators, watches and toys. Large numbers of solar cells are wired together to form solar panels. Solar Panels can provide power to telephone booths, light houses and scientific research centres. Solar panels are also used to power satellites. Several other methods to trap sun rays are under way. If scientists could find an efficient and inexpensive method to use solar energy, people will have clean, limitless energy as long as the sun continue to shine.

WIND ENERGY

Uses: Wind has been used as a source of energy for centuries. It has powered sailing ships across the oceans. It has been used by wind mills to grind and pump water. More recently wind power is used to turn wind turbines.

Wind farm: When many wind machines are grouped together on wind "farms", they can generate enough power to operate a power plant.

Use of wind energy in world: In the United States, some wind farms generate more than thirteen hundred megawatts of electricity a day. In Europe many wind farms routinely generate one hundred or more megawatts of electricity a day.

ENERGY FROM THE TIDES

Definition: Tides are the rise and fall in the level of sea water.

Introduction: People living in coastal areas are familiar with tides occurring twice during twenty four hours. A huge amount of water is pushed towards land with the incoming high tide and set toward sea during low tide.

Electricity generation using tide: If water is stored in a basin at high tide then its energy can be used to drive turbines when released. Electricity can be produced from the generator coupled with these turbines.

GEOTHERMAL ENERGY

Definition:

The earth world provides us with hot water from geysers and hot springs. There is hot molten part, deep in the earth called magma. High temperature of magma turns the water found around the magma into steam. This energy is called geothermal energy. It can be used only at few places where geysers and hot springs occur.

Process of getting geothermal energy:

Geothermal well can be created by drilling deep into the earth near hot rocks in case pockets of heated water are not available then. Water is then pushed down into the well. The rocks quickly heat the water and turn it into steam that expands and moves up to the surface.

Uses: The steam can be piped directly into houses and offices for heating purposes or it can be used to generate electricity. Such wells can produce steam for twenty to thirty years making them very cost effective.

ENERGY FROM BIOMASS

Definition: Biomass is plant or animal materials that can be burnt as fuel.

Forms of Biomass: Wood is probably the best known and most widely used form of biomass. Other forms of biomass are garbage, farm wastes, sugarcane and other plants.

Production of electricity: Sugarcane wastes and other plants wastes are burned to make electricity. Many industries that use forest products get half of their electricity by burning bark and other wood wastes.

Harmful Effects: Biomass can serve as another energy source, but problems are there in its use. Using biomass produces pollutants similar to those that fossil fuels produced. Cutting trees can speed the erosion of our land. Also wood-burning, power plants would require much land to supply enough wood.

Method of energy generation: When animal dung, dead plants and dead animals decompose, they give off a mixture of methane and carbon dioxide. Once collected, methane can be burned

to produce electricity. In experimental plants fifty megawatts of electricity per day have been obtained.

ALTERNATIVE FUELS

Introduction:

Some liquid by-products of living things are promising alternative fuels. These are the alcohols which are derived from wood and other plant products. These alcohols are methanol and ethanol. They make excellent fuels for power plants that produce electricity.

Uses of alternative fuels:

The most important use of these alcohols is as fuel for cars, trucks and other vehicles. Both alcohols can be used as substitutes for gasoline or diesel fuel.

Production of alcohol fuel:

In addition to utilizing plants from its rain forests Brazil grows thousands of acres of crops especially for production of alcohol fuel.

Gasohol: In United States a mixture of ethanol and gasohol called gasohol can be used in cars and trucks.

Hydrogen as an alternative fuel:

Hydrogen is another promising alternative fuel. Hydrogen is the most abundant element in nature. Hydrogen gas makes up **99%** of the mass of the universe. Every molecule of water contains two atoms of hydrogen. The hydrogen can be separated from water by electrolysis and then collected and stored. The hydrogen can be burned as fuel.

UNITS FOR MEASURING ENERGY

Calorie:

Definition: It is the quantity of heat required to raise the temperature of one gram of water through 1^0 c.

Definition of Joule: One joule is the amount of work by a force of 1 Newton which acts on a b body and moves it through a distance of 1 meter.

Relationship of joule and calorie:

4.2 joule = 1 calorie

1000 calories = 1kcal

1000 joules = 1kjoule

Chemical energy in body:

Our body needs energy that is supplied in the form of chemical energy stored in food

Energy in milk:

One glass of milk contains nearly 150 kcal or 630 KJ of energy.

Energy in egg:

An egg provides nearly 160 kcal or 670 KJ of energy.

Energy in apple:

An average size apple (200g) provides 170 kcal or 710 KJ of energy.

Watt

Definition: 1 watt is the power at which energy is used or produced at the rate of 1 joule/second.

Calculations:

1watthour=1watt*1h

= 1(j/s)*3600(s) = 3600 joule

Or 1watt hour = 3600 j

=3.6kj

1kwh=1000 * (3.6kj)

=3600kj

<u>Measurement of energy</u>

Sources of energy: Energy is obtained from different sources such as coal, wood, petroleum, natural gas, the sun, wind, geothermal etc.

Commonly used units:

It is necessary to use common unit to know the energy contained in a fuel instead of measuring its quantity. The common unit used to measure any form of energy is joule or kilo joule KJ.

MEASUREMENT OF ELECTRICITY:

Definition: The energy unit for measuring electricity is kilowatt-hour (KWh) or simply called unit.

Energy consumption:

One unit of electrical energy (=1kwh) is consumed by any device of 1 kilowatt in one hour. Similarly one unit of electrical energy is also consumed by an electric lamp of 100 watt in 10 hours. The same amount of energy may be consumed by 10 electric lamps each of 100 watt when used for 1 hour.

Calculations for energy consumption:

Thus 1kw* 1hour= 1kwh

Or

1(lamp)* 100 watts*10 hours = 1000 watts

= 1kwh

10(lamps)* 100 watts *1 hour= 1000 watts

=1kwh

Electricity meter:

Consumers obtain electric supply through energy meter. The energy or electricity meter measures electrical energy in electrical units or KWh.

Process of electricity meter:

An electric current is produced as soon as an electrical appliance such as electric lamp, fan, electric iron, or TV is turned on. This current moves a disc in the electricity meter. After certain number of revolutions, a digit moves at the unit place in the display window. The display window in the electricity meter displays the meter reading in KWh.

ENERGY AND ENVIRONMENT

Introduction:

Environmental problems such as polluting emission consisting of noise, air pollution and water pollution may arise by using different sources of energy such as fossil fuels, nuclear energy.

Definition of pollution: Pollution is the change in the quality of environment that can be harmful and unpleasant for living things.

Definition of thermal pollution:

A temperature rises in the environment that disturbs life is called thermal pollution.

Effects of thermal pollution:

Thermal pollution upsets the balance of life and endangers the life.

Definition of air pollutants:

Air pollutants are unwanted and harmful.

Causes of air pollutants:

Natural processes such as volcanic eruptions, forest fires and dust storms add pollutant to the air. These pollutant, rarely build up to harmful levels. On the other hand, the burning of fuel and solid wastes in homes, cars and factories releases harmful amount of air pollutants.

Production of waste heat:

All power plants produce waste heat, but fission plants produce the most.

Effect of waste heat:

The heat released into a lake, a river or an ocean upsets the balance of life in them. Unlike other power plants, nuclear power plants do not produce carbon dioxide. But they do produce dangerous radioactive wastes. Storing the radioactive wastes is a technical problem.

Control of air pollution:

In many countries governments have passed laws to control air pollution. Some of these laws limit the amount of pollution that power plants, factories and automobiles are allowed to give off. To meet these conditions for automobiles, new cars have catalytic converters. These devices convert some polluting gases. The use of lead free petrol has greatly reduced the

amount of lead in the air. Engineers are working to improve new kinds of car engines that use electricity or energy sources other than diesel and petrol.

Many individual communities have laws which protect their areas from pollution. Individual can help to control air pollution simply by reducing the use of cars and other machines that burn fuel. Sharing rides and using public transportation are the ways to reduce the number of automobiles in use.

Indoor pollutants:

Indoor pollutants include tobacco smoke, raw materials, for building, car exhaust, chemicals used for cleaning etc. All indoor air pollution can be reduced by allowing fresh air into it.

ENERGY CONSERVATION

Introduction:

Nature has blessed us energy resources both non-renewable and renewable resources. But resources of fossil fuels are limited and will exhaust some day due to the increased rate of consumption and also due to the growing population. If we want to preserve our civilization under the fast growing world population, we must find ways of taping other energy resources.

Ways of energy conservation:

There is another alternative that produces no pollution, no radiation and saves money. It is energy conservation. Which is the use of energy in the most economical and efficient way. Conserving energy avoids waste and pollution. It requires:

i. An understanding of the importance of energy.
ii. Knowledge of avoiding unnecessary use of energy.
iii. Making maximum use of solar energy.

We can conserve energy by taking suitable steps at our homes, schools, offices, in factories, in transportation etc as described below:

ENERGY CONSERVATION IN HOMES

Introduction: We need energy in our homes for lighting, heating and for our comfort. We have to take all possible measures to save as much energy as possible so that it would be available for agriculture and industrial units.

Ways of energy conservation in homes:

This is possible if we

i. Close all unnecessary electrical appliances when not in use, such as electric lights, fans, air conditions, electric heaters, TVs and electric irons etc.
ii. Use electric appliances that uses electricity most economically, such as tube lights and energy saver bulbs etc.
iii. Rooms should have cross ventilation, white washed its walls so as to make maximum utilization of day light.
iv. Designing the homes so as to take maximum benefit of solar energy.
v. Close gas-taps in the kitchen when not in use.
vi. Avoid unnecessary lighting during functions.

ENERGY CONSERVATION IN SCHOOLS

Normally school functions during day time. Generally, very small amount of energy is required for lighting, mostly it is required for comfort and to run lab equipment's in physics, Chemistry and Computer labs and to operate audio and visual aids.

Steps to minimize the unnecessary use of energy:

Although in school's energy is generally used most economically, however further steps can minimize the unnecessary use of energy. These are:

i. Turning off all the unnecessary electric appliances when not in use.
ii. Turning off all the unnecessary lights fans refrigerators or heaters.
iii. Design of the school building should be such that the solar energy could be utilized as much as possible.

ENERGY CONSERVATION IN INDUSTRIES

Introduction: Industries are vital for the development and prosperity of a country. Energy in all of its forms is needed to run industry. However suitable method can be adapted to conserve energy in the industry.

Turn off machines:

All the machines and plants should be turned off when idle

Proper maintenance:

All the equipment used in industry should be properly maintained so that they work efficiently avoiding energy loss.

Improved technology:

Energy can be conserved by employing better machines of high efficiency and improved technology.

Full capacity:

The industry should run at its full capacity at times when electric energy would be surplus.

Alternate energy sources:

Alternate energy sources should also be used like solar energy , sugar cane waste and other waste products where ever available.

ENERGY CONSERVATION IN YRANSPORT

Introduction:

Energy is required to transport people and goods from one place to another. Although modes of transport have been changed over the years from muscular energy to fossil fuels and electricity yet some of them are still in use.

Low consumption vehicles:

Using smaller and low consumption vehicles for transportation.

Sharing transportation:

While travelling to a same place sharing transport can save energy.

Public transport:

Travelling through public transport as much as possible preferably through railway.

Engine maintenance:

Shut down the engine when stopping for longer period and keep the engine properly tuned. This helps to achieve greater efficiencies and causes less pollution.

Moderate speed;

Drive at moderate speed at which fuel consumption is most economical. In addition keeping the tires inflated saves fuel.

ENERGY CONSERVATION IN AGRICULTURE

Introduction: Our country is an agricultural country and our economic development is based on better farming, higher yield and to make more area worth for cultivation. We need water for a irrigation and energy for mechanized farming, processing and transporting the crops.

Rain water:

Storing excessive rain water in rainy areas

Better yield:

Selecting suitable crops according to nature of land and climate conditions for better yield.

Selection of crops:

Selecting crops that are best suited in dry areas and require less water by constructing concrete.

Corporate farming:

To reduce water seepage use irrigation tunnels and by promoting corporate farming. Using tube wells at times of other than peak hours of electricity consumption.

Biomass production:

Promoting the use of biomass to produce bio gas and use the remaining waste material as manure in fields.

Maintained tools:

Keeping the tractor and agricultural tools properly maintained and using the agricultural tools efficiently. Tube wells should also be properly greased.

Planting trees and dams:

Planting trees at suitable places and constructing small dams can conserve energy. Construction of fish farms; where possible.

Fill in the blanks.

1. The ability of a body to do work is called _____
2. The energy possessed by a body both due to its motion or position is called _____
3. Any form of energy that a body possesses is of _____ types.
4. Kinetic energy is an energy possessed by the body due to its _____
5. The faster the body move, the more _____ energy it has.
6. The energy that a body possesses due to its position is called _____
7. A stretched bow has _____ energy due to its position.
8. The energy given by hot bodies in the form of radiation is called _____ energy.
9. The food we take provide us with _____ energy.
10. The _____ is the main source of energy.
11. _____ is widely used pollution free form of energy.
12. The sources for generation of electric energy are _____
13. Electric generator are run by _____ power.
14. The energy produce when a body vibrates is _____
15. Vibrating diaphragm, vibrating strings of sitars are example of _____ energy.
16. Plant prepares their food in the presence of _____
17. Most of the light energy comes from _____
18. The common sources of chemical energy are _____

19. The burning of wood, coal or natural gas in air a chemical reaction which releases energy as _____ and _____
20. The energy released in the form of nuclear radiation during fission and fusion reaction is called _____ energy.
21. Heat energy released in nuclear reactor is changed into _____ energy.
22. The reaction that is taking place on sun is called _____
23. Energy can be neither _____ nor _____ but it can be converted from one form to another.
24. Rubbing of hand converts kinetic energy into _____ energy.
25. Water absorbs energy from sun, which increases its _____ energy.
26. In clouds, the main form of energy present is _____
27. When rain falls down, potential energy changes to _____energy.
28. If the rain water flows down its kinetic energy changes into _____ energy.
29. _____ move generators which produce electrical energy.
30. Rain water stored in dams has _____energy.
31. During inter-conversion of energy from one form to another the total energy at any time remains _____
32. The main sources of energy on earth are _____
33. After invention of _____ the use of mechanical energy increased gradually in transport industry.
34. Internal combustion engines are driven by _____
35. Heat can be produced by burning wood ,coal and _____
36. The backbone of industry is _____ energy.
37. The energy the runs industry, transport and agriculture is _____
38. Examples of common fossil fuels are _____
39. The fuels formed by the conversion of plants and animals remains that died millions of years ago are called _____
40. Fossil fuels are example of _____ resources.
41. The harmful gases released by the burning of fossil fuels are _____ and _____
42. The process taking place in nuclear reactor is known as _____
43. The element used in fission reaction is usually _____
44. Nuclear reactors are harmful to environment as they give off a lot of _____
45. Common examples of renewable energy sources are _____
46. The typical components of solar heating systems are a collector, a storage device and a _____
47. The solar cells are made from _____.

48. In solar cells _____ energy is directly converted into _____ energy.
49. When many wind machines are grouped together they form wind _____
50. In US some wind farm generate more than _____ MW of electricity a day.
51. In Europe some wind farm generate more than _____ MW of electricity a day.
52. _____ are rise and fall of sea level.
53. Tides occur _____ during twenty four hours.
54. The hot molten part, deep in earth is called _____
55. The water found around magma is turned into steam, this energy is called _____
56. Some wells can produce steam for _____ years.
57. _____ is a plant material that can be burnt as fuel.
58. _____ is the best known and widely used biomass.
59. Other forms of biomass are _____
60. When animal dung, dead plants and dead animals decompose, they give off a mixture of _____ and _____
61. In experimental plants _____MW of electricity per day has been obtained.
62. Alternative fuels are _____ which are derived from wood and plant produce.
63. Common alcohols are _____ and _____
64. Gasohol is a mixture of _____ and _____
65. The most abundant element in nature is _____
66. _____ gas makes up 99% of the mass of the universe.
67. Water contain _____ molecules of hydrogen.
68. A conventional unit for measuring energy is _____ which is used to measure heat energy.
69. One glass of milk contains nearly _____ or _____kJ of energy.
70. An egg provides nearly _____ or _____kJ of energy.
71. An apple provides _____ or _____kJ of energy.
72. Another unit in which electrical energy is measured is _____ or _____
73. The common unit used to measure any unit is _____
74. _____ is the change in the quality of environment that can be harmful and unpleasant for living organisms.
75. The function of catalytic converter is to convert some _____
76. The power plant which produces the most heat is _____
77. Volcanic eruptions, forest fires, and dust storms pollute the _____
78. A temperature rise in the environment that disturbs life is called _____
79. Nuclear power plant produces _____ waste.
80. The power at which energy is used at 1 joule per second is called _____

CHAPTER # 9

BASIC ELECTRONICS

INTRODUCTION

The advancement during the last century is due to the development of electronics. It has emerged as a key industry. The development of semi-conductors and their applications have revolutionized the field of electronics. Transistors, diodes and other semi-conductors devices are being used in television, calculators, computers, cameras, digital clocks and watches and lot of other equipment's, we are using today.

SEMICONDUCTORS

Definition:

Semiconductors are the materials which have resistances lying between conductors and insulators.

Examples:

Silicon and germanium are the two very important semiconductors.

Effect of temperature:

i. They are insulators in pure and crystalline form, especially at low temperatures.
ii. Their resistance increases with increase in temperature.
iii. This is opposite to that of metals in which resistance decreases with increase of temperature.

P-Type and N-Type semiconductor materials

Types of semiconductor materials:

By adding some suitable impurity in pure semiconductor materials, two types of materials are obtained. These are called as P-type and N-types material.

i. N-types material
ii. P-type material

N-type semiconductor material

Formation: N-type semiconductor material is formed when an impurity belonging to fifth group such as Antimony or Arsenic is added into a pure crystal of semiconductor material.

Charge carriers are electrons:

In N-type material charge carriers are electrons. Electrons carry negative charge with them. Hence the name N-type is given to semiconductor materials having negative charge carriers.

P-type semiconductor material

Formation:

P-type semiconductor material is formed when an impurity belonging to third group such as Gallium or Indium is added into a pure crystal of semiconductor material.

Charge carriers are holes:

In P-type material charge carriers are holes.

Definition of hole:

A hole is a vacancy of electron and may be considered as positive carrier. Hence the name P-type is given to semiconductor materials having positive charge carriers.

Uses of P-type and N-type materials:

P-type and N-type materials are used in developing semiconductor devices such as:

i. Diodes
ii. Transistors
iii. Integrated circuits etc.

SEMI-CONDUCTOR DIODE

Formation:

A semiconductor diode is formed when P-type and N-type materials are formed at opposite sides on a thin slice of pure semiconductor crystal.

Anode and Cathode:

P-type material acts as anode and N-type material acts as cathode.

Definition of diode:

A diode is a two-terminal, one-way device which lets current to pass through it in one direction only.

Working of diode:

The wire nearest the band is connected to its cathode and the one at the other end is connected to its anode.

1) **Forward biased diode:**

A diode conducts when its anode is given positive voltage and the cathode is connected to the negative terminal. It is then called the forward biased. In a forward biased, the resistance is small and large conventional current passes in the direction as shown by the arrow.

2) **Reverse biased diode:**

If the connections are reversed, it does not conduct, its resistance is large and it is called the reverse biased diode.

Bulb acts as a resistor:

A bulb in the circuit glows when the diode conducts. The bulb also acts as a resistor to limit the current when the diode is forward biased. Otherwise the diode might be overheated and damaged.

USES OF DIODES

There are different types of diodes. They are used in a number of ways. They serve different purpose in different circuits.

1. A diode allows current to flow in one direction, therefore it is used as a rectifier that converts AC into DC.
2. The same property of diodes can also be used to detect signal from Radio waves.
3. The process of recovering or detecting the message from radio waves is called as **demodulation.**

RADIO WAVES

Definition:

Radio waves are electromagnetic waves like heat waves, light waves or X-rays.

Wavelength of Radio waves:

However, the wavelength of radio waves is very long as compared to light waves. Radio waves travel with the same velocity as that of light.

Transmission:

Information or messages that ride over radio waves are propagated into space from the transmitting antenna and are picked up by receiving antennas.

RADIO

Introduction:

A radio set is an electronic instrument designed to receive radio waves. Unlike wireless telegraphy in which intelligence is transmitted in the form of coded signals, Sound i.e. speech and music is transmitted through radio waves from the radio stations.

Working:

At the radio station, microphone converts the sound waves into electrical signals. The frequency and amplitude of these electrical signals vary in accordance with the sound waves. These electrical signals of audio range are then amplified by A.F amplifier and superimposed over high frequency carrier waves of constant amplitude. The resultant carrier waves are called modulated waves. The process is called **modulation.** These modulated waves are then transmitted through antennas.

When these electromagnetic waves are intercepted by a receiving antenna, they produce high frequency electrical variations. These electrical variations produce high frequency voltage, R.F. voltage. These R.F voltages reach the input terminal of the radio receiver through cable. A radio receiver contains electronic circuits to process the incoming signal before it is reproduced.

Groups of electronic circuits:

We can group these circuits as follows:

- Tuning circuit
- Radio frequency amplifier (R.F amplifier)
- Audio frequency detector (A.F detector)

The tuned circuit of a receiver responds a particular R.F. signal of a frequency to which it is adjusted or tuned by the tuning knob of a radio receiver and rejects other signals.

TELEVISION

Introduction:

Television has made possible the instantaneous transmission and reception of pictures or scenes and sound simultaneously at long distances with the help of electromagnetic waves.

Components: In order to transmit and reproduce visual information corresponding to picture elements, a television system in addition to other electronic circuits requires a camera tube and an image reproducing tube.

Camera tube:

A camera tube is a photoelectric tube that produces electrical signals corresponding to the visual information in a picture.

Picture tube:

The image reproducing tube also called as picture tube converts the signal voltage into a visual image on its screen, and thus duplicates the original picture.

Correspondence of Camera and Picture tube:

If we compare the process of picture transmission with sound transmission, a camera tube corresponds to a microphone at the broadcasting station and a picture tube corresponds to a loud-speaker at the receiver.

Diagram:

The transmitting and receiving units of a television system are illustrated by block diagram for both the picture and sound signal.

Working: The desired sound is converted by microphone into an audio signal and is amplified for the sound signal transmitter. For transmission of the picture, the camera tube converts the visual information into electric signals. The electric signals from the camera tube are called the video signals and contain details of a picture. The video signal is transmitted after modulation.

Receiving antenna intercepts the waves from a TV transmitter. The video signal from a TV transmitter contain the information needed to reproduce the picture. Video signals after proper processing are then passed to picture tube of a TV to reproduce the picture.

CABLE TELEVISION

Working of Television system:

In a television system radio waves are used to carry picture and sound signals from the transmitting antenna to the receiving antenna. The high frequency signal picked up by the TV receiving antenna is then processed. Picture and sound signals separated in the television receiver. The processed picture and sound signals are construct the picture on the screen of the television and sound is reproduced by the speaker or head phone respectively.

Working of cable television:

In cable television, electrical signal from a microphone and video camera are not put over radio waves for transmission. They travel along cables from television station or from satellite's ground station to subscriber's television receiver. A cable can carry sound and picture signals from several satellite and television station at a time.

Importance of optical fibres:

i. For both local and long distance television links, copper cables carrying electrical signals are being replaced by optical fibres.
ii. Optical fibres are extremely efficient to carry light signals from one place to other light signals can carry signals thousands times greater than electrical signals through cables.

Working of optical fibres:

Electrical signals of picture and sound are first converted into light signals. These light signals travel through optical cable that contains large number of very thin glass fibres. At the receiving end, an optical receiver converts these signals into electrical signals for television receivers.

SATELLITE TELEVISION

Introduction: Radio waves used for television transmission cover small area. They travel along line of sight. They are mostly intercepted by receiving antennas within a radius of **60 km**. from the television transmitter. Beyond this they fade out due to the earth's curvature.

Importance of Satellite television:

- It is now possible to communicate television programs over long distances all over the world with the help of satellite.
- Radio waves are sent to satellites that hover over the earth and appear at a fixed place in the horizon with respect to a place on earth.
- Radio waves carrying television program are focused by a dish shaped antenna to one of the satellites orbiting around the earth for this purpose.

Communication satellites:

These satellites are also called communication satellites. Radio waves received by satellites are amplified and sent back to earth. These radio waves are then picked up by satellite dishes mounted on roofs of the houses on earth and are converted into electrical signals which run through a cable into a TV set.

COMPUTERS

Definition:

A computer is an electronic device that process data which is entered into it and gives out the result rapidly and precisely.

Basic units of a computer:

The basic units of a computer system are:

- Central processing unit (CPU)
- Storage or Memory
- Input Unit
- Output Unit

1) **Input Unit**

We enter data through input units which converts the data into electrical pulses. Input devices are keyboard, mouse, light pen, scanners etc. Electronic data is stored into the memory from where it is processed as and when instructed.

Units of CPU:

Central processing unit consists of:

1) Control unit
2) Arithmetic and logic unit.

Control unit:

Control unit controls the overall working of the entire computer system.

Arithmetic and logic unit:

Arithmetic and logic unit carries out arithmetic and logic operations on the data.

2) **Output unit:**

Output unit gives out the required information. Output devices are monitors, printers, loud speakers etc.

3) **Types of storage or memory:**

There are two types of storages memory used in a computer system:

i. Primary storage
ii. Secondary storage

1) **Primary storage:**

Types of primary storage:

Primary storage are of two types:

i. Read only memory (ROM)
ii. Read and write memory (RAM)

Read only memory (ROM)

ROM is a permanent memory supplied by the manufacturer and contains all the necessary codes and instruction sets necessary to activate the computer.

Read and write memory (RAM)

RAM is a temporary memory. When turned on, it loads all the necessary software and the data before it runs.

2) Secondary storage:

Secondary storage is a memory unit that a user needs to store data, instructions and the processed data. Secondary memory is used to supplement the capacity of the main memory. It provides large storage capacity. Different types of disk drives and magnetic disks are in use.

Floppy disks or Fixed disks:

The most popular types of magnetic disks are interchangeable disks called the **floppy disks** and **fixed disks** called the hard disks.

4) Central processing unit (CPU)

The main unit of computer system is the central processing unit. CPU of a modern electronic computer contains one or more microprocessor. It is plugged on a circuit board interconnecting RAM and ROM along with other components. This board is called as **mother board.**

MICROPROCESSOR

Definition:

A microprocessor is a semiconductor chip.

Components:

It consists of millions of components such as transistors, diodes, resistors. All these components form the internal circuitry of a microprocessor. A microprocessor contains:

i. Control Unit (CU)
ii. Arithmetic and Logic Unit (ALU)

Central processing unit (CPU):

In the early days digital circuits were designed using vacuum tubes. Later on, vacuum tubes were replaced by transistors. Circuits that could perform arithmetic operations and control operations were called central processing unit (CPU). CPU is the brain of a computer.

Definition of microprocessor:

A microprocessor is a CPU which is constructed on a single silicon chip. A microprocessor chip contains thousands of circuit elements, grown layer over layer on a silicon chip.

Efficiency of a computer:

The efficiency of a computer depend entirely upon the microprocessor used in the system. Various computer manufacturers use different microprocessor.

Modern microprocessors:

Modern microprocessors contain millions of transistors and other circuit elements. They can process large amount of data at amazing speed.

Uses a microprocessor:

i. The camera uses a microprocessor to adjust the shutter speed and lens setting for given condition.
ii. The are easy to use automatic cameras have revolutionized the field of photography, putting it in the reach of many people, who can take professional quality photographs.
iii. Microprocessors are also used as controlling elements in many other devices, such as microwaves ovens, office machines, mobile phones, game machines, video tape recorders, washing machines medical equipment's and thousands of other machines.

INFORMATION TECHNOLOGIES

Information technology or IT:

The technological development and the rapid advancements in electronics during the twentieth century have provided us new tools such as televisions, computers, satellites etc. all these have resulted in the presently growing technology called the information technology or IT.

Information age:

Present age is the information age. We are flooded with information at an explosive rate that cannot be imagined few years back. People all around the world are getting closer and closer. Distances have lost their meaning as the world has turned into a global village.

Computer technology:

Computer technology is the most powerful and the most flexible technology ever developed. Information technology is the combination of computer technology and the communication.

Uses of IT:

i. IT is the use of science to store, handle, process and transmit information.
ii. It is the technology that merges computing with high speed communication links carrying data, sound and video.
iii. It is bringing up far reaching changes in the way we work, the way we live and even in the way we think.

Rapid changes are taking place in information technology every moment all over the world. Previously telephone was one of the few means used for communication. Today we have many other choices such as the fax machines and the computers.

Telecommunication:

The methods used in sending information instantly over long distances are called telecommunication.

Examples:

Televisions, telephones, radios and computers are some of the main telecommunicating devices we have today.

Transmission of information:

They send or transmit different types of information in the form of sounds, written words, computer data or pictures.

TELEPHONE

Working: When you speak into a telephone, it changes the sound into electrical signals. The electrical signals travel along the telephone cables via the telephone exchange to the telephone receiver at the other end of the line. The telephone receiver then changes the electrical signals back to sound.

Telephone signals may pass through a network of exchanges. These connect two telephones making a call. An electrical signal travels through electric wires to your telephone. However, between the telephone exchanges, the electrical signals may be changed into light signals which travel along optical fibers, or radio signals which may travel via a communication satellite in space.

Cellular or mobile telephone:

A cellular or mobile telephone has a small built-in radio transmitter and receiver. It sends and receives a call in the form of radio waves. When we speak into a mobile telephone, the sound of our voice is changed into radio waves. These are then transmitted to a nearby station which is connected to the telephone network. Each station serves an area called a **cell**.

As the caller moves from one cell to another, the radio signals sent out by the telephone are automatically connected to the next station. Radio signals received by the mobile phone will be changed back into sound.

FACSIMILE (FAX) MACHINE

Definition:

Fax is short facsimile, which means an exact reproduction of a document, picture or print.

Working:

A fax machine scans a document and changes the light and dark parts into electrical signals. The electrical signals travel via telephone lines to the receiving fax machine, which reproduces the original document.

TELEX MACHINE

A telex (**teleprinter** and **exchange**) machine can also be used to send documents in the form of electrical signals via telephone lines to another telex machine that prints out the document. However, documents have to be first typed into the telex before they can be transmitted.

COMPUTER

Uses Of Computer:

i. A computer network such as the internet allows the computers to exchange information or make use of central database.

ii. Computer networks allow their users to send messages or graphics at their convenience while receivers review the information at their leisure.

iii. Information can also be put into a network bulletin board and whoever is interested may use it.

iv. In addition, computer conferencing or video conferencing allows users to look at and talk to one another though they may be thousands of kilometers apart.