SCIENCE NOTES – PART IV

101. RUSTING OF IRON:

When iron is exposed to water and oxygen rusting takes place. There is an oxidation of iron. Oxidation means attaching of oxygen. In this case iron changes in to iron oxide. This change is chemical change and irreversible.

102. MYOPIA:

(Near-sightedness or short-sightedness)
It is a condition of the eye where light focuses in front of retina instead on retina. This causes distant objects to be out of focus. The distant objects blurs out. The closer objects look normal.

Optical correction is possible by using lens (Glasses). Lens helps in formation of image on retina.

The lens used is concave lens whose focal length is in negative so that we get Minus (-) number in our prescription from doctor.

103. POLLUTION

Pollution in general term is the presence or introduction of some substance or condition in the environment which is harmful or poisonous effects on human being. It is the introduction of contaminants into the natural environment that causes adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light.

Pollution disturbs our ecosystem and the balance in the environment.

Types of Pollution

Air Pollution
Water Pollution
Soil Pollution
Noise Pollution
Radioactive Pollution
Heat Pollution
Light Pollution
Effects of Pollution
Environment Degradation
Human Health
Global Warming
Ozone Layer Depletion
Infertile Land

104 SHIFTING CULTIVATION

It is a form of agriculture, in which an area of ground is cleared of vegetation and cultivated for a few years till the land is productive (Yield is good) then the area is abandoned for a new area until its fertility has been naturally restored. It is also known as slash-and-burn agriculture

Jhum cultivation is also like shifting cultivation. It is practiced in North Eastern Hill region of India. The people involved in this practice are called Jhumia. The practice involves clearing vegetative /forest cover on land/slopes of hills, drying and burning it before onset of monsoon and cropping on it thereafter.

105 LEAN MANAGEMENT:

Lean manufacturing or lean production or lean management is a systematic method for waste minimization with in manufacturing system without sacrificing productivity.

106 ALLOY:

An alloy is a combination of metals or of a metal and of another element. Alloys are defined by a metallic bonding character.

Examples:

STEEL - a combination of iron and carbon

BRONZE - a combination of copper and tin

107 EARTHQUAKE

An earthquake is the shaking of the surface of the earth, resulting from the sudden release of energy in the Earth's lithosphere that creates seismic waves. The lithosphere of the earth is divided into a small number of plates which float on and travel independently over the mantle and much of the earth's seismic activity occurs at the boundaries of these plates. Epicenter: The epicenter is the Earth's surface directly above the focus, the point where an earthquake or an underground explosion originates. Earthquakes are caused mostly by rupture of geological faults. The first scale for measuring earthquake magnitudes was developed by F Richter in 1935. It is estimated that around 5 Lakh earthquakes occur each year. About 1 lakh of these can be felt. Larger earthquakes occur less frequently.

Most of the world's earthquakes over 90% take place in 40,000 km long, horseshoe-shaped zone called the circum-Pacific seismic belt, known as the Pacific Ring of Fire, HIMALAYAN mountain range was formed as a result of the collision of indo-Australian plate and Eurasian plate. According to tectonic plate theory, Indo Australian plate (on which India is existing) is moving towards north and is subducting under Eurasian plate. This movement causes friction between the two plates. Because of the friction lot of energy is released which causes earthquakes.

108 BLOOD TRANSFUSION

Blood transfusion is generally the process of receiving blood into one's circulation intravenously.

109 MRI

Magnetic Resonance Imaging. MRI is a medical imaging technique used in a radiology to form pictures of the anatomy and the physiological processes of the body.

It is a noninvasive medical test that physicians use to diagnose medical conditions. MRI uses a powerful magnetic field, radio frequency pulses and a computer to produce detailed pictures of organs, soft tissues, bone and all other internal body structures.

110 ULTRA VOILET RAYS

Ultraviolet is an electromagnetic radiation with a wavelength from 10nm to 400nm, shorter than that of visible light but larger than X-rays. UV radiation is present in sunlight constituting about 10% of the total light output of the Sun.

111 SUNBURN:

Sunburn is a form of radiation burn that affects living tissue, such as skin, that results from an over-exposer to ultraviolet (UV) radiation, commonly from the sun. Common symptoms in humans and other animals include red or reddish skin that is hot to the touch, pain, general fatigue, and mild dizziness. Excessive UV radiations is the leading cause of primarily non-malignant skin tumors.

112 INFRA RED RAYS

Infrared radiation is electromagnetic radiation with longer wavelengths than those of visible light and is therefore generally invisible to the human eye. One of the most common uses of infrared radiation is in heat-sensitive thermal imaging cameras.

Some examples of radiating infrared waves are burning charcoal, heat from an electric heater, fire or a radiator emitting warmth. The objects emit IR rays when they are hot.

IR wireless is the use of wireless technology in devices that convey data through IR. (TV Remote).

Human eye is sensitive to IR exposure for a long time.

113 HYDROGEN BOMB

Hydrogen Bomb uses the fusion process to release energy. There is nuclear fusion of isotopes of hydrogen (Deuterium and Tritium) into Helium, with release of lot of energy. During 2017-18 North Korea tested a hydrogen bomb.

Atomic bomb relies on fission or atom splitting.

114 MISSION TO MOON

Six missions landed men on the Moon, beginning with Apollo 11 in July 1969, during which Neil Armstrong became the first man to walk on the Moon.

Chandrayaan-1

Chandrayan-1 was India's first lunar probe. It was launched by the Indian Space Research Organization in October 2008 and operated until August 2009. The mission included a lunar orbiter and an impactor. India launched the spacecraft using a PSLV-XL rocket, serial number C11, on 22 October 2008 at 00:52 UTC from Satish Dhawan Space Centre about 80 km north of Chennai. The vehicle was inserted into lunar orbit on November 8, 2008.

115 MISSION TO MARS

Mariner 9 was launched successfully on May 30, 1971 and became the first artificial satellite of Mars when it arrived and went into orbit. Viking Project was the first mission to land a spacecraft safely on the surface of another planet in 1976. Mars Pathfinder landed successfully on Mars on 1997 July 4.

116 STEM CELL

Stem cell is an undifferentiated cell of a multicellular organism. The cell is capable of giving rise to indefinitely more cells of the same type. From stem cells many other types of cells arises that is called differentiation. In lab it is possible to grow organs from stem cells.

Stem cells have the remarkable potential to develop into many different cell types in the body during early life and growth. Stem cells play a huge part in the body's healing process. Stem cells act as basic building blocks of our body. Stem cells have potential to develop into specialized cells such as blood cells, muscle cells, brain cells etc.

117 RADIOACTIVITY

Radioactive decay is the process by which an unstable atomic nucleus loses energy by radiating radiations, such as alpha particles, beta particles with gama rays. Such material who have unstable nucleus are called radioactive. Radioactivity was discovered in 1896 by the French scientist Henri Becquerel. Alpha particles may be completely stopped by a sheet of paper, beta particles by aluminium shield. Gamma rays can only be stopped by much more heavy sheets such as thick layer of lead.

118 TOTAL INTERNAL REFLECTION

The total internal reflection is the reflection of the total amount of incident light at the boundary between two media. Diamonds shine because of total internal reflection.

119 FRICTION

Friction is the force resisting the relative motion of solid surfaces. Friction also occurs in fluid layers. Friction works against the motion and acts in the opposite direction. When one object is sliding on another it starts to slow down due to friction.

Friction helps in walking. Vehicle movement and braking.

There are four types of friction: static, sliding, and rolling friction occur between solid surfaces. Fluid friction occurs in liquid and gases.
Sliding friction is less than static friction.
Rolling friction is less than sliding friction
ex. Stroll, fish in water, streamline body of plain

120 SPECIFIC HEAT

Heat capacity or thermal capacity is a measurable physical quantity of heat required to raise its temperature by 1 degree centigrade.

Every element is having different specific heat.

Water has the highest specific heat capacity of any liquid.

Example: specific heat
Wood 1.76 joules/g degree C
Concrete 0.88
Glass 0.84
Granite 0.79
Water 4.184
Air 1.0
Iron 0.0005

Land heats and cools more quickly than water. This difference affects the climate of different areas on Earth.

121 DECIBEL dB

Decibel is a unit to measure the intensity of sound, or degree of loudness.
20 dB clock ticking
50 dB normal rainfall
60 dB Ordinary Conversation
80 dB Alarm Clock
100 dB Power drill
110 dB Car Horn
120 dB Rock Music
140 dB Gun Shot
150-175 Fire crackers
188 dB Jet Engine

Above 90 dB long exposure may cause hearing damage.
above 140 dB long exposure may cause Permanent Hearing Damage

122 GENETIC ENGINEERING

Genetic engineering, also called genetic modification or genetic manipulation is the direct manipulation of an organism's genes using biotechnology. CLONING- one of the most controversial uses of genetic engineering has been cloning or producing a genetically identical copy of an organism. Ethics of cloning are hotly debated. The first ever sheep named Dolly was cloned in 1996 by scientists.

With genetic engineering we can change the genetic makeup of cells and add one or more new traits that are not found in that organism.

Genetic engineering is used by scientists to enhance or modify the characteristics of an individual organism.
For example, genetic engineering can be used to produce plants that have a higher nutritional value or can tolerate exposure to herbicides.

Examples:
Golden Rice- Genetic modification is often used to make "healthier" foods, such as golden rice, which contains beta-carotene – the very same vitamin that makes carrot orange. The result is that people without access to many vitamins will get a healthy dose of vitamin A when rice is consumed.

Faster growing trees- Demand for wood can be met by trees that grow faster than average. Genetic engineering has produced trees that can ward off biological attacks, grow more quickly and strongly, and create better wood than trees that are not genetically modified.

123 DRIVERLESS CAR

A driverless car is a vehicle that is capable of sensing its environment and navigating without human input. The car combines a variety of techniques to perceive their surroundings, including radar, laser lights, GPS, odometry (Odometry is the use of data from motion sensors to estimate change in position over time) and computer vision.

124 SUSTAINABLE DEVELOPMENT

Economic development that is conducted without depletion of natural resources. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their needs. UNDP (United Nations Development Programme) - the 2030 Agenda for Sustainable Development is an ambitious universal and holistic agenda. UNDP promotes an integrated approach that tackles the connected issues of multidimensional poverty, inequality, and exclusion, and sustainability, while enhancing knowledge, skills and production technologies to enlarge peoples' choices, reduce risks and sustain development gains.

125 SMOG

Smog is a type of air pollutant. The word 'smog' was coined in the early 20th century as a combination of the words smoke and fog to refer to smoky fog, its opacity, and odour.

Classic smog results from large amounts of coal burning in an area and is caused by a mixture of smoke and Sulphur dioxide.

Smog is yellowish or blackish fog formed mainly by a mixture of pollutants in the atmosphere which consists of fine particles and ground level ozone. Smog which occurs mainly because of air pollution, can also be defined as a mixture of various

gases with dust and water vapor. Smog also refers to hazy air that makes breathing difficult.

The atmospheric pollutants or gases that form smog are released in the air when fuels are burnt. When sunlight and its heat react with these gases and fine particles in the atmosphere, smog is formed. It is purely caused by air pollution. Ground level ozone and fine particles are released in the air due to complex photochemical reactions between volatile organic compounds (VOC), Sulphur dioxide, nitrogen oxide. These volatile organic compound, Sulphur dioxide and Nitrogen dioxide are called precursors. The main sources of these precursors are pollutants released directly into the air by gasoline and diesel run vehicles, industrial plants and activities, and heating due to human activities. Smog is often caused by heavy traffic, high temperatures, sunshine and calm winds.

During the winter months when the wind speeds are low, it helps the smoke and fog to become stagnate at a place forming smog and increasing pollution levels near the ground closer to where people are respiring. It hampers visibility and disturbs the environment.

Smog is more severe when it occurs farther away from the sources of release of pollutants. This is because the photo chemical reactions that cause smog take place in the air when released pollutants from heavy traffic drift due to the wind. Smog can thus affect and prove to be dangerous for suburbs, rural areas as well as urban areas or large cities.

Smog can be responsible for any ailment from minor pains to deadly pulmonary diseases such as lung cancer.

126 STENT

Stent is a metal or plastic tube inserted into the lumen of an anatomic vessel or duct to keep the passageway open, and stenting is the placement of stent. There is a variety of stents used for different purposes, from expandable coronary, vascular and biliary stents, to simple plastic stents used to allow the flow of urine between kidney and bladder.

127 CATARACT

A cataract is a clouding of the lens in the eye which leads to a decrease in vision. Cataracts often develop slowly and can affect one or both eyes. Symptoms may include faded colors, blurry vision, halos around light, trouble with bright lights, and trouble seeing at night.

128 HYDROGEN AS FUEL

Hydrogen fuel is a zero-emission fuel when burned with oxygen. It can be used in electrochemical cells or internal combustion engines to power vehicles or electric devices. It is being now used in passenger cars and has been used in fuel cell buses for many years now. It is also used as a fuel for the propulsion of spacecraft. However safety is an issue. Hydrogen can leak easily and ignite at a relatively low temperature.

129 HYPERLOOP

Hyperloop is a proposed mode of passenger and freight transportation. An Hyperloop stated to be a sealed tube or system of tubes through which a pod may travel free of air resistance or friction conveying people or objects at a high speed. The speed likely to be achieved is 760mph (1200km/h) faster than air and rail travel.

130 PLASTIC BAN

Plastic wastes have been identified as one of the major sources of environmental pollution as they don't decay naturally. Besides choking drains, water-bodies and adding to the load of the already-exhausted landfill sites, there are instances of cattle eating and dying after choking on plastic bags. Most of the states have banned plastic bags less than 50 microns, which is the thickness of a human hair.

Microns is the short of micromillimeter, is the global measurement unit for thickness of plastic bags. The thinner the bag, the more harmful they are to the environment.
According to manufacturers the market share of thin bags is not more than 25%.

131 ANTIGEN

A toxin or other foreign substance which includes an immune response in the body, for the production of antibodies.

In immunology, an antigen is a molecule capable of inducing an immune response in the host organism.

The body combats an antigen with the production of an antibody.

132 ANTIBODY

An antibody is produced by the body to combat the foreign body (Protein) like bacteria and viruses. An antibody is a large Y shaped protein produced mainly by plasma cells that is used by the immune system to neutralize pathogens such as pathogenic bacteria and viruses.

133 UNICELLULAR ORGANISM

A unicellular organism, also known as a single-celled organism, is an organism that consists of only one cell.

Unicellular organisms fall into two general categories: Prokaryotes and Eukaryotes
Example:
Prokaryotes - bacteria
Eukaryotes - Protozoa, some fungi -Valonia ventricosa

Unicellular organisms are thought to be the oldest form of life on the earth. Probably emerging about 4 billion years ago.

134 LICHEN

A lichen is a composite organism that arises from algae and fungi in a symbiotic relationship. The dominant partner is the fungus.

The combined lichen has properties different from those of its component organisms. Lichens come in many colours, sizes and forms. The properties are sometimes plant-like, but lichens are not plants. Lichens may have tiny, leafless branches, flat leaf-like structures, flakes that lie on the surface like peeling paint or other growth forms.

It is estimated that 6% of earth's land surface is covered by lichens.

135 GREEN CORRIDORS

Green corridor refers to a special road route that enables harvested organs meant for transplants to reach the destined hospital. The street signals are manually operated to avoid red lights and peak traffic to ensure earliest arrival. The organs of braindead persons are transported and given to patients who need them.

136 DRIP IRRIGATION

Drip irrigation is a type of micro-irrigation method to save water. Watering is done through drip at a slow discharge of water. This way water goes slowly to the roots of plants. The roots are able to absorb water more efficiently. There is least wastage of water as water does not rundown and does not evaporated.

137 GRAPHENE

Graphene is a semi-metal. It is an allotrope of carbon consisting of a single layer of carbon atoms arranged in a hexagonal lattice. It is the basic structural element of many other allotropes of carbon such as graphite, diamond, charcoal, caron nanotubes and fullerenes.

138 OPTICAL ILLUSION MIRAGE IN DESERT

An optical illusion is an illusion caused by the visual system and characterized by a visual percept that appears to differ from reality.

An optical illusion which occurs mainly in deserts during hot summer is based on the principle of Total internal reflection.

On a very hot day in desert, the air just in contact with sand is hotter than the air above it due to the high temperature of the sand.

This causes the refractive index of the air in contact with the sand to be lower than that of the air above it.

Therefore, sunlight passes through a medium of higher refractive index to that of a lower refractive index.

At a particular angle, the angle of incidence becomes greater than the critical angle. This causes the sunlight to reflect from the interface of both the air columns itself without touching the sand. Hence it appears as a watery surface from far off distances. While going nearer to apparent water, the angle of incidence of sunlight decreases and become less than the critical angle. So, total internal reflection does not occur, and the mirage disappears.

139 HIGS BOSON PARTICLES

The elements were thought to be made up of neutrons, protons and electrons. Now many more particles have been discovered.

Higgs boson is an elementary particle discovered later. Higgs field is also discovered. It is like electromagnetic field but different. This field is also invisible. Higgs field gives the mass to particles The Higgs field is existing everywhere in the universe.

Higgs particles are also known as God's particles as these particles give mass to all other particles.

140 EXPANSION OF UNIVERSE

Universe is expanding constantly. The distance between two distant parts of the universe with time. The universe appears to be expanding at an increasing rate, so that the velocity at which a distant galaxy is receding from the observer is constantly increasing with time.

Dark energy is an unknown form of energy which is supposed to be filled in all empty spaces and because of which universe is expanding at accelerating speed.

141 TB (TUBERCULOSIS)

A serious infectious bacterial disease that mainly affects the lungs. It is caused by bacterium Mycobacterium tuberculosis.

Most infections do not have symptoms, in which case it is known as latent tuberculosis. About 10% of latent infections progress to active disease which if left untreated, kills about half of those infected.
The classic symptoms of active TB are a chronic cough with blood-containing sputum, fever, night sweats and weight loss.
Tuberculosis is spread through the air when people who have active TB in their lungs cough, spit, speak or sneeze.
Prevention of TB involves screening those at high risk, early detection and treatment of cases, and vaccination with bacillus Calmette Guerin (BCG) vaccine.
Treatment requires the use of multiple antibiotics over a long period of time. Antibiotic resistance is a growing problem with increasing rates of multi drug-resistance tuberculosis (MDR-TB).
Presently one third of the world's population is thought to be infected with TB.

142 CONTAGIOUS DISEASES

A contagious disease is the one which are transmitted to other persons, either by physical contact with the person suffering the disease, or by causal contact with their secretions or objects touched by them or airborne route among other routes.
VIRUS : Flu, HIV, Ebola, Measles
BACTERIA : TB

143 FISH IN FROZEN LAKE

In cold winter months, lakes and rivers freeze over forming ice. Yet fish and other aquatic animals manage to survive.
Animals like seals, penguins, walruses and a wide variety of sea birds are all fish eaters. The land is completely frozen.
All liquids have a boiling point and freezing point. When water boils at a certain temperature it turns in to steam. When it is cooled to a certain temperature it freezes and become ice. Water boils at 100 degree Celsius and freezes at 0 degree Celsius.
However only the top layer of the lake or river freezes. Underneath the frozen upper layer, the water remains in its liquid form and does not freeze. When water is heated, its volume gradually decreases till the temperature rises to 4 degree Celsius. Above 4 degree water starts expanding.
At 4 degree water has least volume.
At 4 degree it has highest density.
This irregular expansion of water is called anomalous expansion. This anomalous expansion plays an important role by only freezing the upper layer in lakes and rivers.
The surface water freezes at 0 degree while the lower part still remains at 4 degree Celsius. The light frozen layer of ice floats on top.

144 PRESSURE COOKER

As the pressure rises, the temperature of the water and steam inside the sealed cooker also rises above the normal 100 degrees boiling point temperature. At higher temperature cooking is faster. The higher the pressure the shorter the cooking time.
The trapped steam increases the atmospheric pressure inside the cooker by 15 pounds per square inch (psi). It is 15 pounds above normal sea-level pressure. At this pressure, the boiling point of water is increases from 100 degree Celsius to 121 degree. The higher temperature is what cooks food faster.

145 FUSE

A fuse is an electrical safety device that operates to provide safety to gadgets due to overcurrent. It melts when too much current flows through it. The circuit breaks and flow of current stops.
So, fuse wire needs to be of low melting point.

146 HEAVY WATER

Water is made up of hydrogen and oxygen. Normal hydrogen atom has one proton and one electron. Some hydrogen atoms have one neutron in addition to one electron and one proton. The addition neutron makes the atom of hydrogen heavier. Such hydrogen atoms are called Deuterium.

The water with heavy hydrogen atoms is called heavy water. The density is about 11% higher.
Heavy water is used in reactors of atomic power stations.

It helps in moderating the nuclear reaction. The reaction does not go out of control.

147 ISOTOPES

Isotopes are variants of a particular chemical element which differ in neutron number. All isotopes of a given element have the same number of protons in each atom.
Isotopes of Hydrogen:
Normal 1 electron and 1 proton
Deuterium 1 electron, 1 proton and 1 neutron
Tritium 1 electron, 1 proton, and 2 neutrons

Isotopes of Cobalt:
Normal 27 electrons, 27 protons and 32 neutrons
Cobalt 60 - 27 electrons, 27 protons and 33 neutrons

Cobalt 60 is used in treatment of cancer. Cobalt 60 gives gamma rays. When gamma rays are given to cancerous cells they die. The process is called radiation therapy.

148 ROB'S HAVE JOINTS

The purpose of the gap in the road on the bridge is to allow the road to expand and contract with temperature changes without causing damage or deformation to the road.

149. FISSION

Nuclear fission is a process in which nucleus of an atom splits into two or more smaller nuclei. There is release of lot of energy during the Fission process. The fission process often produces free neutrons and protons
Ex. Uranium fission to yield strontium and krypton.
Atomic bomb uses fission process.
Single free neutron strikes the nucleus of an atom of radioactive material like Uranium or Plutonium, knocks two or three more neutrons free.

150. FUSION

Fusion joins atomic nuclei together.
The element formed has more neutrons or more protons than that of starting material.
Ex. Hydrogen and hydrogen can fuse to form Helium.

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