

1. Heredity and Evolution

1. The inheritance of characteristics through generation is called **heredity**.
2. The inheritable characteristics are also known as **traits**.
3. Each trait can be influenced by both paternal and maternal genetic material – **DNA**.
4. **Gregor Johann Mendel (1822-1884)** worked out the first ever scientific experimental study on heredity.
5. Mendel observed variations in the **garden pea plant (Pisum sativum)**
6. The contrasting characters that Mendel observed in the garden pea plants
 - Stem height - **Tall / Dwarf**
 - Flower colour - **Violet / White**
 - Flower Position - **Axial / Terminal**
 - Pod shape - **Full / Constricted**
 - Pod colour - **Green / Yellow**
 - Seed shape – **Round / Wrinkled**
 - Seed colour – **Yellow / Green**
7. Mendel termed the tall and dwarf plants as **wild types or pure breeding varieties**.
8. In the monohybrid cross Mendel observed all plants were tall in the **first filial generation (F1)**
9. When F1 tall plant was allowed for self pollination, both the tall and dwarf plants appeared in the ratio of **3:1**.
10. The first experiment of Mendel considering the inheritance of a single trait is called **Monohybrid Cross**.
11. Expression of morphological characters is called **Phenotype**.
12. The expression of gene for a particular trait is called **Genotype**.
13. The genotype of a character is influenced by factors, called Genes.
14. The **genes** are the factors which form the physical basis for inheritance.
15. The alternate expressions of the same gene are called **alleles**.

16. The contrasting pair of alleles makes up an **allelomorph**.
17. The differences in the characteristics among the individuals of the same species form **Variation**.
18. The variation that occurs in body cells is **Somatic Variation**.
19. **Somatic Variation** is not inherited.
20. Variations found in the germ cells or gametes are called **Germinal Variations**.
21. **Germinal Variation** is inheritable.
22. **Germinal Variation** leads to speciation and evolution.
23. **Variation** is the source of raw material for evolution.
24. Animals are able to adapt themselves to the changing environment by **variation**.
25. The variation found among the individuals of the same species is called **intra specific variation**.
26. The variation found among the individuals of different species is called **Inter specific Variation**.
27. The variation found among the individuals of different genera is called **intergeneric variation**.
28. **Sexually reproduction** produces offspring with marked, significant and visible variations.
29. **Variations** give the organisms an individuality of their own.
30. Without **variation**, there would be no science of heredity.
31. **Charles Darwin** put forth the law of natural selection.
32. Natural selection involves **struggle for existence & survival of the fittest**.
33. Variation leads to **genetic diversity**, which is the key for evolution.
34. **Evolution** may be defined as a gradual development of more complex species from pre-existing simpler forms.
35. **Evolution** is an extremely slow process.
36. **Evolution** has occurred over millions of years.

37. **Evolution** is revealed by fossil evidences.
38. **Evolution** has resulted in the diversity of organisms.
39. Humans belong to a single species called **Homo sapiens**.
40. **Jean Baptise Lamarck (1744-1829)** postulated the Use & Disuse Theory.
41. Lamarck remarks that the “**will or want**” for a character makes the organisms to possess it at a later time.
42. When two populations are isolated by geographical barriers there is a chance for **gene flow (Genetic drift)**.
43. **Genetic drift** leads to the formation of a new species.
44. **Genetic drift** acts as an agent of speciation.
45. Human evolution started before **Fifteen million years ago, in Africa**.
46. The early human like creatures were called as **Hominids**.
47. 3-4 million years ago hominids walked into **Eastern Africa**.
48. Hominids hunted with stone weapons and were **mostly fruit eaters**.
49. Hominids were not taller than four feet and **walked upright**.
50. The hominid was called **Homo habilis**.
51. 1.5 million years ago **Homo erectus** who were meat eaters lived on earth.
52. The **Neanderthal man** lived in East and Central Asia 1 million years ago.
53. The **Neanderthal man** used to hide to protect them and buried their dead.
54. **Archaic Homo sapiens** arose in South Africa.
55. The **Archaic Homo sapiens** developed into distinct races in the ice age.
56. Between 75,000 – 10,000 years, the modern **Homo sapiens** arose.
57. Prehistoric caves were developed about 18,000 years ago.
58. Agriculture came around 10,000 years back.
59. To understand evolution “**Evolutionary Tree**” is used.
60. **Genetic engineering** is the modification of the genetic information of living Organisms.
61. **Genetic engineering** is done by manipulation of DNA.

62. **Genetic engineering** is also known as gene manipulation or recombinant DNA Technology (r-DNA Technology).
63. The enzymes which can cut DNA into fragments are called **Restriction enzymes or Restriction endonucleases**.
64. The enzymes which can join DNA fragments are called **DNA ligases**.
65. **Restriction enzymes or Restriction endonucleases** are the molecular scissors.
66. **Enzymes** are bio-catalysts that speed up reaction in cells.
67. **Antibiotics** are substances produced by some microbes that help in increasing the immunity to human beings.
68. Acetic acid is used for the production of vinegar.
69. **Edward Jenner (1749- 1823) in 1791** who coined the term vaccine.
70. The first used vaccine was against **Hepatitis B Virus (HBV)**.
71. **Vitamins** are chemical compounds present in minute quantities in food.
72. **Dolly** was a cloned sheep, developed by **Dr.Ian Wilmut**.
73. **Dolly** was developed in **Roselind Institute** in Scotland in **July 1996**.
74. For the development of Dolly nucleus of udder cell was used.
75. The udder cell was taken from a six year old Finn Dorset white sheep.
76. **Vaccines** act as antigens and stimulate the body to manufacture antibody.
77. **Steroids** are a type of derived lipids Ex: Cholesterol.
78. **Steroid drug prednisolone** is produced from **fungus Rhizopus**.
79. **Monoclonal anti-bodies** are the anti bodies produced by cloned cells.
80. Monoclonal anti -bodies are used for the treatment of cancer.
81. **Cloning** is a technique by which morphologically and genetically identical organisms are produced.
82. The "**Clone**" is an organism derived from a single parent by asexual method.
83. **Natural clones are** identical twins.
84. **Induced clones**(artificial) are developed by nuclear transfer.

85. **The stem cells** are the most unspecialized mass of cells.
86. **The stem cells** can be induced to become any type of tissues with specific functions.
87. **Embryonic Stem Cells** can be derived from early embryo.
88. **Vitamin B12 is a** Bio technologically synthesized vitamin.
89. **Vit. B12** is used, to cure pernicious anaemia.
90. *The enzyme* **Amylase** is derived from **amyloproteins** of bacteria.
91. **Bio sensor** is a device consisting of immobilized layer of biological material and its contact with a sensor.
92. **Bio-Chips** are microchips which are developed by employing techniques of Bio-technology.
93. **Bio-Chips** will be useful in defense, medicine etc.,
94. Insulin dependent diabetes is caused by the degeneration of beta cells due to a **defective gene**.
95. Applying the principle of **Bio-technology**, it is possible to correct the defective gene.
96. Gene Therapy is the means to treat or even cure genetic and acquired diseases like cancer and Aids.
97. In **Somatic gene therapy** the change is not passed to the next generation.
98. In **Germ line gene therapy** the change is passed to the next generation.

LESSON No: 2 - IMMUNE SYSTEM

1. On exposure to diseases, we develop resistance towards diseases and gain immunity.
2. Health is a state of physical, mental and social well being.
3. The varying environmental factors such as temperature, humidity, wind, pressure, sun, rain, pollution caused by man, atomic radiation, malnutrition, the millions of microbes that surround our bodies, the inter-personal conflicts are all other factors that affect our health.
4. Health has three dimensions – Physical, Mental & Social.

5. Physical dimension has the sign of free from disease, bright with shining skin, normal metabolism, lustrous hair and no black rings around eyes.
6. A mentally healthy person knows his capacities, does not overestimate or Underestimate him and can judge his shortcomings and weaknesses.
7. The word disease means, "without ease or not at ease"
8. The condition of malfunctioning of the organ system is called disease.
9. Diseases not caused by organisms are called non communicable diseases.
10. Organic diseases are also called as metabolic disorders.
11. Normal blood glucose level in man is 80 - 120 mg / 100 ml of blood.
12. Excess glucose is converted into insoluble glycogen and stored in liver and muscles.
13. Normal blood glucose level is maintained by the hormone Insulin.
14. Insulin is secreted by beta cells of Islets of Langerhans of Pancreas.
15. If Insulin is not produced in sufficient quantity, it results in diabetes mellitus.
16. Diabetes mellitus is a state of expulsion of excess unused glucose in the urine due to less production of insulin.
17. Diabetes insipidus, Coronary heart diseases, Renal failure, Hypertension, Obesity, Alzheimer's disease, Stroke are all caused due to metabolic disorders.
18. The genetical disorders are caused due to defective or mutated genes.
19. Albinism is an inherited disorder of melanin metabolism.
20. Albinism is characterized by the absence of melanin in the skin , hairs and eyes.
21. Recessive mutant genes cause albinism.
22. The clinical symptoms of Albinism are milky white coloured skin and marked photophobia (high sensitivity to light).
23. Haemophilia, sickle cell anaemia, Thalassemia, Down's syndrome, Bubble boy syndrome, are a few other genetical disorders.
24. Protein deficiency causes Marasmus and Kwashiorkar.

25. In Marasmus, the child loses weight and suffers severe diarrhoea and it will appear as though bones are covered by the skin.
26. In Kwashiorkar the child develops an enlarged belly with swelling in the face and feet.
27. Robert Koch and Louis Pasteur were the first to establish the Germ theory of diseases.
28. A germ or microbe produces poisonous substance called Toxins to interfere the host metabolism
29. Vitamin A deficiency causes Nyctalopia Night blindness.
30. Vitamin B1 deficiency causes Beri -Beri Nervous disorder.
31. Vitamin B5 (Pellagra) deficiency causes Dementia, dermatitis, diarrhea.
32. Vitamin B12 deficiency causes Pernicious anaemia & Destruction of RBC.
33. Vitamin C deficiency causes Scurvy (Bleeding gums and loosening of teeth).
34. Vitamin D deficiency causes Rickets (Defective calcification of bones).
35. Vitamin E deficiency causes Sterility.
36. Vitamin K deficiency causes Haemorrhage (Profuse loss of blood).
37. Disease producing organisms are viruses, bacteria, fungi and protozoans.
38. Viruses are living substances inside the host cell and behave as dead particles outside the host cell.
39. The Viral body consists of a nucleic acid, DNA or RNA and a protein cover.
40. All the known viruses are parasitic.
41. Virus causes deadly diseases such as. polio, rabies, hepatitis, meningitis, encephalitis (brain fever), etc.
42. Bacteria are unicellular prokaryotes and visible under Compound Microscope.
43. Bacterial diseases in man are Tuberculosis, Leprosy, Cholera, Typhoid, Diphtheria, Tetanus, Plague, Pneumonia, Syphilis, Gonorrhoea, etc.

44. Fungi are non green saprophytic or parasitic plants living on dead and decaying organic matter or living organisms.
45. Ringworm, Dandruff, Athletes' foot are some fungal diseases in man.
46. Protozoans are unicellular animalcules.
47. Protozoans cause diseases such as malaria, amoebic dysentery, sleeping sickness, etc.
48. Infestations of the body with tapeworm, liver fluke, round worm, filarial worm, etc,. Cause diseases in man like Taeniasis, Ascariasis, Filariasis, etc,.
49. Diseases caused by Microbes are known as infectious diseases.
50. Common Cold is a viral disease.
51. Inflammation of upper respiratory passage is seen in common cold.
52. Common cold can lead to secondary infections like pneumonia, bronchitis.
53. Common cold virus spreads mostly through the droplets.
54. Inanimate objects like handkerchief, bedding, clothes, utensils, toilet articles, are called fomites
55. Influenza was a dreadful disease (pandemic) in 1970s.
56. A(H1N1) Virus, (spherical, highly contagious), causes influenza.
57. Influenza has symptoms like sudden fever with pain in the back and limbs.
58. Influenza virus spreads through nasal and mouth droplets and by fomites.
59. TB is an airborne disease affecting the lungs, bones, joints, lymph glands, alimentary tract, liver, kidney, etc,.
60. TB causing bacterium is Mycobacterium tuberculosis (rod shaped).
61. In TB, the affected parts develop lesions called tubercles.
62. The waxy cell wall of the tuberculosis bacillus prevents it from drying up.
63. Immunization with BCG vaccine is an effective measure to prevent TB.
64. A short rod shaped bacterium with numerous flagella – *Salmonella typhi* causes typhoid.
65. Inflammation and ulceration of intestine, Enlargement of spleen and a characteristic red spot eruption on the abdomen – symptoms of typhoid.

66. Protozoan – Plasmodium is responsible for malaria.
67. Four different species of Plasmodium namely, *P.vivax*, *P.malariae*, *P.falciparum* and *P.ovale* occur in India.
68. The malignant and fatal malaria is caused by *Plasmodium falciparum*.
69. Malaria spreads through the vector - the female Anopheles mosquito.
70. Malaria is characterized by chillness and rise in temperature.
71. Successive attacks of malaria result in the distension of spleen and destruction of liver tissues.
72. The sexual stage of Plasmodium takes place in female Anopheles mosquito.
73. The vegetative stage of Plasmodium occurs in man.
74. Sporozoites are stored in the salivary glands of mosquito.
75. Sporozoites (the infectious stage) multiply within the liver cells first and enter the RBC of man, resulting in the rupture of RBC.
76. Haemozoin, a toxic substance, is responsible for the chill and high fever.
77. Amoebic dysentery (Amoebiasis) is caused by *Entamoeba histolytica* – a protozoan parasite.
78. Stool with excess mucous and blood clot is a symptom of amoebiasis.
79. Three different genera of fungi namely, Epidermophyton, Microsporum and Trichophyton cause ringworm.
80. The diseases like diphtheria, pneumonia, cholera, typhoid, measles, mumps, are transmitted directly.
81. Animals such as ticks, mites, birds, insects and mammals transmit diseases like cholera, malaria, rabies, etc;
82. Immunity is part of a complex system of defence reaction in the body.
83. The infectious organisms and the toxins produced by them and any foreign protein entering the body are called **antigens**.
84. The immune system includes blood plasma, lymph and lymphocytes.

85. Immune system produces suitable proteinaceous substances called antibodies to detoxify the antigens.
86. Natural or Innate Immunity is got right from birth.
87. The resistance against some infectious diseases developed by an individual during lifetime on exposure to the infections is called acquired or specific immunity.
88. Active acquired immunity is developed during the first infection of any pathogen.
89. If the antibody production is stimulated naturally, after recovery from a disease, it is called Natural Active Acquired Immunity.
90. If the antibody synthesis is stimulated by application of vaccines the immunity gained is called Artificial Active Acquired Immunity. E.g. The polio drops and triple antigen.
91. Passive Acquired Immunity - a readymade antibody is introduced from outside instead.
92. If the readymade antibody is taken from the mother's blood into the foetus, it is called Natural Passive Acquired Immunity.
93. If the readymade antibody is given to an individual artificially, (produced in some other animal and extracted) it is called Artificial Passive Acquired Immunity.
94. Administering vaccines to prevent the disease is called immunization.
95. Immunisation develops Artificial Active Acquired Immunity.
96. BCG vaccine is for Tuberculosis.
97. DPT (Triple antigen) vaccine is for Diphtheria, Pertussis, Tetanus.
98. MMR vaccine is for Mumps, Measles, Rubella.
99. DT (Dual antigen) vaccine is for Diphtheria, Tetanus.
100. TT vaccine - Tetanus toxoid.
101. Medical management includes - Treatment involving medicine, treatment not involving medicine.

102. Medicines are generally used to treat infectious diseases.
103. The antibiotics are used as blocks to the pathways of the disease without affecting ourselves.
104. For a person with neurotic problem, yoga and physiotherapy are good.
105. People addicted to alcohol and drugs are given counselling to overcome the habit.
106. Biotechnologically synthesized insulin is used to treat diabetes mellitus.
107. Acquired Immune Deficiency Syndrome (AIDS) is a dreadful disease transmitted through sexual contact or through blood and blood products.
108. Robert Gallo at National Institute of Health, USA and Luc Montagnier at Pasteur Institute, Paris isolated the virus, Human Immuno Deficiency Virus (HIV) which causes AIDS.
109. HIV is a retro virus with glycoprotein envelope and the genetic material – RNA.
110. HIV causes depletion of WBC, which is involved in the formation of antibodies called CD4 plus T-helper cells (lymphocytes).
111. Opportunistic infections such as tuberculosis, candidiasis and recurrent herpes zoster (viral) infection.
112. Tests for HIV - Enzyme Linked Immuno Sorbent Assay (ELISA) & Western Blot – a confirmatory test.

3. STRUCTURE AND FUNCTIONS OF HUMAN BODY

Organ system

1. The harmonious steady state of body functioning is called **Homeostasis**.
2. **Coordination** is the process of interaction of two or more organs in their functions.
3. In our body the **neural or nervous system and the endocrine system** do the function of coordination.

4. The **nervous system** provides an organized network of point to point connections for a quicker coordination
5. The **endocrine system** provides chemical integration through **hormones**.
6. Specialized cells called **neurons or nerve cells** which can detect, receive and transmit different kinds of stimuli.
7. **Nerve cells or neurons** are the structural and functional units of the nervous system.
8. A nerve cell is a microscopic structure consisting of three major parts namely **cell body, dendrites and axon**
9. Cell body is also called as **cyton**.
10. Cell body contains cytoplasm with typical cell organelles and certain granular bodies called **Nissl's granules** .
11. **Dendrites or Dendrons** are shorter fibres which branch repeatedly and project out of the cell body.
12. Dendrites transmit electrical impulses towards the **cyton**.
13. One of the fibres arising from the cell body is very long with a branched distal end and it is called as **Axon**
14. The distal branches terminate as bulb like structures called **synaptic knobs**.
15. Synaptic knobs are filled with chemicals called **neuro transmitters**.
16. Axon contains **axoplasm** inside and is covered by a membrane called **neurilemma**.
17. The gaps left by the myelin sheath on the axon are called **Nodes of Ranvier**.
18. Over the myelin sheath are found certain cells called **Schwann cell**.
19. If the axon is enclosed by the white fatty myelin cover it is called **Myelinated or Medullated or White neuron**.
20. Myelinated neurons form the **cerebral cortex** of our brain.

21. If the neuron is not enclosed by myelin it is called **Non- Myelinated or Non-Medullated or Grey neuron**.
22. An **unipolar neuron** has a nerve cell body with a single process or fibre.
23. Single process of unipolar neuron acts both as **axon and Dendron**.
24. The **embryonic nervous tissue** contains unipolar neurons.
25. The **bipolar neuron** has a cell body and two processes at the ends.
26. The sensory hair cells of the sense organs like **rods and cones of retina** are made up of **bipolar neurons**.
27. **Multipolar neuron** has a cell body with many dendrites and an axon.
28. The **cerebral cortex** contains the multipolar neurons.
29. The point of contact between the neighbouring nerve cells is called **synapse**.
30. The conduction of stimuli by the nerve cells is called **nerve impulse**.
31. The dendrites will receive the stimuli from the **receptor (sense organ)** and conduct the same as **electrical impulse** to the axon through the cyton.
32. The human nervous system is divided into a) **The Central Nervous System (CNS)** , b) **The Peripheral Nervous System (PNS)** and c) **The Autonomic Nervous System (ANS)**
33. The CNS includes the **brain and spinal cord** and it is the site of information processing and control
34. The CNS is accommodated in the protective bony structures namely **skull and vertebral column**
35. The central nervous system is covered by three protective coverings or envelopes collectively called **meninges**.
36. The outermost cover is doubly thick and is called **Duramater**.
37. The middle covering is thin and vascularised and is called **Arachnoid membrane**.
38. The innermost cover is a very thin delicate membrane called **Piamater**

39. **The brain** is the central information processing organ and acts as the command and control system.
40. The human brain is divided into **Fore brain Mid brain hind brain**.
41. Fore brain consists of **cerebrum, thalamus and hypothalamus**.
42. Two third of the brain is **cerebrum**.
43. A deep cleft called **median cleft** divides the cerebrum longitudinally into two halves.
44. The right and left cerebral hemispheres are united at the base by a sheet of nervous tissue called **corpus callosum**,
45. The outer region of the cerebrum is distinguished as, the **grey matter or cerebral cortex** and the inner region is called **white matter**
46. **Cerebral cortex** contains motor areas, sensory areas and association areas.
47. **Association areas** are regions that are neither sensory nor motor.
48. **Motor areas** are the sites of order or command of the cerebrum.
49. **Sensory areas** are the sites where the sensory functions of the various sense organs are received through the sensory nerves.
50. **Association areas** are responsible for complex functions like intersensory associations, memory and communication
51. Within the cerebral hemispheres are present cavities called **ventricles**, filled with a nutritive fluid called **cerebro spinal fluid**
52. **Cerebrum** is the seat of consciousness, intelligence, memory, imagination and reasoning.
53. Specific areas of cerebrum are associated with **specific functions**.
54. Cerebrum wraps around a structure called **thalamus** – a major conducting centre for sensory and motor signalling.
55. **Hypothalamus** lies at the base of the thalamus.

56. **Hypothalamus** controls body temperature, urge to eat and drink, regulation of sexual behaviour, express emotional reactions like excitement, anger, fear, pleasure and motivation
57. The **mid brain** is located between the thalamus and the hind brain.
58. A canal called **cerebral aqueduct** passes through the mid brain.
59. The dorsal portion of the mid brain consists of four hemispherical bodies called **corpora quadrigemina**
60. Mid brain controls and regulates the various **visual reflexes** and **optical orientation**
61. Mid brain with hind brain together form the **brain stem**.
62. **Hind brain** comprises of pons, cerebellum and medulla oblongata.
63. **Cerebellum** regulates and coordinates the group movements of voluntary muscles as in walking or running.
64. **Pons** is the bridge of nerve fibres that connects the lobes of cerebellum
65. Pons relays the information from the cerebrum to cerebellum. It also contains **sleep centre and respiratory centre**.
66. Medulla is the posterior most part of the brain where it merges with the **spinal cord**.
67. Medulla is the centre for several reflexes involved in the regulation of **heartbeat, blood vessel contraction, breathing**.
68. **spinal cord** is a tubular structure, a continuation of the brain lying in the neural canal of the vertebral column.
69. The three meninges –Piamater, Arachnoid membrane and the Duramater cover the spinal cord.
70. The spinal cord has two enlargements one in the neck region, called **cervical plexus** and another in the lumbar region, called **lumbar plexus**.
71. The lower end of the spinal cord is filamentous and is called **Filum terminale**.

72. On the mid dorsal side of the spinal cord is found a narrow depression called **dorsal fissure**.
73. On the mid ventral side of the spinal cord is found a deep depression called **ventral**
74. **fissure**.
75. Running through the center of the spinal cord is the **central canal**, an extension of the ventricle filled with **cerebro spin fluid**.
76. **Outer** region of the spinal cord contains **medullated white neurons**, and **inner** region contains **non-medullated grey neurons**.
77. The spinal cord conducts impulses to and from the brain and acts as a reflex centre.
78. **Twelve pairs** of cranial nerves arise from the brain
79. Some of the cranial nerves are **sensory nerves** (taking impulse from the sense organ to the brain e.g., optic nerves from the eyes).
80. Some of the cranial nerves are the **motor nerves** taking impulse from the brain to the effector organ. e.g. vagus (to Heart)
81. Some are mixed nerves with both sensory and motor functions. eg , **facial nerve**
82. **Thirty one pairs** of spinal nerves arise from the spinal cord.
83. Each spinal nerve has a sensory root and a motor root. All spinal nerves are **mixed nerves**.
84. **ANS** contains sympathetic nerves and parasympathetic nerves.
85. **Endocrines** control and coordinate the physical processes of growth, reproduction and sustenance of life.
86. Endocrine system consists of a number of **endocrine glands** and their **hormones**.
87. Endocrine glands are **ductless glands** (without ducts), secreting the chemical substances called **hormones**

88. **Hormones** are carried by the blood from the site of production to the site of action.
89. Endocrine glands in Head – pituitary gland and pineal gland
90. Endocrine glands in Neck – thyroid gland and parathyroid gland
91. Endocrine gland in Thorax – thymus gland
92. Endocrine glands in Abdomen – pancreas – Islets of langerhans, adrenal glands – adrenal cortex, adrenal medulla and gonads – testes in man and ovaries in woman
93. Chemically hormones are **proteins** or **amino acids** or **steroids**.
94. Pituitary gland is called as the conductor of **endocrine orchestra**.
95. Pituitary gland is differentiated into an anterior lobe **adenohypophysis** and a posterior lobe **neurohypophysis**.
96. Pituitary hormone - Somatotropic or Growth hormone (STH or GH) – for Growth.
97. STH Less production in children – **dwarfism**(retarded growth), Excess production in children – **gigantism** (excess growth), Excess production in adolescents – **acromegaly** with large limbs and lower jaw.
98. **Thyrotropic or Thyroid stimulating hormone (TSH)** - stimulates the growth of thyroid gland and its production – the **thyroxine**.
99. **Adrenocorticotropic or Adrenal cortex stimulating hormone (ACTH)** - stimulates the adrenalcortex to produce the hormones **aldosterone and cortisone**.
100. In females, **Follicle stimulating hormone (FSH)** stimulates the maturation of graafian follicles.
101. In males, the **ICSH** stimulates the sperm formation and induces the interstitial cells to produce male sex hormone – **testosterone**.
102. **Lutenizing hormone (LH)** in female causes the discharge of egg from graafian follicle – a process, called ovulation and production of female sex hormone **oestrogen and progesterone**.

103. **Lactogenic hormone (LTH)** stimulates the growth of mammary glands in female and **milk production** after child birth.
104. **Oxytocin** speeds up the child birth process, by stimulating the contraction and relaxation of the uterus in the female.
105. **Vasopressin or Antidiuretic hormone (ADH)** - helps in the reabsorption of water. and constricts the blood vessels and raises up the blood pressure
106. Less production of ADH results in **diabetes insipidus**, leading to production of excess of dilute urine.
107. Thyroid increases the rate of metabolism, stimulates a rise in the body temperature, promotes growth and differentiation of tissues.
108. Thyroxine affects indirectly growth of the body.
109. Thyroxine is also called as **personality hormone**.
110. **Hypothyroidism ,Hyperthyroidism** are the thyroid disorders.
111. Hypothyroidism – less secretion of thyroxine causes many abnormalities. like **simple goitre, myxoedema** and **cretinism**
112. Thyroid gland bulges as a swelling in the neck and it is called as **goiter**.
113. Loss of mental and physical vigour, increase in weight, thickening of skin, lowered heartbeat, mental dullness are the symptoms **Myxoedema** .
114. **Cretinism** – hypothyroidism in children and the symptoms are stunted growth, retarded mental development, defective teeth, protrusion of tongue and loose skin.
115. **Hyperthyroidism** – The excess production of thyroxine causes exophthalmic goiter or Grave's disease.
116. Symptoms of hyperthyroidism are high metabolic rate, high blood pressure, high irritability, profuse sweating, loss of weight, fatigueness and protrusion of eyeballs.
117. Pancreas is a **dual** role playing endocrine gland. (**dual gland**).
118. The exocrine parts produce pancreatic juice.

119. The endocrine portion pancreas is called **islets of Langerhans**.
120. **Islets of Langerhans** consist of two type of cells, alpha cells and beta cells.
121. **Alpha cells** produce a hormone called glucagon.
122. **Beta cells** produce insulin and amylin.
123. **Insulin** promotes the uptake of glucose by the cells for tissue oxidation.
124. **Insulin** favours conversion of glucose, into **glycogen** and its storage in the **liver and muscles**.
125. **Insulin** prevents the formation of glucose from protein and fat.
126. **Insulin** maintains normal blood glucose level at **80 – 120 mg / 100 ml of blood**.
127. Less production of insulin causes **Diabetes mellitus**, in which the excess unused glucose is excreted in the urine.
128. On the top of each kidney, **adrenal gland** is found. It is composed of two portions, an outer **adrenal cortex** and an inner **adrenal medulla**.
129. **Adrenal gland** is otherwise known as **supra renal gland**.
130. **Adrenal gland** secretes two hormones namely, **Aldosterone and Cortisone**.
131. **Aldosterone (Mineralocorticoid)** maintains mineral metabolism, by favouring reabsorption of sodium and water and excretion of potassium and phosphate ions.
132. **Cortisone (glucocorticoid)**- stimulates the breakdown of glycogen into glucose raising the blood glucose Level.
133. **Adrenal medulla** secretes two hormones, namely **adrenaline(epinephrine)** and **noradrenaline (norepinephrine)**. - **emergency hormones or hormones of flight and fight**.
134. **Adrenaline & noradrenaline** promote the conversion of glycogen into glucose.

135. **Adrenaline & noradrenaline** cause dilation of pupil, profuse sweating
They make the hair stand erect. (gooseflesh)
136. **Testosterones (androgen)** stimulates the growth of reproductive organs and the production of male sex cell, the sperms
137. **Oestrogen, progesterone and relaxin** – female reproductive hormones
138. **Oestrogen** is responsible for growth of female reproductive organs.
139. **Progesterone** maintains pregnancy and regulates menstrual cycle.
140. **Relaxin** relaxes the muscles of the pelvic region at the time of child birth.
141. **Parathyroid gland** produces **parathormone** and **calcitonin** which maintain the mineral metabolism.
142. **Thymus gland** - a lymphoid mass, present above the heart, secretes **thymosin**.
143. **Thymosin** stimulates the differentiation of “T”lymphocytes.
144. **Pineal gland** lies under the corpus callosum, - produces **melatonin**.
145. **Melatonin** - concentration of pigments in specific areas - areola, scrotal sacs,
146. **Amitotic** cell division occurs in unicellular organisms.
147. **Mitosis** occurs in body cells.
148. **Meiosis** occurs in germinal epithelial cells.
149. **Meiotic** cell division, involving changes in the structure and number of chromosomes
150. Meiosis is completed in two successive divisions – **Meiosis-I and Meiosis-II**.
151. In Meiosis-I, as the chromosomal number is reduced to half, it is called **Reduction division**. Meiosis-II is similar to Mitosis
152. Meiosis-I has 4 sub stages - Prophase-I, Metaphase-I, Anaphase-I & Telophase-I.
153. The chromatin reticulum unweaves - individual chromosomes are liberated - nuclear membrane dissolve in Prophase-1

154. The five sub-divisions of Prophase-1 - Leptotene, Zygotene, Pachytene, Diplotene and Diakinesis
155. **Leptotene** - The chromosomes condense and appear like threads.
156. **Zygotene** - homologous chromosomes come closer and start **pairing(synapsis)**.
157. The paired chromosomes are called **Bivalents**.
158. Each bivalent appears to have four strands called **tetrads** or **quadrivalents**.
159. The point of contact between the homologous chromosomes is **Chiasmata**.
160. The exchange of segments of chromatids between homologous chromosomes, is called **crossing over**.
161. The separation of homologous chromosomes is called **terminalization**.
162. The cytoplasmic division is called **Cytokinesis**
163. **Crossing over** results in variation of genetic traits in the offspring.
164. The inheritable characters may be morphological or physiological or anatomical or reproductive and are also known as **traits**.

LESSON 4. REPRODUCTION IN PLANTS

1. **Reproduction** is a special biological process, by which new individuals of the same species are produced.
2. **Lactobacilli** convert milk into curd.
3. **Mycobacterium tuberculosis** causes tuberculosis.
4. Unicellular organisms, amoeba and bacteria, reproduce by **binary fission**.
5. **Vegetative propagation** is the ability of plants to bring forth new plants from existing vegetative structures without sexual reproduction.
6. Buds produced in the notches along the leaf margin of **Bryophyllum** fall on the soil and develop into new plants.
7. In lower group of plants, reproduction takes place by means of **spores**.

8. In algae, the thin walled non-motile spores produced are called **Aplanospores**.

9. A **zoospore** is a motile asexual spore.

10. **Akinetes** secrete thick additional wall layers during adverse condition.

11. **Conidia** are uninucleate, nonmotile, asexual spores produced by the fungus

Penicillium.

12. **Sexual reproduction** is the process in which two components (male and female) are

involved to produce offsprings of their own kind.

13. A **flower** is a modified shoot

14. The main parts of a flower are, 1. **Calyx** 2. **Corolla** 3. **Androecium** and 4. **Gynoecium**.

15. **Androecium** is the male part of a flower, and **Gynoecium** is the female part

16. **Androecium** is a group of stamens

17. Each Stamen consists of a stalk called the filament and a small bag like structure called the **anther**

18. The **pollengrains** are contained in the anther within the pollen sacs.

19. **Gynoecium** has three parts 1) Stigma 2) Style and 3) Ovary

20. The ovary contains the **ovules** and each ovule carries within it an **embryo sac**

21. **Egg cell** is otherwise called as **female gamete**

22. The sexual reproduction in flowering plants involves **Pollination** , **Fertilization**

23. Transfer of pollen grains from the anther to the stigma is called **pollination**.

24. Pollen grains are transferred mainly by wind, water and insects. They are called as **pollinating agents**.

25. Pollination is the first and important event in the development of the **fruit and seed**. Pollination is followed by **fertilization**
26. Pollination is of **two** types. They are **1. Self pollination 2. Cross pollination**
27. Self pollination is also known as **autogamy**.
28. The transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower of the same plant is known as **self pollination**.
29. Self pollination is certain in **bisexual flowers**
30. **Self pollinated** seeds produce weak plants
31. The transfer of pollen grains of a flower to the stigma of another flower of a different plant of the same species is called cross pollination or **alogamy**
32. **Cross pollination** leads to the production of new varieties.
33. Flowers pollinated by wind are called **Anemophilous**, e.g. Grass and pine.
34. The **pollen grains** are dry and powdery, and are easily carried by the wind.
35. Some pollen grains even have **wings**. Stigmas are large and protruding, even branched and feathery. e.g.**Maize**
36. Pollination takes place in **water** plants or plants that are adapted to water habitat. e.g. **Vallisneria**. This pollination is known as **hydrophily**.
37. **Cross pollination** takes place through agency of animals, insects, wind and water.
38. Pollination by birds is called **Ornithophily**.
39. **Zoophily** is the most common of all methods of pollination.
40. Pollination by animals and birds is called **Zoophily**.
41. Pollen grain has protective walls - **exine** and **intine**.
42. The outer wall **exine** is **thick** and it has small pores called **germination pores**.

43. The inner wall **intine** is **thin** and elastic.
44. Mature pollen consists of two cells. The larger one is **vegetative cell** and the smaller one is **generative cell**.
45. The vegetative cell starts growing and emerges through the germination pore.
46. The generative cell gets into the tube and divides into two **male gametes** (sperms).
47. The pollen tube enters into the embryo sac through **micropyle**.
48. The fusion of a male gamete with egg is known as **fertilization**.
49. The fertilized egg is known as **zygote** which develops into **embryo**
50. The fusion of nucleus with the second male gamete is known as **triple fusion**. The triple fusion nucleus is called **endosperm nucleus** because it develops into endosperm..
51. **Endosperm** is a nutritive tissue meant for the development of the embryo.
52. The process of fusion of a male gamete with egg and the other gamete with secondary nucleus is known as **double fertilization**.
53. The **ovule** develops into **seed**.
54. The **integuments** of the ovule develop into **seed coats**.
55. The ovary enlarges and develops into **fruit**.
56. **Fruits** are rich in vitamin and give energy to us.
57. The fruit has two parts namely **pericarp (fruit wall) and seeds**.
58. Some fruits develop without the act of fertilization. Such fruits are called **Parthenocarpic fruits**. e.g. seedless grapes, guava, mango
59. In simple fleshy fruits, the pericarp is **succulent** and **juicy** when fully ripe. The fleshy fruits are **indehiscent** in nature.
60. The pericarp is distinguished into three parts namely, **epicarp, mesocarp and endocarp**.
61. Fleshy fruits are of two types – **Baccate and Drupaceous**.

62. **Baccate** is further classified into berry, hesperidium, pome and pepo.
63. **Simple dry fruits** have a dry pericarp. They are classified based on mode of dehiscence as **dry dehiscent, dry indehiscent and schizocarpic fruits**.
64. **Dry dehiscent fruits** split open at maturity to liberate the seeds.
65. **Dry indehiscent fruits** do not split open at maturity and the seeds are liberated by the decay of pericarp.
66. **Schizocarpic fruits** show characters of dehiscent and indehiscent fruits.
67. Schizocarpic fruits break into many one seeded parts called **mericarps**.
68. **Aggregate fruit** is developed from a single flower with multicarpellary, apocarpous, superior ovary.
69. **In aggregate fruit, each free carpel** develops into a fruitlet. Hence, the aggregate fruit has a cluster of fruitlets attached to a common stalk (e.g) Polyalthia
70. In **Annona squamosa** (custard apple), the margin of the carpels are united and appears like a single fruit.
71. **Multiple or composite fruit** is formed by all the flowers of whole inflorescence and give a single fruit. There are two types of multiple fruits namely **sorosis and syconus**
72. **Seed** is a fertilized **ovule**. It possesses embryo, food materials and are protected by the seed coat.
73. On the basis of the **number of cotyledons** in the embryo (seed), the angiosperms have been divided into two groups – Dicotyledons & Monocotyledons.
74. **Dicotyledons:** Seeds with two cotyledons (e.g) pea, bean, gram and castor.
75. **Monocotyledons:** Embryo with one cotyledon (e.g) maize, rice, wheat and onion

76. **Baccate – Berry-Tomato** It is one or many seeded fruit. Epicarp is thin and the mesocarpis fleshy.
77. **Hesperidium - Orange** It develops from multicarpellary, superior ovary with **axile placentation**.
78. In orange, Juicy hairs produced from the endocarp is the **edible part**.
79. **Pome - Apple** The fruit develops from pentacarpellary syncarpous inferior ovary with many seeds.
80. Pepo Cucumber - develops from a **tricarpellary**, syncarpous inferior ovary with parietal placentation.
81. **Drupe - Mango** - one seeded fleshy fruit and develops from monocarpellary, syncarpous ovary fruit is also known as **stone fruit**.
82. Legume – Beans, develops from monocarpellary, unilocular, superior ovary with **marginal** placentation.
83. **Follicle - Calotropis** - like legume fruit.
84. Septicidal capsule – Lady's finger.
85. Loculicidal capsule - Cotton.
86. **Achene - Clematis, Mirabilis** - is a single seeded fruit which develops from monocarpellary, unilocular ovary.
87. **Caryopsis – Paddy**, is a one seeded fruit which develops from **superior monocarpellary ovary**.
88. **Cypsela - Tridax**, fruit develops from inferior, **bicarpellary syncarpous ovary**.
89. Nut - Cashew nut, developed from superior, bi or multicarpellary ovary.
90. **Lomentum – Acacia**, resembles a **legume**.
91. **Creomocarp – Coriandrum**, is a two seeded fruit which develops from **bicarpellary syncarpous, bilocular and inferior ovary**.
92. **Regma – Castor**, develops from **tricarpellary syncarpous superior ovary**.

93. **Sorosis - Jack fruit**, the rachis (inflorescence axis) and other floral parts of the female inflorescence fuse together forming a **composite fruit**.
94. In jack fruit pines on the tough rind represent the **stigma of the carpels**.
95. **Syconus - Fig**, is derived from a special type of inflorescence known as **hypanthodium** which has a fleshy receptacle.
96. Rudimentary root portion called the **radicle** and a rudimentary stem portion known as **plumule**.
97. In paddy, the so called seed is actually a fruit. It is a simple indehiscent one seeded fruit known as **caryopsis**.
98. In monocot seed the lower part of the axis is the **radicle**, covered by a sheath called **coleorrhiza (root sheath)**.The upper part is known as **plumule** which is covered by a sheath called **coleoptiles**.
99. All seeds fall directly below the parent plant, the seedlings would have to compete for **space, water, oxygen, minerals and sunlight**, leading to competition.
100. **Autochory** is an active mechanism of **self dispersal** of fruits and seeds.
Eg.**Balsam**
101. **Anemochory** is the wind dispersal of fruits and seeds.Eg. **Calotropis (Erukkum), Moringa (drum sticks)**
102. **Hydrochory** is a mechanism in which dispersal of fruits and seeds is by **water**.Eg. lotus
103. **Zoochory** is a mechanism in which dispersal of fruits and seeds is by **animals**.
104. Fruits of **Xanthium** have sharp pointed stiff hooks.
105. In **Achyranthus** the **perianth** and bracts are pointed.
106. In fruits like tomato and guava, the seeds are eaten along with the edible portion and later passed out by excreta
107. **Man** is responsible for the dispersal of many fruits and seeds

108. . In dicot seed one end of the raphae there is a minute opening known as **germpore or micropyle**.
109. Fruits of **Tridax** carry a persistent calyx modified into a **pappus** (a ring of fine, feathery hairs) which act like a parachute and aids in the dispersal by wind.

LESSON 5: REPRESENTATIVE STUDY OF MAMMALS

1. Mammals are the diverged group of animals.
2. Mammals are found almost in all habitats - oceans, freshwater, hilly regions, forests, deserts, polar regions and swamps
3. The sea living dolphins, whales etc., look like fish, by form and structure.
4. A nocturnal bat gliding in the sky looks like a bird.
5. Mammals are distinguished from other vertebrates by two fundamental characteristics - Epidermal Hairs & Milk producing glands.
6. Whales and dolphins have sensitive bristles on their snouts.
7. Mammalian hair is a derivative from the skin.
8. Mammalian hair is an insulator against heat loss.
9. Hairs (long, sharp & stiff - called quills) are defensive for porcupine and hedgehogs.
10. The colouration and pattern of mammal's skin usually matches its background.
11. Hairs are sensory structure for dog, cat, cattle, man, horse and donkey.
12. All female mammals possess mammary glands that secrete milk.
13. Milk producing glands are modified sweat glands
14. The place of living of an organism is its habitat.
15. Whiskers of cats and dogs are sensitive to touch.
16. In high mountains - mountain goats, big horned sheep, grizzly bears, etc are seen.

17. Plains and forests contain - porcupine, giant elephants tiger, leopard, rhinoceros Hippopotamus, etc
18. Tundra has - reindeer, musk deer, ox, rodents.
19. In deserts - black buck, Indian wild ass are seen.
20. Fresh water has - beavers, platypus, & otters.
21. Marine mammals - whales, dolphins, dugong, porpoise, seal, walrus, etc
22. In the marine whales & dolphins the limbs are modified into flippers. The flippers are used as oars to swim in water
23. The marine whales, dolphins also possess huge subcutaneous fat deposit.
24. The jaws of the whales are modified into baleen plates.
25. The *baleen plates* - sieve the water and trap the minute planktonic organisms as their food called krill
26. The skin of camels is doubly thick and contains water storing osmotic cells to conserve water, as they live in deserts
27. In Camels, the thick bunched eyebrows protect the eyes from sandy wind.
28. Camel's nasal hole can be closed during desert storms to prevent the entry of sand particles.
29. Most mammals are herbivores, eating mostly plants.
30. To digest the cellulose rich food, mammals have developed a mutual partnership with Bacteria (for cellulose splitting enzymes)
31. Mammals such as cows, buffaloes, antelopes, goats, deer, etc., have huge four chambered stomach that function as storage and fermentation chamber.
32. The stomach of cattle also helps them to ruminate or cud.
33. Mammals have heterodont dentition with different types of teeth
34. Carnivorous animals have tearing teeth – the canine.

35. In elephant the incisors are modified into tusks as a specialized weapon.
36. Bats are the only mammals capable of powered flight.
37. The forelimbs of bats are modified into wing like structure.
38. The bat's wing is a leathery membrane of skin and the muscle is stretched over the bones of the four fingers.
39. Bats prefer to hang upside down from their legs while resting.
40. The nocturnal bats can fly without crashing into things and still capture insects by echo location.
41. The marsupials, kangaroo have developed abdominal pouches to bear the tender young ones.
42. The polar bears have thick skin coats and woolly fur to bear the biting cold of the Polar Regions.
43. The supreme mammal – man is highly adapted as an intellectual social animal. (The fingers and toes are adapted for handling)
44. Mammals are warm blooded or homeotherms,
45. The body temperature in man is maintained at 98.4° F to 98.6° F.
46. The temperature regulation is done by the sweat glands of skin, kidneys, lungs and blood.
47. In summer, we sweat more as a cooling up mechanism, to conduct the heat out.
48. During summer the kidneys expel less urine since much of water is lost in the sweat.
49. In winter, we produce little sweat as a warming up mechanism to conserve heat.
50. During winter the kidneys excrete out more urine
51. Red blood cells of mammals are fully packed with the respiratory red blood pigment haemoglobin,.

52. The transport of substances from one part of the body to the other is the circulatory system.
53. The circulatory system is composed of the heart, the blood vessels, the blood and the lymph.
54. The blood vessels are of arteries, veins and capillaries
55. William Harvey in 1628 discovered the circulation of blood in man.
56. The human heart is a hollow fibro muscular organ. It is conical in shape.
57. The heart is covered by a protective double walled sac called *pericardium*.
58. *Pericardium* is filled with *pericardial fluid*.
59. The heart is made up of special type of muscles called cardiac muscles.
60. The partitions within the heart divide the heart into four chambers as auricles and ventricles.
61. The right half of the heart receives and pumps off deoxygenated blood
62. The left half of the heart receives and pumps out oxygenated blood.
63. Auricles are thin walled upper chambers.
64. The auricles are separated by a partition called inter auricular septum.
65. Auricles are the receiving chambers of blood.
66. Superior venacava and inferior venacava empty the deoxygenated blood in to the right auricle.
67. the left auricle open the four pulmonary veins emptying the oxygenated blood brought from the two lungs
68. Ventricles are thick walled lower chambers of the heart.
69. A partition called inter ventricular septum divides the ventricle into right and left ventricle.
70. The ventricles pump the blood out from the heart.

71. From the right ventricle the deoxygenated blood is pumped into pulmonary artery to supply the two lungs.
72. From the left ventricle oxygenated blood is pumped into the aorta to supply the oxygenated blood to the different parts of the body through its branches.
73. Between the right auricle and right ventricle is found the right auriculo ventricular aperture
74. Between the left auricle and left ventricle is found the left auriculo ventricular aperture
75. A tricuspid valve with three flaps is found in the right auriculo ventricular Aperture
76. A bicuspid valve or mitral valve with two flaps in the left auriculo ventricular Aperture
77. The valves regulates the flow of blood, from auricles to ventricles and not backwards.
78. At the base of the pulmonary artery is present the semi-lunar valve, which regulate the blood to flow from the right ventricle to the pulmonary artery.
79. At the base of the aorta is present the aortic valve, to regulate the flow of blood from left ventricle into aorta left auriculo ventricular aperture.
80. Human heart works by contraction and relaxation of the cardiac muscles.
81. The contraction phase is called systole
82. Relaxation phase is called diastole.
83. When the auricles are filled with blood they are in relaxation phase (auricular diastole). By now ventricles will push the blood into aorta and pulmonary artery by their contraction (ventricular systole).

84. When the auricles contract (auricular systole) the blood is pushed into the ventricles through the bicuspid and tricuspid valves, leading to ventricular relaxation (ventricular diastole).
85. The closure of the valves of the heart produces two different cardiac sounds as “lubb” and “dubb”.
86. The human heart beats 72 times in a minute at rest.
87. Heartbeat is an inherent capacity of the heart,
88. Arteries carry the blood from the heart to different parts of the body.
89. Arteries are the branches of aorta, supplying oxygenated blood to the different regions of the body
90. All the arteries carry the oxygenated blood except pulmonary artery which carries deoxygenated blood.
91. The aorta branches into arteries.
92. Arteries branch into arterioles.
93. Arterioles branch into fine tubes called metaarterioles.
94. The metaarterioles end up in the tiny blood vessels called capillaries.
95. Veins drain the blood from different parts of the body to the heart.
96. The capillaries reunite to form venules which drain the deoxygenated blood from the tissues.
97. The small venules united with the big veins open into superior venacava and inferior venacava.
98. Except the pulmonary veins all other veins carry deoxygenated blood
99. The tiny blood vessels form a network, called capillary network
100. Capillary enables the passage of substances from the blood into the tissues
101. Blood is the river of life – providing the internal environment to the body.
102. Blood is the connective tissue, Blood consisting of the fluid part, the plasma and the solid components, the blood cells

103. The liquid component of blood is the plasma
104. Plasma is composed of water, organic substances, inorganic substances, . The important organic substances of plasma are the plasma proteins
105. The plasma proteins are of three types namely globulin, fibrinogen and albumin
106. Albumin is for water balance
107. Globulin is for immunity
108. Fibrinogen is for blood clotting
109. Blood cells are of three types of blood cells namely Red Blood Cells, White blood Cells and Blood Platelets
110. Blood Cells are freely floating in the plasma
111. Red Blood Cells are also called–Erythrocytes
112. RBCs are circular, biconcave and disc shaped. the young RBCs have nuclei the matured ones are without nuclei.
113. The red blood pigment haemoglobin is fully packed in the RBCs. They are concerned with carriage of respiratory gases
114. White Blood Cells are also called – Leucocytes
115. WBCs are amoeboid in shape with prominent nuclei.
116. WBCs are concerned with phagocytosis of engulfing the germs
117. WBC produces antibodies to resist the germs entering the body.
118. Blood Platelets are also called – Thrombocytes
119. Platelets are irregular broken up pieces of certain giant cells.
120. Platelets are concerned with blood clotting to prevent the loss of blood.
121. Kidney excretes Nitrogenous waste products such as urea, uric acid, creatinine, sent out as Urine
122. Lungs eliminates Carbondioxide and water vapour sent out as Expired air

123. Skin excretes as Excess water and salt sent out as Sweat
124. Excretion is the removal of metabolic waste products called excreta
125. The principal excretory organs of our body are the kidneys, which maintain the chemical composition of the blood and so are called as master chemist of our body
126. A pair of kidneys are present in the upper abdominal region, one on either side of the vertebral column attached to the dorsal body wall
127. A thin transparent membrane called capsule covers the kidney.
128. The kidneys are bean shaped with outer convex surface and inner concavity. The depression in the concavity is called renal hilus,
129. The muscular tube which arises from the hilus is called ureter.
130. The two ureters open into the distensible muscular sacs called the urinary bladder. urinary bladder is the store house of urine.
131. From the urinary bladder arises the urethra which delivers the urine out of the body
132. The outer portion of the kidney is dark in colour and is called renal cortex
133. Inner pale region of the kidney is called renal medulla.
134. Renal medulla contains conical masses called renal pyramids.
135. On the renal pyramids are found the openings called renal papilla
136. The renal papilla, opens into the inner space of the kidney called renal pelvis.
137. From the renal pelvis arises the ureter.
138. Nephrons are the structural and functional units of the kidney
139. Each kidney is composed of millions of nephrons.
140. A nephron has two structural components namely, Malpighian capsule and the uriniferous tubules
141. Malpighian capsule consists of a network of blood capillaries called glomerulus and a double walled cup called Bowman's cup.

142. The glomerulus is a network of blood capillaries, formed by the branches of the wider afferent renal arteriole.
143. From the glomerulus arises the narrow efferent renal arteriole, which branches over the rest of the nephron as network of capillaries.
144. The Bowman's capsule accommodates the glomerulus
145. The fore limbs of mammals consist of five parts namely upper arm, fore arm, wrist, and phalanges.
146. . The thumb is deviant from other four fingers, to enable man to do the above jobs.
147. A horse uses it's fore limb to gallop.
148. A rat or bandicoot uses it's fore limb to make holes in the ground to live.
149. A giraffe uses its pretty long and stout fore limbs to reach up the vegetations, at the height of the plants.
150. A monkey leaps from one branch of the tree to another using it's fore limb to swing and leap.
151. A whale uses its fore-limbs as oars to swim
152. Behaviour can be defined as an organism's adaptive response to stimuli in its environment
153. Behaviour is both an instinctive process (influenced by genes) and learned experience (gained by experience).
154. Social attachments between animals are called imprinting.
155. The binding or attachment between the parents and the offspring is called filial imprinting.
156. An individual of a species is raised by a parent of another species This behavioural pattern is called cross fostering
157. In an elephant herd, it is always the oldest she elephant that leads the herd, while the strong males will form the periphery of the herd and the young calves and other she elephants will be in the centre.

158. The secondary sexual characters developed during the breeding season bring the two sexes together for sexual reproduction.

159. The bright and colourful plumage of male peacock is to draw the attention of the female.

160. Sexual imprinting is a process in which an individual learns to direct its sexual behaviour at a member of its own species.

161. During the courtship, animals produce signals to communicate with potential mates and with other members of their own sex.

162. A character exhibited by one sex to attract the other sex is called courtship signaling

163. Effort by the parent to take care of the young ones is called parental care.

164. The parents care for the young ones and provide high nutrition, protect the young ones from predators and enable the young ones to lead a successful life.

165. Asiatic wild dog commonly called Dholes – *Cuon alpinus*

166. *Cuon alpinus* is an endangered species living in Mudumalai Wildlife Sanctuary at Nilgiris, Tamilnadu

LESSON 6: LIFE PROCESSES

1. The activities performed by the different organs are called life processes.

2. Nutrition, Respiration, Transportation and Excretion are some of the life processes.

3. Nutrition - The processes of obtaining energy through consumption of food.

4. Respiration - The process of acquiring oxygen through breathing and make it available to cells is called as respiration.

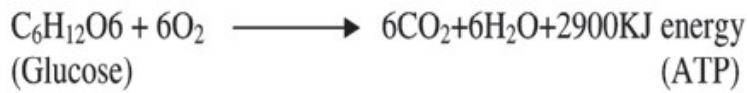
5. Respiration helps in breaking down of organic substances into simpler compounds

6. Transportation - is the process by which the food and oxygen is carried from one organ to other organs in the body.
7. Excretion - is the process by which the metabolic waste by-products are removed from the different organs and released out from the body.
8. Types of Nutrition- Autotrophic Nutrition & Heterotrophic nutrition.
9. Autotrophic Nutrition - Most of the green plants are self dependent, because they produce their own food by photosynthesis. It is described as autotrophic nutrition.
10. Carbohydrates are utilized as energy rich sources to the plant.
11. The process of photosynthesis is explained in the form of bio-chemical reaction:
$$6\text{CO}_2 + 12 \text{H}_2\text{O} \text{ ----- } \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$$
12. Photosynthesis requires Sunlight, Water, CO_2 and Chlorophyll.
13. CO_2 - assimilated from the atmosphere through small pores called stomata.
14. Fungal cells do not contain chloroplasts and they are grouped into saprophytes and parasites.
15. Parasitic organisms live on other organisms and get their nourishment.
16. The plants or animals in which the parasites live for nourishments are called hosts.
17. Parasitic plants have some special roots, which penetrate the host plants and absorb food. These roots are called haustoria. (e.g.: Cuscutta and Viscum).
18. Saprophytic organisms obtain nutrients from nonliving organic matter. (e.g., Many fungi and bacteria).
19. Monotropa (an angiosperm) lacks chlorophyll and have mycorrhizal roots for absorbing nourishments from the humus.

20. In vertebrate animals, White blood cells (leucocytes) are defensive in function.
21. WBCs engulf the invading germs and digest them (phagocytosis).
22. The unicellular animalcule, Amoeba engulfs the diatoms.
23. Paramecium has cytopharynx to swallow the food.
24. Digestion of food within the cells is called intracellular digestion.
25. Intracellular digestion does not require digestive system.
26. In animals like sponges and coelenterates, the digestion is intracellular.
27. The digestive system in higher animal consists of alimentary canal and digestive glands.
28. Digestion taking place in the alimentary canal is called as extracellular digestion.
29. The process of converting the complex food into a simple chemical substance that can be absorbed and assimilated by the body is called digestion.
30. The medical specialty that deals with the structure, function, diagnosis and treatment of diseases of stomach and intestine is called gastroenterology.
31. The digestive system is composed of two groups of organs. They are
 - 1) The gastro intestinal tract
 - 2) Accessory digestive glands
32. Digestion is brought about with the help of enzymes (bio-catalysts).
33. The gastro intestinal tract (alimentary canal) is about 9 mts in length.
34. The mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and anus are the parts of the alimentary canal.
35. Food that we eat is the starch and it is the source of energy.

36. During respiration, the food materials are oxidized (degraded), energy is released from the food and it is stored in ATP (Adenosine triphosphate).

37. Apart from ATP, two other substances are also formed during respiration. They are CO₂ and H₂O.



38.

39. Substances that are used in respiration are known as respiratory substrates (carbohydrates, fats and proteins).

40. Depending on whether oxygen is used or not, respiration is of two types - Aerobic respiration, Anaerobic respiration.

41. Respiration that uses oxygen is known as aerobic respiration.

1. Aerobic respiration takes place in four stages – Glycolysis, Oxidative decarboxylation of pyruvic acid, Krebs's cycle, Electron transport chain.

42. In Glycolysis, glucose (a simple carbohydrate) is split into two molecules of pyruvic acid.

43. Glycolysis takes place in the cytoplasm.

44. Oxidation of pyruvic acid takes place in the mitochondria.

45. During electron transport chain the energy is used to synthesize the ATP.

46. Complete oxidation of a glucose molecule in aerobic respiration produces 38 ATP molecules.

47. The type of respiration in which oxygen is not utilized is known as anaerobic respiration.

48. Anaerobic respiration is also known as fermentation. [E.g. Conversion of milk into curd.]

49. In Amoeba, Hydra and Sponges respiration takes place through their body surface (by Diffusion).

50. Respiratory surface for a fish is gill; for a frog it is lungs and skin; lungs for land vertebrates.
51. The alveoli are the site of exchange of gases.
52. The leaf is the site of photosynthesis.
55. Xylem transports water with dissolved minerals absorbed from the soil.
56. Phloem transports food from the leaves to the parts of the plant.
57. Tracheids are the conducting elements of the roots, stems and leaves.
58. Evaporation of water molecules from the cells of a leaf (transpiration) creates a suction which pulls water from the xylem cells of roots.
59. The loss of water in the form of vapour from the aerial parts of the plant is known as transpiration.
60. Transpiration helps in the absorption and upward movement of water and mineral dissolved in it from roots to the leaves.
61. The transport of soluble products of photosynthesis is called translocation.
62. Translocation is carried out by phloem.
63. In higher animals, blood and lymph are the fluids involved in transportation.
64. Lymph is similar to the plasma of blood but it is colourless and contains less protein.
65. Lymph carries digested and absorbed fat. Excretion is the process by which the metabolic waste products are removed from the plant body.
66. In plants the waste products are stored in cellular vacuoles, leaves that fall off and as resins and gums.
67. In unicellular protozoans, the excreta are discharged out through the contractile vacuoles.
68. In coelenterates and sponges, the excreta diffuse out through the cell membrane.

69. In flat worms and round worms, excretion takes place by the excretory tubes.
70. In annelids nephridia collect excreta.
71. Large amount of ammonia is found in fish excreta.
72. Fish are called ammoniotelic animals.
73. The birds are called uricotelic animals.
74. Mammals are called ureotelic animals.
75. Nephron consists of a filtering apparatus called glomerulus and uriniferous tubules.
76. The glomerulus filters the plasma part of the blood to form urine.
77. The uriniferous tubules do reabsorption.
78. Worms have the simplest form of coordinating system.
79. An earthworm has dual nerve cords.
80. Two ganglia act as brain and eye spots act as photo receptors.
81. In mammals, co-ordination is achieved by nervous system and endocrine system.
82. Plants show two types of movements - Movement independent of growth & Movement dependent on growth
83. Response (Growth) of the plant to the direction of light (Phototropism)
84. Response (Growth) of the plant to the direction of gravitational force (Geotropism)
85. Response (Growth) to the direction of water (Hydrotropism)
86. Response (Growth) to the direction of chemicals (Chemotropism)
87. Growth of the stem - towards the direction of sunlight - Phototropism.
88. Growth of roots - towards the direction of gravitational force - Geotropism.
89. Growth of the roots - towards the water source – Hydrotropism.
90. Growth of the plant parts - towards the direction of chemicals - Chemotropism. (e.g.,) The pollen tubes grow towards ovule.

91. The endocrine system consists of ductless glands and their secretions called hormones.
92. Hormones are bio - chemical substances (act as bio catalysts).
93. Hormones are released into the blood stream.
94. Hormones co - ordinate the physiological activities in our body.

LESSON 7. CONSERVATION OF ENVIRONMENT

1. Plants, animals, human beings survive with the interaction between them and the non-living things like **air, water and land**.
2. The resources of nature include **soil, water, coal, electricity, oil, gas**, etc.
3. Environmental science can be defined as the study of organisms in relation to their surrounding.
4. All wastes are **pollutants** and they create pollution of air, land and water.
5. The undesirable change in the **physical, chemical or biological characteristics** of air, land and water forms pollution.
6. A substance that affects the environment is called **pollutant**. e.g. **Sulphur-di-oxide, carbon-monoxide, lead, mercury**, etc.
7. Wastes are classified in to - **Bio-degradable & Non-bio-degradable**.
8. Substances that are broken down by **microbial action** are called bio-degradable waste. e.g. **wood, paper and leather**.
9. Substances that are not broken down by microbial action are called **non-bio-degradable wastes**. e.g. **Plastic substances and mineral wastes**.
10. **Harmful waste** materials are disposed by – **Land Fills, Deep well injection & Incineration**.

11. **Land Fills** are permanent storage facilities in secured lands for **military related liquid and radioactive waste** materials.
12. High level **radioactive wastes** are stored in **deep underground** storage.
13. **Deep well injection** involves drilling a well into dry porous material below ground water. **Hazardous waste liquids** are pumped into the well.
14. **Incineration - hazardous bio-medical wastes** are usually disposed off by means of incineration.
15. **Human anatomical wastes, discarded medicines, toxic drugs, blood, pus, animal wastes, microbiological and bio-technological wastes** are bio-medical wastes.
16. **Non-hazardous solid wastes** are managed by **reuse (recycling)**.
17. **Recycling (reclamation)** - separating out **rubber, glass, paper and scrap metal** from refuse and reprocessing them.
18. **Paper (54% recovery)** Can be repulped and reprocessed into **recycled paper, cardboard** and other products.
19. **Glass(20% recovery)** Can be crushed, remelted and made into new containers or crushes used as a substitute for gravel or sand in construction materials such as **concrete and asphalt**.
20. **Food and yard wastes (leaves, grass etc.,)** can be composted to produce **humus** soil conditioner.
21. **Water** is a **basic natural resource** and valuable asset to all nations.
22. Water in India is of two kinds - Salt water & fresh water.
23. **Fresh water** is obtained from **rain water, surface water & ground water**.
24. The main sources of water are **rain and snow**.
25. Rain & snow form a part of the **hydrological cycle**.
26. **Surface water** - **rivers, lakes, streams and ponds**.
27. **Ground water** - **Aquifers** are **under ground reserves** of fresh water.

28. The upper layer of water level is **the water table**.
29. **Scanty rainfall** and unnecessary felling of trees affect the ground water level.
30. **Seeding clouds - dry ice or potassium iodide** particles can initiate rain.
31. **Desalination (Reverse osmosis)** - of ocean water is a technology that has great potential for increasing fresh water.
32. In **desalination, evaporation and recondensation** are involved.
33. **Dams, reservoirs and canals** - tap runoff water in them.
34. **Water shed management** - management of rainfall and resultant runoff.
35. **Water shed** - construction of small dams to hold back water.
36. **Rain water harvesting** - collecting rain water from the roof of building or courtyards and storing it under ground for later use.
37. The main idea in **harvesting rain water** is to check the run-off water.
38. The **rain water harvesting** helps to prevent flooding of living areas.
39. **Wetland conservation** - acts as **aquifer recharge zones**.
40. **Domestic conservation** – by reducing the water loss by taking **shower, using low-flow taps, recycled water for lawns, home gardens, vehicle washing and using water conserving appliances**.
41. **Industrial conservation** – recharging cooling water & treating & reusing waste water.
42. All non-domesticated and non cultivated biota found in natural habitat are termed '**wildlife**'.
43. **200** varieties of **amphibians**, **400** varieties of **reptiles**, **3000** varieties of **fishes**, **3000** species of **birds**, **4100** species of mammals & **20,000** species of **flowering plants** are found in our country.
44. Wildlife have **aesthetic, ecological, educational, historical and scientific values**.

45. Good **biotic diversity** is essential for **ecological balance**.
46. Large scale destruction of wildlife could lead to **ecological imbalance**.
47. **Wildlife sanctuary** is an area constituted by competent authority in which hunting or capturing of animals is prohibited.
48. There are **13 Biosphere reserves, 27 Tiger reserves, 89 National parks, 200 Zoos and 500 wildlife sanctuaries** in our country covering an area of **1.6 lakh sq.km**.
49. A community of organisms that interact with one another and with the environment is called an **ecosystem**.
50. The Ecosystem is of two types, namely **aquatic and terrestrial**.
51. The components of ecosystem are: **Abiotic factors, Producers, Consumers & Decomposers**.
52. Producers, consumers and decomposers are **biotic factors**.
53. An example for aquatic ecosystem is a **pond**.
54. **Abiotic factors** - light, temperature, hydrogen ion concentration, inorganic substances like CO_2 , H_2 , O_2 , N , PO_4 , CO_3 and S and organic substances like carbohydrates, proteins and lipids.
55. **Producers** are the water living plants like *Hydrilla*, *Vallisneria* etc., and *phytoplankton* like *Chlamydomonas*, *Volvox* and *Spirogyra*.
56. **Primary consumers or herbivores** - Zooplanktons like insects, larvae of Dragon-fly consume the phytoplanktons.
57. **Secondary Consumers** - fishes, frogs, water beetles etc., feed on the primary consumers in the pond.
58. **Tertiary Consumers** - big fishes and kingfisher that feed on small fishes.
59. **Decomposers** - Several bacteria and fungi form the decomposers in the pond.

60. A balanced ecosystem is an ecological community together with its environment and functioning as a complex unit.
61. An **ecosystem** maintains the balance between the number of resources and the number of users or the balance between prey and predators.
62. Various organisms are linked by **food chains** in which the food energy is passed from one organism to another.
63. The **food chains** are interlinked to form **food webs**.
64. Eco-balance or **ecological balance** is the maintenance of balance between living components and its resources of an ecosystem.
65. In an ecosystem, the energy from the sun is fixed by the plants. Then it is transferred to herbivores and carnivores.
66. Minerals are returned to the soil by the decomposition of dead and decaying materials by **saprophytic organisms - bacteria and fungi**.
67. Coal is composed of **carbon, sulphur, hydrogen, oxygen and nitrogen**.
68. **Coal** is a **fossil fuel** and is the largest source of energy for the generation of electricity world wide.
69. Coal is one of the largest worldwide sources of **CO₂ emissions**.
70. Coal is processed in industry to get some useful products such as **coke, coal tar and coal gas**.
71. Coal burning generates waste products which contain **mercury, uranium, thorium, arsenic and other heavy metals** - harmful to human health and environment.
72. **Sulphur** particles present in the coal cause **acid rain**.
73. Coal burning releases **CO₂, a green house gas**, which causes climate change and **global warming**.
74. Coal is the largest contributor to the man-made increase of CO₂ in the air.

75. **Petroleum or crude oil** is a naturally occurring, toxic, flammable liquid consisting of a complex **mixture of hydrocarbons**.
76. Substances obtained from petroleum and natural gas are used in the manufacture of detergents, fibers (polyester, nylon, acrylic etc.), polythene and other plastic substances.
77. **Hydrogen gas**, obtained from natural gas, is used in the production of **fertilizers (urea)**.
78. Due to its great commercial importance, **petroleum** is also called '**Black Gold**'.
79. **Oil Spills** - Crude oil (refined fuel) spills from tanker ship damages natural ecosystem.
80. **Tar Balls** - a blob of oil, weathered after floating on the ocean.
81. Tar balls are aquatic pollutants in most of the seas.
82. Alternatives to petroleum – Internal combustion engines (Biofuel or combustion hydrogen), Electricity (electric vehicles), Compressed air or fuel cells (hydrogen fuel cells).
83. **Green chemistry** is the design of chemical products to reduce or eliminate the use and generation of hazardous substances.
84. The concept of green chemistry was introduced in **1995**.
85. The **Green Chemistry Institute** was recently created and the Presidential Green Chemistry challenge awards were established in **1999**.
86. E.g. for Green chemistry is the replacement of an organic solvent with water or the use of no solvent at all.
87. Green chemistry - synthesis of a new compound with **less toxicity** (e.g. a new pesticide that is toxic only to target organisms and biodegrades easily.)
88. It is better to prevent waste generation than to treat or clean up waste after it is generated.

89. Lead free solders and alternatives to lead additives in paints and the development of cleaner batteries.
90. **Bio-plastics** – are made from plants including corn, potatoes or other agricultural products.
91. Catalytic reagents are superior to **stoichiometric** reagents.
92. Green chemistry is a way of dealing with risk reduction and pollution prevention.
93. The use of electronics for faster communication is a **global village** concept.
94. Global electronic village (GEV) is a term used to connect people around the world technologically through **Information Communication Technologies (ICTS)**.
95. Global Village (GV) is located at a distance of **12 kms from Bangalore** on the Bangalore - Mysore Expressway.
96. Global Village is spread over **110 acres** of greenery.
97. **Kshema Technologies** is the first of GTV's companies to move into the campus with an **80,000 sq ft facility to house 600 employees**.
98. The term global village was coined by **Marshall McLuhan**.

LESSON 8. WASTE WATER MANAGEMENT

1. **Water** is a precious physical substance.
2. Water is present to an area of about **1400 million km³** in the entire globe.
3. Water occurs in number of forms - **solid, liquid and vapour**.
4. **Rainfall** is the primary source of water over the earth surface.
5. **Ocean water** is the largest among all the water resources.
6. **2.4%** of water is fresh and most of this water is in **glaciers** or in **ground water**.
7. **Geologic layers** containing water is known as **aquifers** of underground water.

8. On some areas of the earth's crust, fresh water flows freely which is called as an **artesian well or spring**.
9. **Sewage** can be treated in septic tanks, biofilters or aerobic treatment systems.
10. Sewage can be collected and transported to treatment plant.
11. Conventional sewage treatment involves **three stages** - primary, secondary and tertiary treatment.
12. **Primary treatment** - temporarily holding the sewage in a quiescent basin where heavy solids settle, while oil, grease and lighter solids float.
13. **Secondary treatment** - to remove dissolved and suspended biological matter.
14. Secondary treatment - performed by **water – borne micro organisms**.
15. **Tertiary treatment** - either chemical treatment or filtration.
16. Treated water is sometimes disinfected chemically or physically (for example by lagoons and micro filtration.).
17. **Bioremediation** - process that is done by the use of **microorganisms, fungi or their enzymes** to treat the contaminants.
18. **Nitrosomonas europaea** can be used to treat sewage, freshwater, walls of buildings and on the surface of monuments.
19. *Nitrosomonas europaea* is used especially in polluted areas where there is high levels of nitrogen compounds.
20. Household waste is separated into **grey water and black water**.
21. **Grey water** can be used for watering plants or recycling for flushing toilets.
22. **Waste water** is often referred to as **grey water**.
23. Any water that has been used in the home, with the exception of water in the toilet can be referred to as waste water.
24. **Recycling** of household waste water makes less fresh water usage, reduce strain in septic tanks, recharge ground water, encourage plant growth.

25. Water supply, sanitation and health are closely interrelated.
26. Water contaminated by human, chemical or industrial wastes can cause a variety of **communicable diseases** through ingestion or physical contact.
27. **Water - borne diseases** include cholera, typhoid, amoebic and bacillary dysentery and diarrhoea.
28. **Water - washed diseases** are caused by poor personal hygiene and skin or eye contact with contaminated water; (scabies, trachoma and flea, lice and tick borne diseases).
29. **Water - based diseases** are caused by parasites found in intermediate organisms living in water; (dracunculiasis, schistosomiasis, Japanese encephalitis).
30. **Water - related diseases** are caused by insect vectors which breed in water; (dengue, lymphatic filariasis, malaria, onchocerciasis, trypanosomiasis and yellow fever).
31. **Contaminated water** that is consumed may result in viral hepatitis, typhoid, cholera, dysentery and other diseases that cause diarrhoea.
32. Drinking water containing high amounts of chemicals like **arsenic and nitrates** can cause serious diseases.
33. **Lack of clean water and sanitation** is the second most important risk factor in terms of the global burden of diseases, after **malnutrition**.
34. Approximately **4 billion cases** of diarrhoea per year cause **1.5 million deaths**, mostly among **children under five**.
35. Intestinal worms infect about 10 percent of the population of the developing world, and can lead to malnutrition, anaemia and retarded growth.
36. **300 million** people suffer from **malaria**.
37. **Energy management** is the process of monitoring, controlling and conserving energy.

38. An **energy audit** - inspection, survey and analysis on energy flows for energy conservation.
39. Energy audit is done to reduce the amount of energy input into the system without negatively affecting the output.
40. Energy audit is done by the equipments - **blower doors / infra-red cameras**.
41. A home energy audit is used to identify cost effective ways to improve the comfort and efficiency of buildings.
42. Using energy efficient, **compact fluorescent light bulbs** (CFL), saves **6,000 megawatts** of electricity each year.
43. Students can help their school to save money on water usage, by checking leaks in the system, reducing water usage and improving the efficiency of water delivery.
44. By recycling paper, milk cartons and other materials, schools are able to reduce the amount of waste they produce.
45. A natural resource is a **renewable resource**. E.g., **Solar radiation, Hydrogen, Wind and hydroelectricity**.
46. Solar energy is the energy derived directly from the sun.
47. Along with nuclear energy, **solar energy** is the most abundant source of energy on earth.
48. The fastest growing type of alternative energy increasing at **50 percent** a year, is the **photovoltaic cell**.
49. The sun yearly delivers more than **10000 times** the energy that humans currently use.
50. The **hydrogen** is found to be a good choice among all the alternative fuel options.
51. Hydrogen is non-toxic, safe to handle, distribute and use as a fuel.

52. Hydrogen has the highest mass energy content – its heat of combustion per unit weight is about **2.5 times** that of hydro carbon fuel, times that of ethanol and **6.0 times** that of methanol.
53. **Hydrogen's thermodynamic energy conversion efficiency of 30-35 %** is greater than that of **gasoline (20-25%)**.
54. **Wind power** is derived from uneven heating of the Earth's surface by the sun.
55. In wind mills, wind energy is used to turn mechanical machinery to do physical work, like crushing grain or pumping water.
56. A **non-renewable resource** is a natural resource which cannot be produced, grown, generated.
57. **Fossil fuels (such as coal, petroleum and natural gas)** and nuclear power (uranium) are examples for non – renewable natural resource.
58. Fossil fuels are energy rich, combustible forms of carbon or compounds of carbon formed by the decomposition of biomass buried under the earth over millions of years.
59. **Coal** is a **black mineral** of plant origin - compounds of carbon containing hydrogen, oxygen, nitrogen and sulphur.
60. Petroleum is a dark, viscous, foul smelling liquid, a mixture of solid, liquid and gaseous hydro carbons with traces of salt, rock particles and water.
61. The composition of **natural gas** is chiefly **methane (> 90%)** with traces of **ethane and propane**.
62. Natural gas is found associated with other fossil fuels, in coal beds, as **methane clathrates**.
63. Natural gas is created by **methanogenic organisms** in marshes, bogs, and land fills.
64. Natural gas is an important fuel source, a major feedstock for fertilizers and a potent green house gas.

65. By-products of natural gas are - ethane, propane, butane, pentane, higher molecular weight hydrocarbons, elemental sulphur, carbon-di-oxide, water vapour , helium and nitrogen.
66. **Natural gas** is often informally referred to as simply gas.
67. Natural Gas is a major source of **electricity generation**.
68. Natural gas supplied to homes is used for cooking.
69. Home or other building heating by natural gas includes boilers, furnaces and water heaters.
70. Natural gas is a major feedstock for the production of **ammonia, for use in fertilizer production**.
71. Natural gas is also used in the manufacture of fabrics, glass, steel, plastics, paint and other products.
72. **Biofuels** are fuels that are derived from **biomass**.
73. Biofuels are of solid fuels, liquid fuels and various biogases.
74. The various liquid biofuels are Bio alcohol, Green diesel, Bio diesel, Vegetable oil, Bio ethers, and Bio gas
75. **Bioalcohol (Bioethanol)** is an alcohol made by fermenting the sugar.
76. Ethanol can be used as a fuel for vehicles in its pure form.
77. **Bioethanol** is widely used in the **USA and Brazil**.
78. **Biodiesel** is made from vegetable oil and animal fats. It is used as a fuel for vehicles in its pure form.
79. **Biogas** is produced by the process of anaerobic digestion of organic material by anaerobes.
80. Energy conservation refers to efforts made to reduce energy consumption in order to preserve resources for the future and reduce environmental pollution.
81. Energy conservation results in increase of financial capital, environmental value, national security, personal security and human comfort.

82. Electrical energy conservations are the important element of energy policy.
83. In a gas stove, a blue flame indicates that the gas stove is operating efficiently.
84. Yellowish flame - indicates the burner needs a cleaning.
85. In TV and Audio systems - idle operation leads to an energy loss of **10 watts / device.**