

■ **GENERAL SCIENCE**

PHYSICS

Scalars and Vectors:

- **Scalars:** Magnitude-only physical quantities (e.g., mass, speed, volume, time).
- **Vectors:** Magnitude and direction physical quantities (e.g., displacement, velocity, force).

Newton's Laws of Motion:

1. **First Law (Law of Inertia):** Objects remain at rest or in uniform motion unless acted upon by an external force.
 - **Example:** Running when jumping off a moving train/bus.
2. **Second Law:** Force is proportional to the product of mass and acceleration.
 - **Example:** Force = mass x acceleration.
3. **Third Law:** Every action has an equal and opposite reaction.
 - **Example:** Train buffers to avoid jerks; rocket propulsion.

Circular Motion:

- Motion along a circular path.
- Tangent gives direction.
- Centripetal force acts radially inward.
- Centrifugal force is a pseudo force equal and opposite to centripetal force.
- *Example:* Cream separator, centrifugal dryer.

Friction:

- Opposing force between surfaces during sliding or rolling.
- Enables movement on Earth's surface.
- Brakes in automobiles stop due to friction.

Work: Work is done when a force moves a body through a distance.

- **Work = Fs**

Energy: Energy is the capacity to do work (scalar quantity).

- Mechanical energy has two types:
- **Kinetic Energy (K):** $\frac{1}{2}MV^2$ (mass and velocity).
- **Potential Energy (U):** $U = mgh$ (mass, gravity, and height).
- Law of conservation of energy: Total energy in an isolated system remains constant.

Power: Power is the rate of doing work.

- Formula: **Power** = $\frac{WORK\ DONE}{TIME\ TAKEN}$
 - 1 watt hour = 3600 joule
 - 1 kilowatt hour = 3.6×10^8 joule
 - 1 HP = 746 watt

Gravitation:

- All bodies attract each other with a force of gravitation.
- Earth's gravity has an acceleration of 9.8 m/s^2 .
- Escape velocity: Minimum velocity to leave Earth's gravitational field.
- Gravitational force is independent of shape, size, and mass of the body.

Satellites:

- Satellites are natural or artificial bodies orbiting a planet.
- The Moon is a natural satellite, INSAT-B is an artificial satellite.
- Geo-stationary satellites orbit at 36000 km, completing one rotation in 24 hours.
- Earth's rotation causes stars to appear from East to West.
- Acceleration due to gravity is one-sixth on the Moon compared to Earth.

Some Satellites:

- **Geo-stationary Satellite:**
 - Used for TV broadcasting, weather forecasting, and predictions of floods and droughts.
 - Orbits at a fixed position, completing one rotation every 24 hours.
- **Polar Satellite:**
 - Revolves around Earth in a polar orbit at around 800 km.
 - Orbital period is 84 minutes.
 - Used for weather forecasting, mapping, etc.

General Properties of Matter:

Elasticity:

- Property allowing a body to regain its original shape after a deforming force is removed.
- Steel is more elastic than rubber.

Pressure:

- Force acting normally on a unit area of a surface.
- Formula: Pressure = $\frac{Force}{Area}$
- Atmospheric pressure measured by a barometer.
- Barometric readings: Sudden fall indicates a storm, slow fall predicts rain, slow rise predicts clear weather.
- Pressure in a static liquid at the same horizontal level is the same at all points.

Pascal's Law of Pressure:

- In equilibrium, pressure is the same at all points in a liquid.
- Pressure exerted in a confined liquid is transmitted equally and undiminished in all directions.
- Applied in hydraulic lift, hydraulic press, and hydraulic brakes.

Archimedes' Principle:

- When a body is immersed in a liquid, it experiences an apparent loss in weight equal to the weight of the liquid displaced.
- A body floats in a liquid if its density is less than or equal to the density of the liquid.
- Laws of floatation: Density of the body less than or equal to the density of liquid, neutral equilibrium, and center of gravity conditions.

Density:

- Defined as mass per unit volume.
- Relative density measured by a hydrometer.
- Sea water is denser than normal water.
- Density affects buoyancy; ships may rise when entering denser sea water.
- Objects sink or float based on their density compared to the liquid.

Surface Tension:

- Force acting on unit length of a liquid's surface.
- Property minimizing free surface area.
- Decreases with rising temperature, becomes zero at critical temperature.
- Various phenomena based on surface tension, like lead shot formation, camphor dancing on water.

Cohesive and Adhesive Forces:

- Cohesive force between molecules of the same substance.
- Adhesive force between molecules of different substances.

Capillarity:

- Rise or depression of liquids in a capillary tube.
- Occurs due to cohesive and adhesive forces.
- Examples include ink absorption in blotting paper, oil rising in lamp wicks.

Viscosity:

- Property causing internal friction between layers of a fluid.
- Affects flow behavior.

Bernoulli's Theorem:

- Total energy per unit volume is constant in streamlined motion of incompressible, non-viscous liquids or gases.
- Applied in various devices like venturimeters, atomizers, and aeroplane motion.

Heat and Thermodynamics:

Heat:

- Form of energy measuring warmth or coldness.
- Units: Calorie, kilocalorie, or joule.

Temperature:

- Measurement of hotness or coldness.
- Heat flows from higher to lower temperature.

Thermal Expansion:

- Increase in size on heating.
- Three types: linear, superficial, cubical expansion.
- Examples include telephone wires kept loose for contraction in winter, gaps in railway tracks for expansion.

Specific Heat:

- Amount of heat required to raise the temperature of unit mass through 1°C .

Latent Heat:

- Heat absorbed or released for a change of state at constant temperature.
- Examples: Latent heat of fusion of ice, latent heat of vaporization of steam.

Evaporation:

- Slow conversion of liquid into vapor below boiling temperature.
- Humidity and relative humidity play a role.

Transmission of Heat:

- Conduction in solids, convection in liquids and gases, radiation from the Sun to the Earth.

Simple Pendulum:

- A heavy point mass suspended from a rigid support by an elastic and inextensible string.
- Time period is not affected by mass, shape, or size.
- Pendulum clocks may vary with seasons.
- Time period changes in a descending or ascending lift.

Comparison of Various Properties

Property	Description
Density	Mass per unit volume
Surface Tension	Force acting on liquid's surface
Cohesive Forces	Force between molecules of the same substance
Adhesive Forces	Force between molecules of different substances
Capillarity	Rise or depression of liquids in a capillary tube
Viscosity	Internal friction in a fluid
Thermal Expansion	Increase in size on heating
Specific Heat	Heat required to raise temperature of unit mass
Latent Heat	Heat absorbed or released for a change of state
Evaporation	Slow conversion of liquid into vapor
Transmission of Heat	Transfer of heat from one place to another
Simple Pendulum	Mass suspended from a rigid support

Waves:

- Disturbance propagating energy without matter transportation.
- Mechanical waves: Longitudinal (particles vibrate in wave direction) and Transverse (particles vibrate perpendicular to wave direction).
- Electromagnetic waves: Propagate without a medium (e.g., light, radio waves, X-rays).

Sound Waves:

- Longitudinal mechanical waves.
- Audible waves: 20 Hz to 20,000 Hz.
- Infrasonic waves: <20 Hz.
- Ultrasonic waves: >20,000 Hz (used for signals, depth measurement, cleaning machinery).

Speed of Sound:

- Maximum in solids, minimum in gases.
- Speed changes with medium but not with pressure.
- Increases with temperature.

- More in humid air due to lower density.

Echo: Repetition of sound due to reflection.

Intensity: Amount of energy passing per unit time through a unit area.

Pitch: Sensation of frequency.

SONAR:

- Sound navigation and ranging.
- Measures sea depth, locates submarines, and shipwrecks.

Doppler's Effect: Apparent frequency changes with relative motion between source and observer.

Light: Electromagnetic wave form with Speed: $3 \times 10^8 \text{ m/s}$

Reflection of Light:

- Ray returning into the same medium upon hitting a boundary.
- Laws: Incident, reflected rays, and normal lie in the same plane. Angle of reflection equals angle of incidence.

Reflection from Plane Mirror:

- Virtual and laterally inverted image.
- Size of the image equals that of the object.
- Image position changes with object motion.

Spherical Mirrors:

- Concave: Real, inverted image. Used in applications like solar cookers.
- Convex: Virtual, erect, diminished image. Used as rear-view mirrors.

Refraction of Light:

- Bending of light passing between media.
- Wavelength and velocity change, frequency and phase do not.
- Stars twinkle due to atmospheric refraction.

Total Internal Reflection (TIR):

- Light reflects back into denser medium when entering rarer medium with an angle greater than the critical angle.
- Used in applications like diamond sparkle, mirage, optical fibers.

Lens:

- Convex: Converging lens.
- Concave: Diverging lens.
- Behavior changes in different media.

Dispersion of Light:

- White light splits into constituent colors when passed through a prism.

Optical Fiber:

- Works on TIR principle.
- Used in telecommunications and medical applications like endoscopy

Ohm's Law:

- $I = \frac{V}{R}$ (Current is directly proportional to potential difference, inversely proportional to resistance).
- Wire stretching changes resistance but not specific resistance.
- Metal resistance increases with temperature, semiconductor decreases, electrolytes decrease.
- Conductivity is the reciprocal of resistivity.
- Joule's law of heating explains the heating effect of electric current.

Electrical Devices:

- Ammeter: Measures current, connected in series.
- Voltmeter: Measures potential difference, connected in parallel.
- Fuse Wire: Protective device with low melting point, connected in series.

Magnets:

- Attracts iron, points north when suspended.
- North pole points north when freely suspended.
- Like poles repel, unlike poles attract.
- Electromagnet: Current-carrying coil with a soft iron core.

Atomic and Nuclear Physics:

- Cathode rays: Discovered by Crooke, travel straight, produce fluorescence, deflected by electric/magnetic fields.
- Positive or Canal Rays: Discovered by Goldstein, positively charged, deflected by electric/magnetic fields, capable of producing changes.
- X-rays: Electromagnetic waves, discovered by Roentgen, used in medical, engineering, and scientific fields.

Radioactivity:

- Discovered by Becquerel, Madame Curie, and Pierre Curie.
- Unstable nucleus emits α , β , and γ particles.
- α -particle emission decreases atomic number by 2, mass number by 4.
- β -particle emission increases atomic number by 1.

Nuclear Reactions:

- Nuclear fission: Heavy nucleus splits into two nearly equal mass nuclei.
- Nuclear fusion: Two or more light nuclei combine to form a heavier nucleus.
- Atom Bomb based on nuclear fission (U235, Pu239).
- Hydrogen Bomb based on nuclear fusion, 1000 times more powerful than atom bomb.

Nuclear Reactor:

- Controlled nuclear fission reaction.
- Components: Fissionable fuel (U235 or U239), moderator (heavy water, graphite), control rods (cadmium, boron), coolant (water, heavy water, He, CO₂).
- Uses: Electrical energy production, isotope production for science applications.

LASER (Light Amplification by Stimulated Emission of Radiation):

- Produces intense, coherent, and highly directional beam of single frequency.
- Developed in 1964 by Bhabha Atomic Research Centre (BARC).

LASER Technology in India:

- First laser: Gallium Arsenide (GaAs) semiconductor laser designed and fabricated by BARC in 1964

Collaboration in Laser Technology:

- CAT, DRDO, IISc collaborate with American institutions on laser plasma, quantum optics.

MASER (Microwave Amplification by Stimulated Emission of Radiation):

- Invented by Gordon, Gieyer, and Townes in 1952.
- Uses microwaves, longer wavelength than ordinary lasers.

Units of Measurement

Quantity	Unit (SI)	Quantity	Unit (SI)
Length	Metre	Viscosity	Newton.sec/m ²
Time	Second	Surface tension	Newton/metre
Mass	Kilogram	Heat	Joule
Area	Square metre	Temperature	Kelvin

Quantity	Unit (SI)	Quantity	Unit (SI)
Volume	Cubic metre	Absolute temperature	Kelvin
Velocity	Metre/second	Resistance	Ohm
Acceleration	Metre/second ²	Electric current	Ampere
Density	Kilogram/metre ³	Electromotive force	Volt
Momentum	Kilogram-metre/second	Electrical conductivity	mho/metre
Work	Joule	Electric energy	Kilowatt-hour
Energy	Joule	Electric power	Kilowatt or watt
Force	Newton	Magnetic intensity	Oersted
Pressure	Pascal or Newton/metre ²	Charge	Coulomb
Frequency	Hertz	Magnetic induction	Gauss
Power	Watt	Luminous flux	Candela
Weight	Newton or Kilogram	Intensity of sound	Decibel
Impulse	Newton-second	Power of lens	Diopre
Angular velocity	Radian/second	Depth of sea	Fathom

CHEMISTRY

• **Physical and Chemical Changes:**

- Physical changes only affect physical properties, not composition.
- Chemical changes alter composition and result in a new substance.
- Examples: Physical - crystallization, melting; Chemical - burning, electrolysis.

• **Matter:**

- Anything with mass and occupies space.
- States: Solid, liquid, gas, plasma (ionized gases), Bose-Einstein Condensates (super low temp.).

• **Boiling Point:**

- Temperature at which liquid turns to vapor.
- Impurities increase boiling point (e.g., sea water).
- Decreases at high altitudes.

• **Melting Point:**

- Temperature at which a substance changes from solid to liquid.
- Melting point of ice is 0°C.
- Decreases in the presence of impurities.

• **Atom, Molecule, and Element:**

- Atom: Smallest particle of an element with protons, neutrons, electrons.
- Molecule: Smallest part of an element or compound with independent existence.
- Element: Contains only one type of atom.
- Recent Elements: Oganesson (Og, 118), Ununseptium (Uus, 117).

• **Isotopes and Isobars:**

- **Isotopes:** Same atomic number, different neutrons (e.g., H-1, H-2, H-3).
- **Isobars:** Same mass number, different atomic number (e.g., Ar-40, K-40, Ca-40).

Dating Techniques:

- **Radiocarbon Dating:** Determines age of carbon-bearing materials (wood, animal fossils).
- **Uranium Dating:** Used for Earth, minerals, rocks.

Colloids:

- Heterogeneous solutions with dispersed and dispersion medium.
- Show Tyndall effect (light scattering) and Brownian motion (zig-zag motion).
- Can be lyophilic (dispersion medium loving) or lyophobic (dispersion medium repelling).

Battery: Converts chemical energy to electrical energy.

- **Primary Batteries (Non-rechargeable):** Acts as a galvanic cell (e.g., dry cell, mercury cell).
- **Secondary Batteries (Rechargeable):** Acts as a galvanic and voltaic cell (e.g., lead storage battery, nickel-cadmium battery).

Electrolytic Refining:

- Anode: Impure metal.
- Cathode: Strip of pure metal.

Corrosion:

- Oxidative deterioration of metal surfaces by environmental action (electrochemical process).
- Rusting in iron accelerated by impurities, electrolytes, and gases.
- **Prevention Methods:**
 - Electroplating, oiling, greasing, painting, varnishing.
 - Galvanization (deposition of zinc layer over iron).

Types of Batteries

Battery Type	Anode	Cathode	Electrolyte	Used in
Leclanche Cell	Zinc	Graphite	Paste of ammonium chloride and zinc chloride	Transistors, clocks
Mercury Cell	Zinc-mercury amalgam	Paste of HgO (Mercuric oxide) and carbon	Paste of KOH and ZnO	Hearing aids, camera
Lead Storage Battery	Lead	Lead packed in lead dioxide	38% solution of sulphuric acid	Automobiles, invertors

Some Colloids and Examples

Dispersed Phase	Dispersion Medium	Type of Colloid
Liquid Gas	Aerosol	Fog, clouds, mist
Solid Gas	Aerosol (Solid)	Smoke, automobile exhaust
Gas Liquid	Foam	Shaving cream
Liquid Liquid	Emulsion	Milk, face cream
Solid Liquid	Sol	Mud, milk of magnesia
Gas Solid	Foam	Rubber, sponge, pumice
Liquid Solid	Gel	Jelly, cheese, butter
Solid Solid	Solid Sol	Milky glass, colored gemston

Apple Browning Mechanism:

- **Explanation:** Sliced apples turn brown due to oxidation of iron present in them.
- **Process:** Iron in apples undergoes oxidation when exposed to air, resulting in a brownish color.

Renewable and Non-renewable Natural Resources

Renewable Resources	Non-renewable Resources
- Available in large excess (e.g., air, sunlight)	- Limited quantity, exhaustible (e.g., minerals, coal, petroleum)
- Never-ending supply	- Ends if used excessively over time

Coal: Types of Coal:

1. Peat (60% C)
 2. Lignite or brown coal (70% C)
 3. Bituminous coal (60-80% C)
 4. Anthracite coal (90% C)
- **Common Form:** Bituminous coal is the most prevalent.

Flame Composition:

1. **Innermost Part:** Black due to unburnt carbon particles, lowest temperature.
2. **Middle Part:** Yellow due to incomplete combustion.
3. **Outermost Part:** Blue due to complete combustion, hottest part used by goldsmiths.

Fire Extinguishers:

- **Water:** Extinguishes fire by cutting off oxygen supply as it evaporates.
- **Limitations:** Not suitable for electrical or oil fires due to conductivity and oil's buoyancy.
- **Alternative:** Carbon dioxide generated by baking soda and acid reaction for electrical or oil fires.

Fuels: Substances producing heat and light upon combustion.

- **Calorific Value:** Heat obtained when 1g of fuel burns in excess oxygen.
- **LPG Safety:** Odorless gas with added ethyl mercaptan for leak detection.

Rocket Propellants:

Common Propellant: Mixture of liquid hydrogen and liquid oxygen.

Important Fuels and Compositions

Fuel	Composition	Sources
Water Gas	CO + H ₂	Steam over red hot coke
Producer Gas	N ₂ + CO (2:1 ratio)	Insufficient air over red hot coke
Coal Gas	Hydrogen, Methane, Ethylene, Acetylene, CO ₂ , Nitrogen	Fractional distillation of wood
Natural Gas	Methane (83%), Ethane (16%)	Petroleum
LPG (Butane + Propane)	C ₄ H ₁₀ + C ₃ H ₈	Oil wells
CNG (Compressed Natural Gas)	Methane (CH ₄) 95%	Petroleum
Biogas or Gobar Gas	Methane (CH ₄), CO ₂ , H ₂ , N ₂	Organic wastes

Calorific Value of Substances

Fuel	Calorific Value (kJ/g)
Coal	25-32
Kerosene oil	48
Petrol	50
Diesel	45
Biogas	35-40
LPG	50
Cow dung	6-8
Hydrogen	150
Natural gas	35-50

Safety Matches:

- **Composition:**
 - Stick: Mixture of antimony trisulphide and potassium chlorate.
 - Box side: Mixture of powdered glass and red phosphorus.

Acids, Bases, and Salts

Property/Type	Acids	Bases	Salts
Taste	Sour	Bitter, soapy to touch	Product of neutralization reaction
Litmus Test	Turn blue litmus red	Turn red litmus blue	-
Conductivity	Good conductor in aqueous solution	Good conductor in aqueous solution, molten	-
Application	Pickles stored in glass due to acid reactivity	-	-

Carbon Dioxide and Carbon Monoxide:

- **Carbon Dioxide:**
 - Acidic oxide used in photosynthesis.
 - Does not support combustion.
 - Turns lime water milky in the presence of air or breath.
- **Carbon Monoxide:**
 - Neutral oxide with high affinity for hemoglobin.
 - About 200 times more affinity than oxygen.
 - Dangerous in unventilated rooms with fire, causing suffocation.

Plaster of Paris and Portland Cement

- **Plaster of Paris:**
 - Chemical formula: $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$.
 - Prepared by heating gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at 373 K.
 - Sets into hard gypsum when mixed with water.
 - Used for plastering, making toys, decoration, and setting fractured bones.
- **Portland Cement:**
 - Complex mixture of calcium silicates and aluminates with gypsum.
 - Raw materials: Limestone and clay.
 - Composition: CaO (50-60%), Al_2O_3 (5-10%), MgO (2-3%), with added gypsum.
 - Used in mortar (sand, cement, water) for joining bricks and plastering walls.
 - Concrete (gravel, sand, cement, water) used for flooring and road construction.

Reinforced Concrete Cement (RCC): Concrete with embedded steel bars and wires.

- **Uses:** Construction of roofs, bridges, and pillars.

Soaps:

- **Composition:** Sodium and potassium salts of higher fatty acids.
- **Examples:** Sodium palmitate, sodium stearate, etc.

Glass:

- **Composition:** Mainly silica (SiO_2).
- **Coloration:** Different substances added for color.
 - Red: Copper oxide (CuO)
 - Green: Chromium oxide (Cr_2O_3)
 - Ruby Red: Gold chloride (AuCl_3)
 - Blue: Cobalt oxide (CoO)
 - Brown: Iron oxide (Fe_2O_3)

Pesticides: Types:

- **Insecticides:** DDT, gamma-xylene, aluminium phosphate.
- **Fungicides:** Bordeaux mixture, organo-mercury compounds.
- **Herbicides:** Benzipram, sodium chlorate.
- **Rodenticides:** Aluminium phosphide.

Heavy Water:

- **Composition:** Deuterium oxide (D_2O), molecular mass = 20.
- **Use:** Moderator in nuclear reactors due to the presence of deuterium.

Hard Water:

- **Types:** **Temporary Hard Water:** Soluble bicarbonates of calcium and magnesium.
Permanent Hard Water: Soluble sulphates and chlorides of calcium and magnesium.
- **Removal:** **Temporary Hardness:** Boiling or adding calcium hydroxide (Clark's process).
Permanent Hardness: Adding sodium carbonate (Na_2CO_3) or calgon.

Hardening of Oil (Hydrogenation):

- **Process:** Unsaturated oil heated with nickel catalyst and hydrogen.
- **Result:** Conversion into solid mass (e.g., ghee), a saturated fat.

Medicines and Examples

Type	Purpose	Examples
Analgesics	Reduce pain	Aspirin, paracetamol, morphine, phenacetin
Tranquilizers	Treat stress, mental diseases	Equanil, valium, chlorodiazepoxide, serotonin, meprobamate
Antiseptic	Prevent microorganism growth on living tissues	Dettol, savlon, iodine tincture, boric acid, hydrogen peroxide, iodoform
Antibiotic	Destroy microorganisms (obtained from microorganisms)	Penicillin, ampicillin, amoxicillin, ofloxacin, chloramphenicol
Antimalarial	Cure malaria	Chloroquine
Sulphadugs	Alternative for antibiotics	Sulphanilamide, sulphadiazine
Antacids	Reduce acidity	Baking soda, magnesium hydroxide

Polymers: Compounds of high molecular weight formed by polymerization of low molecular weight monomers.

Industries: Backbone of plastics, fibers, paints, and varnishes industries.

Fibers and Their Monomers

Fiber	Monomers	Uses
Nylon-6,6	Adipic acid + hexamethylene diamine	Bristles for brushes, synthetic fibers, parachutes, substitute for metal in bearings
Nylon-6 (Perlon)	Caprolactum	Fibers, plastic tire cords, ropes
Terylene	Ethylene glycol + terephthalic acid	Wash and wear fabrics, tire cords, safety belts, tents
Kevlar	Terephthalic acid + 1,4-diamino benzene	Bulletproof vests
Lexan (Polycarbonate)	Diethyl carbonate + bis-phenol-A	Bulletproof windows, safety helmets
Polyurethanes	Toluene diisocyanate + ethylene glycol	Washable and long-lasting mattresses, cushions

Important Industrial Compounds

Industrial Name	Chemical Name	Chemical Formula
Alum	Potassium aluminium sulphate	$KAl(SO_4)_2 \cdot 12H_2O$
Alcohol	Ethyl alcohol	C_2H_5OH
Baking soda	Sodium bicarbonate	$NaHCO_3$
Bleaching powder	Calcium oxychloride or calcium hypochlorite	$CaOCl_2$

Industrial Name	Chemical Name	Chemical Formula
Brine (Common Salt)	Sodium chloride	NaCl
Borax	Sodium tetraborate decahydrate	Na ₂ B ₄ O ₇ ·10H ₂ O
Caustic potash	Potassium hydroxide	KOH
Caustic soda	Sodium hydroxide	NaOH
Chalk (Marble)	Calcium carbonate	CaCO ₃
Chilli Salt Petre	Sodium nitrate	NaNO ₃
Chloroform	Trichloro methane	CHCl ₃
Epsom salt	Magnesium sulphate	MgSO ₄ ·7H ₂ O
Glauber's salt	Sodium sulphate decahydrate	Na ₂ SO ₄ ·10H ₂ O
Gypsum	Calcium sulphate dihydrate	CaSO ₄ ·2H ₂ O
Hypo	Sodium thiosulphate pentahydrate	Na ₂ S ₂ O ₃ ·5H ₂ O
Laughing gas	Nitrous oxide	N ₂ O
Lunar caustic	Silver nitrate	AgNO ₃
Marsh gas	Methane	CH ₄
Quick lime	Calcium oxide	CaO
Sal Ammonia	Ammonium chloride	NH ₄ Cl
Sapphire (Ruby)	Aluminium oxide	Al ₂ O ₃
Slaked lime	Calcium hydroxide	Ca(OH) ₂
Soda Ash	Sodium carbonate	Na ₂ CO ₃
Spirit	Methyl alcohol	CH ₃ OH
Washing soda	Sodium carbonate decahydrate	Na ₂ CO ₃ ·10H ₂ O

BIOLOGY

Living World:

- **Binomial Nomenclature:** Developed by Carolus Linnaeus in the 18th century.
- **Classification (Whittaker 1969):** Five kingdoms - Monera, Protista, Fungi, Plantae, and Animalia.
- **Viruses:** Sub-microscopic, obligate intracellular parasites. TMV (Tobacco Mosaic Virus) crystallized by WM Stanley.
- **Viroids:** Smallest infectious single-stranded RNA molecules, discovered by TO Diener.

The Cell:

- **Cell Theory (1838):** Proposed by Schleiden and Schwann.
- **Cell Types:**
 - Prokaryotic: Lack nucleus and membrane-bound organelles (found in bacteria).
 - Eukaryotic: Have nucleus and membrane-bound organelles (found in plants,

animals, and fungi).

Nucleic Acids:

- **Types:** DNA (Deoxyribo Nucleic Acid) and RNA (Ribo Nucleic Acid).
- **DNA:** Adenine, guanine, cytosine, and thymine.
- **RNA:** Contains uracil instead of thymine.

Human Systems:

- **Organization:** Cells → Tissues → Organs → Organ Systems.
- **Digestion:** Hydrolysis process converting complex food into simple components using digestive enzymes.

Respiratory System:

- **Respiration:** Oxidative process involving the oxidation of food substances.
- **Types:** Anaerobic (without O₂) and aerobic (with O₂).

Respiratory Organs of Animals

Respiratory Organ	Animal
Lungs	Reptiles and mammals
Skin	Frog, earthworm, and leeches
Gills	Fishes, tadpoles, and prawns
Tracheae	Insects, centipedes, and millipedes
Body Surface	Protozoans, porifera, and coelenterates
Book Lungs	Spider and scorpion
Book Gills	King crab, prawn, crayfish, and Daphnia
Mantle	Mollusca (Unio)
Air Bladder	Lungfish and bony fishes (e.g., Labeo)
Airsacs/Lungs	Birds

Human Systems (Summary)

- **Digestive System:** Converts complex food into simple components through hydrolysis.
- **Respiratory System:** Involves oxidative processes, can be anaerobic or aerobic.
- **Organization:** Cells → Tissues → Organs → Organ Systems.

Vitamin: It's function and sources

Vitamin	Function	Sources
Vitamin A	Vision, immune system, skin health	Carrots, sweet potatoes, spinach, liver, eggs
Vitamin B1	Energy metabolism, nerve function	Whole grains, pork, beans, nuts, seeds
Vitamin B2	Energy metabolism, skin health	Dairy products, lean meats, almonds, mushrooms
Vitamin B3	Energy metabolism, skin health	Meat, fish, peanuts, mushrooms, avocados
Vitamin B5	Energy metabolism, hormone synthesis	Meat, poultry, fish, whole grains, legumes
Vitamin B6	Amino acid metabolism, nerve function	Poultry, fish, bananas, potatoes, spinach
Vitamin B7	Fatty acid synthesis, skin health	Eggs, nuts, seeds, sweet potatoes
Vitamin B9	DNA synthesis, cell division	Leafy greens, legumes, citrus fruits, liver
Vitamin B12	Red blood cell formation, nerve function	Meat, fish, dairy products, fortified foods
Vitamin C	Antioxidant, collagen synthesis, immune support	Citrus fruits, strawberries, bell peppers
Vitamin D	Calcium absorption, bone health	Sunlight, fatty fish, fortified dairy products
Vitamin E	Antioxidant, skin health	Nuts, seeds, vegetable oils, leafy greens
Vitamin K	Blood clotting, bone metabolism	Leafy greens, broccoli, Brussels sprouts

Water-Soluble Vitamin

Water-Soluble Vitamin	Function	Sources
Vitamin C (Ascorbic Acid)	Antioxidant, collagen synthesis, immune support	Citrus fruits (oranges, lemons), strawberries, bell peppers, broccoli
Vitamin B1 (Thiamine)	Energy metabolism, nerve function	Whole grains, pork, beans, nuts, seeds
Vitamin B2 (Riboflavin)	Energy metabolism, skin health	Dairy products, lean meats, almonds, mushrooms
Vitamin B3 (Niacin)	Energy metabolism, skin health	Meat, fish, peanuts, mushrooms, avocados
Vitamin B5 (Pantothenic Acid)	Energy metabolism, hormone synthesis	Meat, poultry, fish, whole grains, legumes
Vitamin B6 (Pyridoxine)	Amino acid metabolism, nerve function	Poultry, fish, bananas, potatoes, spinach
Vitamin B7 (Biotin)	Fatty acid synthesis, skin health	Eggs, nuts, seeds, sweet potatoes
Vitamin B9 (Folate)	DNA synthesis, cell division	Leafy greens, legumes, citrus fruits, liver
Vitamin B12 (Cobalamin)	Red blood cell formation, nerve function	Meat, fish, dairy products, fortified foods

- **Water:**
 1. Crucial role in digestion, transportation, excretion, and body temperature regulation (body comprises 65% water).
 2. Vital for bodily functions and maintaining overall health.
- **Roughage:**
 1. Fibrous material found in the cell wall of plants.
 2. Mainly composed of cellulose.
 3. Does not provide energy but aids in water retention within the body.
 4. Important for healthy digestion and bowel movements.

Blood (Lymphatic System):

- **Composition:**
- **Fluid Connective Tissue:** Composed of plasma and blood cells.
- **Blood Volume:** 5-6 litres in an adult.
- **pH:** Slightly alkaline, pH 7.3-7.4.
- **Plasma:** Pale yellow, transparent; constitutes about 60% of blood volume.
- **Plasma Composition:**
 - 90-92% water.
 - 7% organic substances (albumin, globulin, fibrinogen proteins).
 - 1% inorganic substances.
- **Blood Cells:**
- **Red Blood Corpuscles (RBCs):**
 - Most abundant.
 - Non-nucleated.
 - Contains hemoglobin (respiratory pigment).
- **White Blood Cells (WBCs):**
 - Colourless, nucleated, and granular or agranular.
 - Types:
 - Eosinophils (2-8%): Acidophils, phagocytic granulocytes, play a role in hypersensitivity.
 - Basophils (2%): Non-phagocytic granulocytes, increases during chickenpox.
 - Neutrophils (65%): Phagocytic granulocytes, increases during bacterial infection.

Enzyme	Source	Where Active	Substrate	Main Breakdown Product
Salivary amylase	Salivary glands	Mouth	Polysaccharides	Disaccharides (e.g., glucose)

Enzyme	Source	Where Active	Substrate	Main Breakdown Product
Pancreatic amylase	Pancreas	Small intestine	Polysaccharides	Disaccharides
Disaccharidases	Small intestine	Small intestine	Disaccharides	Monosaccharides
Pepsin	Stomach mucosa	Stomach	Proteins	Peptide fragments
Trypsin and chymotrypsin	Pancreas	Small intestine	Proteins and polypeptides	Peptide fragments
Carboxypeptidase	Pancreas	Small intestine	Peptide fragments	Amino acids
Amino peptidase	Intestinal mucosa	Small intestine	Peptide fragments	Amino acids
Lipase	Pancreas	Small intestine	Triglycerides	Free fatty acids and monoglycerides
Pancreatic nucleases	Pancreas	Small intestine	DNA and RNA	Nucleotides
Intestinal nucleases	Intestinal mucosa	Small intestine	Nucleotides	Nucleotide bases and monosaccharides

Major Enzymes of Digestion

Blood Groups, Genotypes, and Transfusion Possibility

Blood Group (Phenotype)	Antigen in Red Blood Cells	Antibodies in Plasma	Can Give Blood to Groups	Can Receive Blood from Group	Genotype
O	None	Anti-A, Anti-B	O, A, B, and AB	O	ii
A	A	Anti-B	A and AB	O and A	IAIA or IAi
B	B	Anti-A	B and AB	O and B	IBIB or IBi
AB	A and B	None	AB	O, A, B, and AB	IAIB

Blood (Lymphatic System):

- **Monocytes (0.5%):**
 - Agranulocytes.
 - Referred to as the "policemen of blood."
 - Increase during tuberculosis.
- **Lymphocytes (26%):**
 - Agranulocytes.
 - Produce antibodies.
 - Increase during viral infection.

- **Platelets (Thrombocytes):**
 - Non-nucleated.
 - Life span of about 8 to 10 days.
- **Rh Factor:**
 - Discovered by Landsteiner and Weiner in Rhesus monkey.
 - Responsible for erythroblastosis foetalis disease.
- **Blood Clotting Components:**
 - Fibrinogen
 - Prothrombin
 - Thromboplastin
 - Calcium ions
 - Vitamin-K
- **Human Heart:**
 - Myogenic (contraction initiated by Sino-atrial node in the right atrium).
 - Sino-atrial node (SA node) acts as a pacemaker.
 - First heart sound: Lub, Second heart sound: Dub.
 - Contraction (systole) and relaxation (diastole) cycles.
 - Blood pressure: Systole - 120 mm Hg, Diastole - 80 mm Hg.
- **Excretion:**
 - Elimination of harmful waste products to regulate body fluid and tissue composition.
 - Human excretory system: Two kidneys, nephron as the structural unit.
 - Urine color: Pale yellow (due to urochrome pigment).
 - Urine composition: 95% water, 2% salts, 2.6% urea, 0.3% uric acid.
 - Urine pH: Mildly acidic (about 6.0).
 - Urine smell on standing: Pungent (due to urea conversion into ammonia).
 - Specific gravity of urine: 1.015-1.025.
 - Volume of urine: 1 to 2 liters per day.
- **Brain:**
 - Organizing and processing center of the body.
 - Site of consciousness, sensation, memory, and intelligence.
 - Receives impulses from the spinal cord and cranial nerves.
 - Three major portions: Hindbrain, Midbrain, Forebrain.

Some Diseases Caused by Viruses and Bacteria

Disease	Pathogen	Incubation	Symptoms	Prevention/Vaccine
Chickenpox	Herpes zoster virus	12-20 days	Skin rash, vesicles	Varicella vaccine
Smallpox	Variola virus	12 days	Rash, pustules, scabs	Smallpox vaccine
Poliomyelitis	Polio virus	7-14 days	Paralysis, stiffness	Salk and OPV vaccines
Measles	Rubella virus	10 days	Rubella, coughing	MMRV vaccine
Mumps	Mumps virus	12-26 days	Swollen glands	Mumps vaccine, isolation
Rabies	Rabies virus	10 days to 1-3	Throat spasms,	Dog immunization

Disease	Pathogen	Incubation	Symptoms	Prevention/Vaccine
		months	paralysis	
Tuberculosis	M tuberculosis	2-10 weeks	Cough, chest pain	BCG vaccine
Diphtheria	C diphtheriae	2-6 days	Inflammation, blockage	DPT vaccine
Cholera	Vibrio cholerae	6h to 2-3 days	Diarrhea, dehydration	Sanitation, cholera vaccine
Leprosy	Mycobacterium leprae	2-5 years	Skin nodules, deformity	BCG, lepromin tests
Tetanus	Clostridium tetani	3-21 days	Jaw stiffness, spasms	ATS and DPT vaccines
Typhoid	Salmonella typhi	1-3 weeks	Typhoid fever	TAB vaccine, sanitation
Plague	Pasteurella pestis	2-6 days	Bubonic plague, septicemia	Rat control, plague vaccine
Gonorrhoea	Neisseria gonorrhoeae	2-10 days	Genital inflammation	Avoid prostitution
Pneumonia	Streptococcus pneumoniae	1-3 days	Respiratory issues	PCV 13 vaccine

Disease

Disease	Pathogen	Incubation	Symptoms	Prevention/Vaccine
Salmonellosis	Salmonella enteritidis	48 h	Diarrhea	RASV vaccine
Swine Flu	H1N1 flu virus (Orthomyxovirus)	1-4 days	Fever, sore throat, dyspnea, myalgia, diarrhea, vomiting, dizziness	Antiviral drugs (Oseltamivir, Zanamivir), vaccines available
Ebola Virus Disease	Ebola virus (Filovirus)	2-21 days	Hemorrhagic fever, muscle pain, headache, sore throat, diarrhea, kidney and liver dysfunction, internal and external bleeding	No licensed vaccine, immune therapies used currently
Dengue	RNA virus of genus Flavivirus	3-14 days	Muscle pain, swollen lymph nodes, fever, headache, rash	No specific antiviral drug, symptoms-based treatment
Chikungunya	RNA virus of genus Alphavirus	1-12 days	Headache, fatigue, digestive complaints, conjunctivitis	No specific treatment, supportive care with drugs like naproxen, paracetamol
COVID-19	Novel Coronavirus	5-14 days	Fever, dry cough, tiredness, aches, pains,	—

Disease	Pathogen	Incubation	Symptoms	Prevention/Vaccine
			nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell, rash, discoloration of fingers or toes	

Common Diseases and Affected Body Part

Disease	Affected Part
AIDS	Immune system of the body
Arthritis	Joints
Asthma	Bronchial muscles
Cataract	Eyes
Conjunctivitis	Eyes
Glaucoma	Eyes
Diabetes Mellitus	Pancreas and blood
Dermatitis	Skin
Diphtheria	Throat
Dementia	Brain
Eczema	Skin
Goitre	Thyroid
Hepatitis	Liver
Jaundice	Liver
Malaria	Spleen
Meningitis	Brain
Paralysis	Nerves and limbs
Polio	Legs
Pyorrhea	Teeth
Pneumonia	Lungs
Typhoid	Intestines
Tuberculosis	Lungs
Tonsillitis	Tonsils gland in throat
Gastroenteritis	Stomach and intestines
Osteoporosis	Bones
Pancreatitis	Pancreas
Nephritis	Kidneys

Fungal Diseases

Disease	Fungus
Aspergillosis	Aspergillus flavus, A fumigatus, A niger
Blastomycosis	Blastomyces dermatitidis

Disease	Fungus
Candidiasis	Candida albicans
Chromomycosis	Cladosporium corionii
Coccidiomycosis	Coccidiodes immitis
Cryptococcosis	Lipomyces neoformans
Geotrichosis	Geotrichum candidum
Histoplasmosis	Histoplasma capsulatum
Neuritis	Mucor pusillus
Onychomycosis	Trichophyton purpureum

- **Ebola Virus Disease:**
 - Pathogen: Ebola virus.
 - Incubation: 2-21 days.
 - Symptoms: Hemorrhagic fever, muscle pain, headache, sore throat, diarrhea, kidney and liver dysfunction, internal and external bleeding.
 - Prevention/Vaccine: No licensed vaccine, immune therapies used currently.
- **Dengue:**
 - Pathogen: RNA virus of genus Flavivirus.
 - Incubation: 3-14 days.
 - Symptoms: Muscle pain, swollen lymph nodes, fever, headache, rash.
 - Prevention/Vaccine: No specific antiviral drug, symptoms-based treatment.
- **Chikungunya:**
 - Pathogen: RNA virus of genus Alphavirus.
 - Incubation: 1-12 days.
 - Symptoms: Headache, fatigue, digestive complaints, conjunctivitis.
 - Prevention/Vaccine: No specific treatment, supportive care with drugs like naproxen, paracetamol.
- **COVID-19:**
 - Pathogen: Novel Coronavirus.
 - Incubation: 5-14 days.
 - Symptoms: Fever, dry cough, tiredness, aches, pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell, rash, discoloration of fingers or toes.
 - Prevention/Vaccine: Not applicable.
- **Fungal Diseases:** Various fungal diseases caused by different fungi.
- **Vaccines:** Various vaccines discovered by different scientists.
- **Antibiotics:** Various antibiotics developed through biotechnology, with their microbial sources.

Ebola Virus Outbreak:

- As of August 19, 2015, the World Health Organization reported three confirmed Ebola cases in Guinea, with no confirmed cases reported in Sierra Leone for a full week.
- A total of 72 cases were under monitoring in Sierra Leone.

- On June 29, 2015, a confirmed case of Ebola was reported in a 17-year-old male who died in Liberia.
- Ebola spread beyond Africa to the USA, Spain, Mali, and to a lesser extent, Italy and the UK.

Important Antibiotics

Antibiotics	Source	Action
Penicillin	<i>Penicillium chrysogenum</i> , <i>P. notatum</i> + <i>Phenyl Acetic Acid</i>	Tonsillitis, Sore Throat, Gonorrhoea, Rheumatic Fever, some Pneumonia types
Griseofulvin	<i>Penicillium griseofulvum</i>	Antifungal, especially for Ringworm
Nystatin	<i>Streptomyces nourse</i>	Antifungal for Candidiasis and overgrowth of Intestinal Fungi during excessive antibiotic treatment.
Hamycin	<i>Streptomyces pimprei</i>	Antifungal for Thrush
Fumagillin	<i>Aspergillus fumigatus</i>	Broad-spectrum antibacterial, especially against Salmonella and Shigella.
Bacitracin	<i>Bacillus licheniformis</i>	Syphilis, Lymphonema or Reticulosis.
Streptomycin	<i>Streptomyces griseus</i>	Meningitis, Pneumonia, Tuberculosis, and Local Infection. Toxic in some through the eighth cranial nerve.
Chloramphenicol	<i>Streptomyces venezuelae</i> , <i>S. lavendulae</i> , Now synthetic	Typhoid, Typhus, Whooping cough, Atypical Pneumonia, Bacterial Urinary Infections.
Tetracyclines/Aureomycin	<i>Streptomyces aureofaciens</i>	Viral pneumonia, Osteomyelitis, Whooping Cough, and Eye infections.
Oxytetracycline/Terramycin	<i>Streptomyces rimosus</i>	Intestinal and Urinary Infections (Spirochaetes, Rickettsia, and Viruses)

Important Discoveries

Discovery	Made by	Country
Antibiotic	Alexander Fleming (1928)	Scotland
Antiseptic	Joseph Lister (1867)	Scotland
Blood circulation	William Harvey (1628)	Britain
Blood transfusion	Jean-Baptiste Denys (1625)	France

Discovery	Made by	Country
Cholera and TB germs	Robert Koch (1883)	Germany
Electrocardiogram (ECG)	William Einthoven (1903)	Dutch
CT Scan	Godfrey Hounsfield (1973)	England
Sphygmomanometer	Scipione Riva-Rocci (1898)	Italy
Stethoscope	Rene Laennec (1819)	France
Thermometer	Sir Thomas Allbutt (1867)	England
Ultrasound	Ian Donald (1950)	Ireland
X-ray	WC Roentgen (1895)	Germany
Electroencephalogram (EEG)	Hans Berger (1929)	Germany

Some Important Facts of the Human Body

Fact	Description
Number of cells in body	Approximately 75 trillion
Longest bone	Femur (thigh bone)
Smallest bone	Ear ossicle, stapes
Blood volume	6.8 litres (in a 70 kg body)
Normal BP	120/80 mm Hg
Life span of RBC	120 days
Life span of WBC	3-4 days
Universal blood donor	O Rh-negative
Universal blood recipient	AB
Average body weight	70 kg
Normal body temperature	98.4°F or 37°C
Dental formula (adult)	2-1-2-3 / 2-1-2-3 = 32 teeth
Dental formula (child)	2-1-2-0 / 2-1-2-0 = 22 milk teeth
Gestation period	9 months (253-266 days)
Largest gland	Liver
Largest muscle in the body	Gluteus maximus (Buttock muscle)
Longest cell	Neuron (nerve cell)
Menstrual cycle	28 days
Minimum distance for proper vision	25 cm
pH of urine	6.0
Total length of blood vessels	Approximately 100,000 km
Number of bones in the body	206
Weight of the brain	Around 1.4 kg
Total number of muscles	More than 600
Average heart rate	60-100 beats per minute

National Laboratories and Research Institutions

Name	Place
------	-------

Central Leather Research Institute	Chennai, T.N.
Central Mining Research Station	Dhanbad, Jharkhand
Indian Institute of Science	Bengaluru, Karnataka
Indian Space Research Organisation	Bengaluru, Karnataka
All India Institute of Medical Sciences	New Delhi
National Institute of Virology	Pune, Maharashtra
National Physical Laboratory	New Delhi
National Centre for Biological Sciences	Bengaluru, Karnataka
National Environmental Engineering Research Institute	Nagpur, Maharashtra
National Institute of Oceanography	Goa
National Brain Research Centre	Bengaluru, Karnataka
National Chemical Laboratory	Pune, Maharashtra
National Institute of Mental Health and Neurosciences	Bengaluru, Karnataka
Central Drug Research Institute	Lucknow, Uttar Pradesh
Central Electronics Engineering Research Institute	Pilani, Rajasthan
National Aerospace Laboratories	Bengaluru, Karnataka

Nuclear/Atomic Research Centres

Name	Place
Bhabha Atomic Research Centre	Trombay, near Mumbai, MS
Saha Institute of Nuclear Physics	Kolkata, Paschim Banga
Tata Institute of Fundamental Research	Mumbai, Maharashtra
Indira Gandhi Centre for Atomic Research	Kalpakkam, Tamil Nadu

Ecology:

- Principles governing relationships between organisms and their environment.
- Pyramid of numbers is upright in grassland and pond ecosystems, inverted in tree ecosystems.
- Pyramid of biomass is upright in grassland and forest ecosystems, inverted in pond ecosystems.
- Pyramid of energy is always upright.

Ecosystem:

- The term "ecosystem" was introduced by A G Tansley in 1935, referring to the intricate relationships between living organisms and their non-living surroundings.

- Ecosystems are functional units where organisms interact with each other and the physical environment, involving energy flow, nutrient cycling, and material exchange.

Types of Ecosystems:

I. Natural Ecosystem: a) Terrestrial Ecosystems: - Diverse habitats like grasslands, forests, and deserts. - Support a variety of land-adapted plant and animal species.

b) Aquatic Ecosystems: - Exist in water bodies, including freshwater (rivers, lakes) and marine (oceans). - Home to diverse marine life.

II. Artificial Ecosystem:

- Man-made ecosystems intentionally created by humans.
- Examples include agricultural ecosystems and controlled environments like aquariums.

Components of Ecosystem:

Abiotic Component: i) Climate: - Encompasses sunlight, temperature, precipitation, wind, and humidity.

ii) Inorganic Substances: - Elements like sulfur, nitrogen, and calcium vital for nutrient cycling.

iii) Organic Compounds: - Proteins, carbohydrates, and lipids produced by autotrophs, serving as energy sources.

Biotic Component: i) Autotrophs: - Photosynthetic plants producing their own food.

ii) Heterotrophs: - Depend on other organisms for nutrition, including herbivores and carnivores.

iii) Decomposers: - Bacteria and fungi breaking down organic matter, recycling nutrients.

Food Chain:

- A linear process of energy transfer from producers to consumers.
- Represents the flow of energy within an ecosystem.

Types of Food Chains:

I. Grazing Food Chain: Begins with plants (producers) and involves herbivores and carnivores.

II. Detritus Food Chain: Starts with dead organic matter and includes decomposers.

Food Web:

- A complex network of interconnected food chains within an ecosystem.
- Depicts the feeding relationships among organisms.

Importance of Food Web:

- Critical for maintaining ecological balance.
- Highlights intricate connections and interactions.

Differences between Food Chain and Food Web:

- Food Chain: Linear energy transfer; higher trophic levels feed on a single organism.
- Food Web: Network of interconnected chains; flexibility in feeding on multiple organisms.
- **Ecological Pyramids:** Represent trophic structure, showing energy and biomass flow.

Types of Ecological Pyramids:

I. Pyramid of Number: Illustrates the number of individuals at each trophic level.

II. Pyramid of Biomass: Depicts the total weight of organisms at each trophic level.

III. Pyramid of Energy: Represents energy content or productivity, always upright.

• **Pollution:**

- Undesirable changes in air, water, and soil properties affecting humans.
- Caused by agents or substances known as pollutants.
- Motor vehicles contribute 60% of air pollution in major cities.
- Photochemical smog includes O₃, H₂O₂, PAN, etc.
- CO has 250 times more binding affinity with hemoglobin than O₂.
- Acid rain composed of H₂SO₄ and HNO₃.
- Chlorofluorocarbons cause ozone depletion.
- Sewage is a major source of water pollution.
- Bioremediation uses microorganisms to remove pollutants.
- Biomagnification increases the concentration of chemicals in successive trophic levels.
- Endosulfan, an organic pollutant, is now banned worldwide.
- Chernobyl disaster occurred on April 26, 1986.
- Nitrate fertilizers cause blue baby syndrome.
- Noise pollution is measured in decibels (sound beyond 80 dB is termed as noise).

Air Pollution:

Causes of Air Pollution:

- Gases, smoke, particulate matter, and chemicals.
- Primary pollutants: CO, SO₂, NO_x; Secondary pollutants: O₃, PAN.

Effects of Air Pollution:

- SO₂ causes plant injury; concentrations affect human health.
- Greenhouse effect due to increased CO₂; acid rain from SO₂ and NO₂.

Water Pollution:

Causes of Water Pollution:

- Sewage, detergents, industrial wastes.
- Measured by Biological Oxygen Demand (BOD).

Notable Effects of Water Pollution:

- Mercury (Hg) is persistent; cadmium (Cd) causes "itai-itai" disease.

Soil Pollution:

Causes and Effects:

- Chemical waste disposal, nitrogen fertilizer use.
- Plastics and biological pathogens contribute.

Noise Pollution:

- Unwanted sound measured in decibels (dB).
- Sounds above 80 dB considered noise.

Notable Facts:

- Kanpur is the most noise-polluted city.
- Planting greenery helps absorb sound waves.

Radioactive Pollution: Sources and Effects:

- Nuclear explosions as chief sources.
- Strontium-90, Cesium-137 cause health issues.

Major Incidents: Hiroshima and Nagasaki (1945), Chernobyl (1986).

Biotechnology:

- Applied biology involving the use of living things in various applications.
- Genetic Engineering: Insertion of foreign genes into DNA.
- Gene Therapy: Insertion of genes into cells and tissues to treat diseases.

Test Tube Baby:

- Fusion of ovum and sperm outside the body, followed by implantation in the uterus.
- In Vitro Fertilisation (IVF) technology is a boon to childless couples.
- The world's first test tube baby, Louise Joy Brown, was born on July 25, 1978.

Cloning:

- Biological process producing genetically identical individuals.
- Dolly, a sheep, was the first mammal clone developed by Dr. Ian Wilmut, UK.

Bt Crops:

- Crop plants containing genes for Bt toxins from *Bacillus thuringiensis*.
- Provide resistance to insects without the need for insecticides.
- Examples: Bt-cotton, Bt-corn, golden rice, etc.

Seed Village Concept:

- Introduced by Dr. Swaminathan in Jounti village in 1965.
- Aims to convert the entire village into a high-quality seed-producing center.
- Focus on imparting technical literacy for quality seed production.

Smallest and Largest in Categories:

- Lists the smallest and largest in various categories, including bacteria, bird, mammal, bone, endocrine gland, and others.

Branches of Biology:

- Lists and describes some important branches of biology, such as agriculture, anatomy, anthropology, biochemistry, and genetics.

Important Antibiotics

Antibiotics	Source	Action
Penicillin	<i>Penicillium chrysogenum</i> , <i>P. notatum</i> + <i>Phenyl Acetic Acid</i>	Tonsillitis, Sore Throat, Gonorrhoea, Rheumatic Fever, some Pneumonia types
Griseofulvin	<i>Penicillium griseofulvum</i>	Antifungal, especially for Ringworm
Nystatin	<i>Streptomyces nourse</i>	Antifungal for Candidiasis and overgrowth of Intestinal Fungi during excessive antibiotic treatment.
Hamycin	<i>Streptomyces pimprei</i>	Antifungal for Thrush
Fumagillin	<i>Aspergillus fumigatus</i>	Broad-spectrum antibacterial, especially against <i>Salmonella</i> and <i>Shigella</i> .

Antibiotics	Source	Action
Bacitracin	<i>Bacillus licheniformis</i>	Syphilis, Lymphonema or Reticulosis.
Streptomycin	<i>Streptomyces griseus</i>	Meningitis, Pneumonia, Tuberculosis, and Local Infection. Toxic in some through the eighth cranial nerve.
Chloramphenicol	<i>Streptomyces venezuelae</i> , <i>S. lavendulae</i> , Now synthetic	Typhoid, Typhus, Whooping cough, Atypical Pneumonia, Bacterial Urinary Infections.
Tetracyclines/Aureomycin	<i>Streptomyces aureofaciens</i>	Viral pneumonia, Osteomyelitis, Whooping Cough, and Eye infections.
Oxytetracycline/Terramycin	<i>Streptomyces rimosus</i>	Intestinal and Urinary Infections (Spirochaetes, Rickettsia, and Viruses)

Important Discoveries

Discovery	Made by	Country
Antibiotic	Alexander Fleming (1928)	Scotland
Antiseptic	Joseph Lister (1867)	Scotland
Blood circulation	William Harvey (1628)	Britain
Blood transfusion	Jean-Baptiste Denys (1625)	France
Cholera and TB germs	Robert Koch (1883)	Germany
Electrocardiogram (ECG)	William Einthoven (1903)	Dutch
CT Scan	Godfrey Hounsfield (1973)	England
Sphygmomanometer	Scipione Riva-Rocci (1898)	Italy
Stethoscope	Rene Laennec (1819)	France
Thermometer	Sir Thomas Allbutt (1867)	England
Ultrasound	Ian Donald (1950)	Ireland
X-ray	WC Roentgen (1895)	Germany
Electroencephalogram (EEG)	Hans Berger (1929)	Germany

Some Important Facts of the Human Body

Fact	Description
Number of cells in body	Approximately 75 trillion
Longest bone	Femur (thigh bone)
Smallest bone	Ear ossicle, stapes

Blood volume	6.8 litres (in a 70 kg body)
Normal BP	120/80 mm Hg
Life span of RBC	120 days
Life span of WBC	3-4 days
Universal blood donor	O Rh-negative
Universal blood recipient	AB
Average body weight	70 kg
Normal body temperature	98.4°F or 37°C
Dental formula (adult)	2-1-2-3 / 2-1-2-3 = 32 teeth
Dental formula (child)	2-1-2-0 / 2-1-2-0 = 22 milk teeth
Gestation period	9 months (253-266 days)
Largest gland	Liver
Largest muscle in the body	Gluteus maximus (Buttock muscle)
Longest cell	Neuron (nerve cell)
Menstrual cycle	28 days
Minimum distance for proper vision	25 cm
pH of urine	6.0
Total length of blood vessels	Approximately 100,000 km
Number of bones in the body	206
Weight of the brain	Around 1.4 kg
Total number of muscles	More than 600
Average heart rate	60-100 beats per minute

National Laboratories and Research Institutions

Name	Place
Central Leather Research Institute	Chennai, T.N.
Central Mining Research Station	Dhanbad, Jharkhand
Indian Institute of Science	Bengaluru, Karnataka
Indian Space Research Organisation	Bengaluru, Karnataka
All India Institute of Medical Sciences	New Delhi
National Institute of Virology	Pune, Maharashtra
National Physical Laboratory	New Delhi
National Centre for Biological Sciences	Bengaluru, Karnataka
National Environmental Engineering Research Institute	Nagpur, Maharashtra
National Institute of Oceanography	Goa
National Brain Research Centre	Bengaluru, Karnataka
National Chemical Laboratory	Pune, Maharashtra
National Institute of Mental Health and Neurosciences	Bengaluru, Karnataka
Central Drug Research Institute	Lucknow, Uttar Pradesh
Central Electronics Engineering Research Institute	Pilani, Rajasthan
National Aerospace Laboratories	Bengaluru, Karnataka

Nuclear/Atomic Research Centres

Name	Place
Bhabha Atomic Research Centre	Trombay, near Mumbai, MS
Saha Institute of Nuclear Physics	Kolkata, Paschim Banga
Tata Institute of Fundamental Research	Mumbai, Maharashtra
Indira Gandhi Centre for Atomic Research	Kalpakkam, Tamil Nadu

COMPUTER

A computer is an electronic machine that stores, reads, and processes data to produce meaningful information as output.

Types of Computers:

1. **Based on Uses:**

- **Analog Computer:**
 - Measures physical quantities (pressure, temperature) and converts to numerical values.
 - Primarily used for scientific and engineering purposes.
- **Digital Computer:**
 - Counts numbers, words, or symbols.
 - Used in fuel control, banking, and various applications.
- **Hybrid Computer:**
 - Combines analog and digital computing.
 - Converts continuous information, providing both analog and digital output.
 - Used in industrial settings and machines.

2. **Based on Sizes:**

- **Micro Computer:**
 - Smallest computer with ALU and CPU on the same chip.
- **Personal Computer:**
 - Single-user system for business and personal applications.
- **Mini Computer:**
 - More powerful than microcomputers.
 - Serves multiple users simultaneously.
- **Mainframe Computer:**
 - Large-sized with high storage capacity.
 - Used in banks, large organizations, and public sectors.
- **Super Computer:**
 - Processes vast data quickly.
 - Used for complex calculations

Components of Computer:

- **Input Unit:** Devices used to give instructions, e.g., Keyboard, Mouse, Joystick, Optical character reader, CDs, Bar code reader, Touch screen, Light pen, Scanner, Magnetic Ink Character Recognition (MICR), etc.
- **Central Processing Unit (CPU):** Known as the brain of the computer, it consists of:
 - **Arithmetic Logic Unit (ALU):** Performs logical and arithmetic operations.
 - **Control Unit (CU):** Instructs, maintains, and controls the flow of information.
 - **Output Unit:** Devices to display the result of processing, e.g., Visual Display Unit, Printer, Monitor, Speaker, Pen Drive, etc.

Memory: Memory holds all raw and processed data, set of instructions, and information inside the CPU.

- **Primary Memory:**
 - **RAM (Random Access Memory):** Volatile memory for temporary storage.
 - **ROM (Read Only Memory):** Non-volatile memory for storing unchangeable logical data.
- **Secondary Memory:** Stores data, programs, instructions, and information permanently.

Hardware: Peripheral devices that can be seen and touched, including input devices, output devices, storage devices, and processing devices.

Software: A set of instructions that directs the computer to process information, classified as System Software and Application Software.

Networking: Relates to the communication between two or more computers linked together, categorized into Local Area Network (LAN), Metropolitan Area Network (MAN), and Wide Area Network (WAN).

Security Threats:

- **Worm:** Self-contained program propagating without needing to be part of another program.
- **Spam:** Unsolicited messages sent over the Internet for spreading malware, advertising, phishing, etc.
- **Spyware:** Malicious software collecting information about users without their knowledge.
- **Malware:** Software designed to disrupt or damage a computer system.
- **Virus:** Program or code loaded onto the computer without the user's knowledge.
- **Important Facts About Computer Viruses:**
 - **Creeper Virus (Early 1970s):**
 - Detected on ARPANET.
 - Reaper Program developed to delete it.
 - **Origin of Term "Virus" (1972):**
 - Coined in David Gerrold's novel.

- Refers to sentient computer program HARLIE.
- **Elk Cloner (First "In the Wild" Virus):**
 - Spread beyond its origin (1982).
 - Attached to APPLE DOS 3.3 via floppy disks.
- **First PC Virus ("Brain" - 1986):**
 - Boot sector virus.
 - Marked the emergence of PC viruses.
- **1980s PC Virus Trends:**
 - Traditional viruses on the rise.
 - Trojan horse programs spread via bulletin boards.
 - Shareware and bootleg software as virus vectors.
- **Mid-1990s: Rise of Macro Viruses:**
 - Written in scripting languages.
 - Primarily targeted Microsoft Office programs.
- **Early 2000s: Cross-site Scripting Viruses:**
 - Exploited vulnerabilities on websites.
 - Examples include attacks on MySpace and Yahoo.

Most Popular Computer Viruses:

1. **I Love You (2000):**
 - Spread through emails.
 - Overwrote files, causing widespread damage.
2. **Code Red (2001):**
 - Targeted Windows servers.
 - Exploited a vulnerability in Microsoft IIS.
3. **Nimda (2001):**
 - Rapidly spread via email, websites, and networks.
 - Infected a large number of systems globally.
4. **Melissa (1999):**
 - Spread through infected Word documents.
 - Mass-mailed itself to email contacts.
5. **Sasser (2004):**
 - Exploited a Windows OS vulnerability.
 - Caused disruptions by crashing computers and overloading networks.

Antivirus: Software attempting to identify, detect, and prevent malware on the computer.

Common Terms:

- **Cache Memory:** Temporary storage for frequently accessed data.
- **Registers:** Special memory units used by the CPU to speed up information access.
- **Operating System:** Integrated set of programs controlling computer resources for efficient execution.
- **Compiler, Interpreter, Assembler:** Programs converting source code into machine-readable code.
- **Modem (Modulator-Demodulator):** Converts digital signals to analog for communication.

- **Antivirus Software and Preventive Measures:**

- **Role of Antivirus Software:**

- Crucial for virus detection and destruction.
- Utilizes Virus Signature Definitions and Heuristics Algorithm.

- **Detection Methods:**

1. Virus Signature Definitions: Compares files against a database of known virus signatures.

2. Heuristics Algorithm: Analyzes behavior to detect potential virus-like patterns.

- **On-Access Scanning:**

- Provides real-time scanning of emails and open files.
- Ensures continuous protection against viruses.

- **Effect on Efficiency:**

- Does not impact host software efficiency for virus communication.
- Regular updates are vital for detecting new viruses.

- **Preventive Measures:**

- **Data Backups:**

- Regularly back up data on alternative storage.
- Mitigates losses caused by viruses; facilitates data restoration.

- **Important Facts About Computer Viruses:**

- **Creeping Virus (Early 1970s):**

- Detected on ARPANET; Reaper Program developed to delete it.

- **Origin of Term "Virus" (1972):**

- Coined in David Gerrold's novel, referring to sentient computer program HARLIE.

- **Elk Cloner (First "In the Wild" Virus - 1982):**

- Spread beyond its origin; attached to APPLE DOS 3.3 via floppy disks.

- **First PC Virus ("Brain" - 1986):**

- Boot sector virus; marked emergence of PC viruses.

- **1980s PC Virus Trends:**

- Traditional viruses on the rise.
- Trojan horse programs spread via bulletin boards.
- Shareware and bootleg software common virus vectors on BBS.

- **Mid-1990s: Rise of Macro Viruses:**

- Written in scripting languages.
- Primarily targeted Microsoft Office programs.

- **Early 2000s: Cross-site Scripting Viruses:**

- Exploited vulnerabilities on websites.
- Examples include attacks on MySpace and Yahoo

Super Computers Developed in India

Name	Year	Mft Company
Param Siddhi	2020	CDAC
Param Shivay	2019	IIT-BHU

Name	Year	Mft Company
Pratyush	2017	IITM (Pune)
Param Kanchenjunga	2016	CDAC & NIT Sikkim
Param Ishan	2016	CDAC & IIT Guwahati
Aaditya	2013	IITM (Pune)
PARAM YUVA II	2013	C-DAC, PUNE
SAGA-220	2011	ISRO
ANUPAM-Adhya	2010-11	BARC

Super Computers of the World

Name	Year	Country	Operating System
Fugaku	2021	Japan	Custom Linux
Frontera	2019	America	Linux (Cent OS)
IBM Summit	2018	America	IBM
Sunway Taihulight	2016	China	Linux
Tianhe-2	2013	China	Kylin Linux
Titan	2012	America	Linux
Sequoia	2011	America	Linux
K-Computer	2011	Japan	Linux
Mira	2010	America	Linux

Sophia (Robot): In October 2017, Saudi Arabia granted citizenship to a robot named Sophia, capable of changing facial expressions and engaging in conversations with people.

1. **Pkzip:**

- Function: File compression and archiving.
- Purpose: Efficient storage and transfer of files.

2. **Antivirus Software:**

- Function: Protection against malicious software.
- Purpose: Safeguarding the system from viruses and malware.

3. **Data Recovery Tools:**

- Function: Retrieving lost or deleted data.
- Purpose: Restoration of accidentally deleted or corrupted files.

4. **Disk Cleanup and Optimization Utilities:**

- Function: Freeing up storage space and improving performance.
- Purpose: Enhancing system speed and efficiency by removing unnecessary files.

5. **System Monitoring and Maintenance Tools:**

- Function: Monitoring system performance and optimizing resources.
- Purpose: Ensuring smooth operation and preventing issues through regular maintenance.

Unit	Size	Description
Bit	One binary digit	Stores either a binary 0 or 1
Byte	Eight bits	One character
Word	16 to 64 bits	One character
Kilobyte (KB)	1 thousand bytes	About one page of double-spaced text
Megabyte (MB)	1 million bytes	About the size of a short book
Gigabyte (GB)	1 billion bytes	Equivalent to 1000 short books
Terabyte (TB)	1 trillion bytes	An entire library
Petabyte (PB)	1 quadrillion bytes	Just about all the libraries in the US
Exabyte (EB)	1 quintillion bytes	Vast amounts of data storage
Zettabyte (ZB)	1 sextillion bytes	Theoretical storage capacity beyond petabytes
Yottabyte (YB)	1 septillion bytes	Hypothetical storage capacity beyond zettabytes

Inventions

Name of Invention	Inventor	Nationality	Year
Aeroplane	Orville & Wilbur Wright	U.S.A	1903
Ball-Point Pen	John J. Loud	U.S.A.	1888
Barometer	Evangelista Torricelli	Italy	1644
Bicycle	Kirkpatrick Macmillan	Britain	1839-40
Bifocal Lens	Benjamin Franklin	U.S.A.	1780
Car (Petrol)	Karl Benz	Germany	1888
Celluloid	Alexander Parkes	Britain	1861
Cinema	Nicolas and Jean Lumiere	France	1895
Diesel Engine	Rudolf Diesel	Germany	1895
Dynamo	Hypolite Pixii	France	1832
Electric Lamp	Thomas Alva Edison	U.S.A.	1879
Electric Motor (DC)	Zenobe Gramme	Belgium	1873
Electric Motor (AC)	Nikola Tesla	U.S.A.	1888
Electromagnet	William Sturgeon	Britain	1824
Electronic Computer	Dr. Alan M Turing	Britain	1943
Fountain Pen	Lewis E. Waterman	U.S.A.	1884
Gramophone	Thomas Alva Edison	U.S.A.	1878
Helicopter	Etienne Oehnichen	France	1924
Jet Engine	Sir Frank Whittle	Britain	1937
Laser	Charles H. Townes	U.S.A.	1960
Locomotive	Richard Trevithick	Britain	1804
Microphone	Alexander Graham Bell	U.S.A.	1876

Name of Invention	Inventor	Nationality	Year
Microscope	Z. Janssen	Netherlands	1590
Motor Cycle	G. Daimler	Germany	1885
Printing Press	Johann Gutenberg	Germany	1455
Razor (safety)	King C. Gillette	U.S.A.	1895
Refrigerator	James Harrison & Alexander Catlin	U.S.A.	1850
Safety Pin	Walter Hunt	U.S.A.	1849
Sewing machine	Barthelemy Thimmonnier	France	1829
Ship (steam)	J.C. Perier	France	1775
Skyscraper	W. Le Baron Jenny	U.S.A.	1882
Slide Rule	William Oughtred	Britain	1621
Steam Engine (condenser)	James Watt	Britain	1765
Steel Production	Henry Bessemer	Britain	1855
Steel (stainless)	Harry Brearley	Britain	1913
Submarine	David Bushnell	U.S.A.	1776
Telegraph	M. Lammond	France	1787
Telephone (perfected)	Alexander Graham Bell	U.S.A.	1876
Television (mechanical)	John Logie Baird	Britain	1926
Television (electronic)	P.T. Farnsworth	U.S.A.	1927
Thermometer	Galileo Galilei	Italy	1593
Transformer	Michael Faraday	Britain	1831
Transistor	Bardeen, Shockley & Brattain	U.S.A.	1948
Washing Machine (elect.)	Hurley Machine Co.	U.S.A.	1907
Zip-Fastener	W.L. Judson	U.S.A.	1891

Discoveries

Discovery	Discoverer	Nationality	Year
Aluminium	Hans Christian Oerstedt	Denmark	1827
Atomic number	Henry Moseley	England	1913
Chlorine	C.W. Scheele	Sweden	1774
Electromagnetic induction	Michael Faraday	England	1831
Electromagnetic waves	Heinrich Hertz	Germany	1886
Electromagnetism	Hans Christian Oersted	Denmark	1920
Electron	Sir Joseph Thomson	England	1897
General theory of relativity	Albert Einstein	Switzerland	1915
Hydrogen	Henry Cavendish	England	1766

Discovery	Discoverer	Nationality	Year
Law of electric conduction	Georg Ohm	Germany	1827
Law of electromagnetism	Andre Ampere	France	1826
Laws of gravitation & motion	Isaac Newton	England	1687
Laws of planetary motion	Johannes Kepler	Germany	1609-19
Magnesium	Sir Humphry Davy	England	1808
Neutron	James Chadwick	England	1932
Nitrogen	Daniel Rutherford	England	1772
Oxygen	Joseph Priestly	England	1772
Ozone	Christian Schonbein	Germany	1839
Plutonium	G.T. Seaborg	U.S.A.	1940
Proton	Ernest Rutherford	England	1919
Radioactivity	Antoine Henery Bacquerel	France	1896
Radium	Pierre and Marie Curie	France	1898
Silicon	Jons Berzelius	Sweden	1824
Sun as centre of solar system	Copernicus	Poland	1543
Uranium	Martin Klaproth	Germany	1789
X-rays	Willhelm Roentgen	Germany	1895

Internet:

- **Definition:** Global connection of computers facilitating communication through cables and telephones.
- **Communication Essentials:** Requires destination address and secure data transfer means.
- **Protocols:**
 - **Transmission Control Protocol (TCP):** Divides data into packets for transmission.
 - **Internet Protocol (IP):** Adds destination addressing information to packets.
- **Components:**
 - **Hosts:** Individual machines at specific locations.
 - **Domains:** General categories to which Internet-connected computers belong
- **Communication Tools:**
 - **Email:** Primary for electronic text communication.
 - **Usenet and News Groups:** Platforms for discussing various interests.
- **Applications:**
 - **Telnet:** Enables a computer to become a terminal for another on the Internet.
 - **Gopher:** Displays Internet resources in menu or list form.
- **Markup Languages:**
 - **HTML (Hypertext Markup Language):** Creates documents for the World Wide Web.

- **SGML (Standard Generalised Markup Language):** Defines structure and manages digital document content.
- **World Wide Web (www):** Collection of hypertext pages on the Internet.
- **HTTP (Hypertext Transfer Protocol):** Manages linking between hypertext documents.
- **Web Terminology:**
 - **Home Page:** Represents an individual, subject, or corporation.
 - **URL (Uniform Resource Locator):** Access method for Internet resources.
- **Browsing: Browser:** Application for exploring Internet resources.
- **Data Transfer:**
 - **FTP (File Transfer Protocol):** Accesses remote Internet hosts.
- **Connectivity:**
 - **Modem:** Facilitates computer information transmission over telephone lines.
- **Information Services:**
 - **WAIS (Wide Area Information Service):** Accesses text databases or libraries on the Internet.

MCQ

1. What is the defining characteristic of scalar quantities in physics?
A) Magnitude and direction

- B) Magnitude-only
C) Velocity and speed
D) Acceleration and force
2. **Which of the following is an example of Newton's First Law of Motion?**
A) A ball rolling down a hill
B) A car accelerating on a straight road
C) Running when jumping off a moving train/bus
D) Pushing a heavy box
3. **According to Newton's Second Law, what is the relationship between force, mass, and acceleration?**
A) Force = mass x velocity
B) Force = mass / acceleration
C) Force is not related to mass and acceleration
D) Force = mass x acceleration
4. **What is the direction of the centripetal force in circular motion?**
A) Radially outward
B) Tangential
C) Radially inward
D) Opposite to the centrifugal force
5. **In the context of friction, what role does it play in stopping automobiles?**
A) Enhances speed
B) Reduces fuel consumption
C) Facilitates movement
D) Stops the vehicle
6. **What is the law of conservation of energy?**
A) Energy is always increasing in a system.
B) Energy cannot be created or destroyed.
C) Energy is proportional to mass.
D) Energy depends on velocity.
7. **What is the standard unit of power?**
A) Joule
B) Watt
C) Newton
D) Kilogram
8. **What is the acceleration due to gravity on Earth?**
A) 6.67 m/s^2
B) 9.8 m/s^2
C) 10 m/s^2
D) 12 m/s^2
9. **What is the minimum velocity required to leave Earth's gravitational field called?**
A) Escape velocity
B) Terminal velocity
C) Acceleration velocity
D) Gravitational velocity
10. **What is the primary characteristic of a geo-stationary satellite?**
A) Orbits at a fixed position
B) Completes one rotation in 12 hours
C) Orbits at a low altitude
D) Rotates in the opposite direction
11. **In which type of orbit does a polar satellite revolve around Earth?**

- A) Geostationary orbit
 - B) Polar orbit
 - C) Equatorial orbit
 - D) Heliocentric orbit
12. **What is the acceleration due to gravity on the Moon compared to Earth?**
- A) One-sixth
 - B) Half
 - C) The same
 - D) Double
13. **What property allows a body to regain its original shape after a deforming force is removed?**
- A) Density
 - B) Elasticity
 - C) Viscosity
 - D) Surface Tension
14. **How is pressure defined in terms of force and area?**
- A) Pressure = Force x Area
 - B) Pressure = Force/Area
 - C) Pressure = Area/Force
 - D) Pressure = Force + Area
15. **What does a sudden fall in barometric readings indicate?**
- A) Clear weather
 - B) Rain
 - C) Storm
 - D) Windy conditions
16. **According to Pascal's Law of Pressure, what happens to pressure in a confined liquid?**
- A) It decreases
 - B) It remains constant
 - C) It varies based on temperature
 - D) It increases
17. **What principle explains the apparent loss in weight of a body immersed in a liquid?**
- A) Pascal's Law
 - B) Newton's Principle
 - C) Bernoulli's Theorem
 - D) Archimedes' Principle
18. **What is the condition for a body to float in a liquid according to the laws of floatation?**
- A) Density of the body is greater than the density of the liquid
 - B) Density of the body is less than the density of the liquid
 - C) The body is in a state of unstable equilibrium
 - D) The center of gravity is not a factor
19. **How is density defined?**
- A) Force per unit area
 - B) Mass per unit volume
 - C) Work done per unit time
 - D) Acceleration due to gravity
20. **What is the force acting on unit length of a liquid's surface called?**
- A) Cohesive force
 - B) Adhesive force

- C) Surface Tension
D) Viscosity
21. **What is the property that minimizes the free surface area of a liquid?**
A) Cohesive force
B) Adhesive force
C) Viscosity
D) Surface Tension
22. **Between which forces does capillarity occur?**
A) Adhesive and Viscous forces
B) Cohesive and Adhesive forces
C) Elastic and Frictional forces
D) Surface Tension and Elastic forces
23. **What is the property causing internal friction between layers of a fluid?**
A) Density
B) Surface Tension
C) Viscosity
D) Elasticity
24. **What is the form of energy that measures warmness or coldness?**
A) Temperature
B) Work
C) Heat
D) Energy
25. **In heat and thermodynamics, what is the measurement of hotness or coldness called?**
A) Warmth Index
B) Heat Intensity
C) Thermometer
D) Temperature
26. **Which unit is used to measure heat energy?**
A) Newton
B) Calorie
C) Watt
D) Joule
27. **What is the term for the increase in size of a substance on heating?**
A) Compression
B) Contraction
C) Expansion
D) Conduction
28. **Which type of expansion involves an increase in all three dimensions of a substance?**
A) Linear expansion
B) Superficial expansion
C) Cubical expansion
D) Thermal expansion
29. **What is the term for the heat absorbed or released during a change of state at constant temperature?**
A) Specific Heat
B) Latent Heat
C) Thermal Expansion
D) Evaporation

- 30. In which process does a liquid slowly convert into vapor below its boiling temperature?**
A) Boiling
B) Condensation
C) Evaporation
D) Sublimation
- 31. Which method of heat transfer occurs in solids?**
A) Conduction
B) Convection
C) Radiation
D) Evaporation
- 32. What is a simple pendulum?**
A) A heavy point mass fixed to a wall
B) A rigid bar suspended from a ceiling
C) A heavy point mass suspended from a string
D) A rotating disc attached to a stand
- 33. What property of a simple pendulum is not affected by mass, shape, or size?**
A) Amplitude
B) Frequency
C) Time Period
D) Time Period
- 34. Which waves propagate energy without matter transportation?**
A) Mechanical waves
B) Transverse waves
C) Electromagnetic waves
D) Sound waves
- 35. What distinguishes longitudinal waves from transverse waves?**
A) Particle vibration direction
B) Wave frequency
C) Wave speed
D) Amplitude
- 36. What is the range of audible waves in sound?**
A) 0 Hz to 10 Hz
B) 20 Hz to 20,000 Hz
C) 20,000 Hz to 40,000 Hz
D) 10,000 Hz to 15,000 Hz
- 37. Which waves have a frequency greater than 20,000 Hz and are used for signals and cleaning machinery?**
A) Audible waves
B) Infrasonic waves
C) Ultrasonic waves
D) Electromagnetic waves
- 38. In which medium does sound travel the fastest?**
A) Gases
B) Liquids
C) Solids
D) Vacuum
- 39. What phenomenon refers to the repetition of sound due to reflection?**
A) Resonance

- B) Refraction
C) Diffraction
D) Echo
40. **What is the term for the amount of energy passing per unit time through a unit area in waves?**
A) Amplitude
B) Frequency
C) Intensity
D) Pitch
41. **Which property of sound is associated with its frequency?**
A) Amplitude
B) Intensity
C) Pitch
D) Echo
42. **What does SONAR stand for?**
A) Sound Observation and Navigation Apparatus
B) Sonic Orbital Navigation and Ranging
C) Sound Navigation and Radar
D) Signal Observation and Ranging
43. **What effect causes the apparent frequency change in sound with relative motion between the source and observer?**
A) Doppler's Effect
B) Archimedes' Effect
C) Bernoulli's Effect
D) Newton's Effect
44. **What is the speed of sound affected by?**
A) Pressure
B) Density
C) Temperature
D) All of the above
45. **What waves propagate without a medium and include light, radio waves, and X-rays?**
A) Sound waves
B) Mechanical waves
C) Electromagnetic waves
D) Transverse waves
46. **What is the speed of light, an electromagnetic wave, typically measured as?**
A) 3×10^6 m/s
B) 3×10^7 m/s
C) 3×10^8 m/s
D) 3×10^9 m/s
47. **What is the term for a ray that returns into the same medium upon hitting a boundary?**
A) Refraction
B) Reflection
C) Diffraction
D) Dispersion
48. **What laws govern the reflection of light, stating that incident, reflected rays, and the normal lie in the same plane?**

- A) Newton's Laws
 - B) Kepler's Laws
 - C) Laws of Reflection
 - D) Boyle's Laws
49. **What type of image is formed by a plane mirror?**
- A) Real and inverted
 - B) Virtual and erect
 - C) Real and erect
 - D) Virtual and inverted
50. **In spherical mirrors, what type of image is formed by a concave mirror?**
- A) Virtual and erect
 - B) Real and erect
 - C) Virtual and inverted
 - D) Real and inverted
51. **What is the phenomenon where light bends as it passes between media with different optical densities?**
- A) Reflection
 - B) Diffraction
 - C) Refraction
 - D) Dispersion
52. **Under what condition does Total Internal Reflection (TIR) occur?**
- A) Light reflects back into denser medium
 - B) Light reflects back into rarer medium
 - C) Angle of incidence is less than the critical angle
 - D) Angle of incidence is greater than the critical angle
53. **What is the function of a convex lens?**
- A) Converging lens
 - B) Diverging lens
 - C) Both A and B
 - D) None of the above
54. **What happens when white light passes through a prism?**
- A) Diffraction
 - B) Reflection
 - C) Refraction
 - D) Dispersion
55. **What principle does an optical fiber operate on?**
- A) Reflection
 - B) Refraction
 - C) Dispersion
 - D) Diffraction
56. **What is Ohm's Law and how is current related to potential difference and resistance?**
- A) $I = v/r$; directly proportional to potential difference, inversely proportional to resistance
 - B) $I = r/v$; inversely proportional to potential difference, directly proportional to resistance
 - C) $I = vr$; directly proportional to potential difference and resistance
 - D) $I = v + r$; potential difference plus resistance equals current
57. **What is the purpose of an ammeter, and how is it connected in a circuit?**

- A) Measures resistance, connected in parallel
 - B) Measures current, connected in series
 - C) Measures voltage, connected in parallel
 - D) Measures power, connected in series
- 58. What protective device has a low melting point and is connected in series in an electrical circuit?**
- A) Resistor
 - B) Capacitor
 - C) Inductor
 - D) Fuse Wire
- 59. What property of magnets causes them to point north when suspended freely?**
- A) South pole
 - B) North pole
 - C) Attraction
 - D) Repulsion
- 60. What type of rays did Roentgen discover, and for what purpose are they used in various fields?**
- A) Cathode rays; used in medical imaging
 - B) Alpha rays; used in nuclear power
 - C) X-rays; used in medical, engineering, and scientific fields
 - D) Beta rays; used in telecommunications
- 61. What is the primary purpose of a nuclear reactor?**
- A) Nuclear fusion
 - B) Controlled nuclear fission
 - C) Isotope production for medical applications
 - D) Electrical energy production
- 62. Which of the following is a component of a nuclear reactor?**
- A) Lithium
 - B) Oxygen
 - C) Silicon
 - D) Uranium
- 63. Who developed the LASER (Light Amplification by Stimulated Emission of Radiation) in 1964?**
- A) Albert Einstein
 - B) Bhabha Atomic Research Centre (BARC)
 - C) Gordon, Gieyer, and Townes
 - D) Isaac Newton
- 64. Which material was used in the first laser developed by BARC in 1964?**
- A) Silicon
 - B) Gallium Arsenide (GaA)
 - C) Titanium
 - D) Gold
- 65. What does a MASER use for amplification, and what type of waves does it employ?**
- A) Microwaves
 - B) Infrared waves
 - C) Ultraviolet waves
 - D) Radio waves

66. **In the units of measurement, what is the SI unit for resistance?**
A) Watt
B) Ohm
C) Ampere
D) Volt
67. **What is the state of matter characterized by ionized gases?**
A) Solid
B) Liquid
C) Gas
D) Plasma
68. **Which property increases the boiling point of a substance?**
A) Presence of impurities
B) Low altitude
C) High altitude
D) Decreased temperature
69. **What is the temperature at which a substance changes from solid to liquid called?**
A) Boiling point
B) Melting point
C) Critical temperature
D) Freezing point
70. **What is the smallest part of an element with independent existence, as per the concept of matter?**
A) Atom
B) Molecule
C) Element
D) Compound
71. **What defines isotopes?**
A) Same mass number, different atomic number
B) Different mass number, different atomic number
C) Same atomic number, different neutrons
D) Same atomic number, same neutrons
72. **Which dating technique is used to determine the age of carbon-bearing materials like wood and animal fossils?**
A) Uranium dating
B) Radiocarbon dating
C) Potassium dating
D) Strontium dating
73. **What type of batteries are lead storage batteries commonly used in?**
A) Cameras
B) Transistors
C) Automobiles
D) Hearing aids
74. **What is the process of converting chemical energy to electrical energy in batteries known as?**
A) Electroplating
B) Electrolytic refining
C) Galvanization
D) Galvanic cell

75. **Which of the following is a method to prevent corrosion in metals?**
A) Radiocarbon dating
B) Oiling and greasing
C) Electrolytic refining
D) Tyndall effect
76. **What is the primary function of the Leclanche cell battery?**
A) Used in automobiles
B) Acts as a galvanic cell
C) Used in hearing aids
D) Acts as a voltaic cell
77. **In the Apple Browning Mechanism, what causes the browning of sliced apples?**
A) Oxidation of iron
B) Reduction of iron
C) Presence of nitrogen
D) Exposure to sunlight
78. **Which type of colloids show the Tyndall effect and Brownian motion?**
A) Lyophilic colloids
B) Lyophobic colloids
C) Emulsion
D) Colloidal particles
79. **What is the purpose of galvanization in the context of metals?**
A) Electroplating
B) To prevent corrosion
C) Electrolytic refining
D) To enhance conductivity
80. **Which natural resource is classified as non-renewable?**
A) Minerals
B) Sunlight
C) Air
D) Water
81. **Which type of coal has the highest carbon content?**
A) Peat
B) Lignite
C) Bituminous coal
D) Anthracite coal
82. **What is the common form of coal that is most prevalent?**
A) Peat
B) Lignite
C) Bituminous coal
D) Anthracite coal
83. **Which part of the flame is blue and indicates complete combustion?**
A) Innermost part
B) Middle part
C) Outermost part
D) All parts are blue
84. **What is the limitation of using water as a fire extinguisher?**
A) Conductivity
B) Buoyancy
C) Evaporation
D) Oxidation

- 85. What is the alternative fire extinguishing method recommended for electrical or oil fires?**
A) Water
B) Carbon dioxide
C) Nitrogen
D) Steam
- 86. What is the calorific value a measure of in fuels?**
A) Volume
B) Luminosity
C) Heat obtained upon combustion
D) Mass
- 87. Which safety measure is added to LPG to detect leaks due to its odourless nature?**
A) Methane
B) Ethane
C) Ethyl mercaptan
D) Hydrogen
- 88. Which rocket propellant is commonly used and consists of a mixture of liquid hydrogen and liquid oxygen?**
A) Methane
B) LPG
C) Liquid hydrogen and liquid oxygen
D) Nitrous oxide
- 89. What is the composition of water gas (produced by steam over red-hot coke)?**
A) CO + H₂
B) N₂ + CO (2:1 ratio)
C) Hydrogen, Methane, Ethylene, Acetylene, CO₂, Nitrogen
D) Methane (CH₄) 95%
- 90. Which fuel is primarily composed of Methane (CH₄) and is obtained from petroleum?**
A) Water gas
B) Producer gas
C) Natural gas
D) Biogas
- 91. What is the calorific value of LPG (Butane + Propane)?**
A) 25-32 kJ/g
B) 35-40 kJ/g
C) 50 kJ/g
D) 150 kJ/g
- 92. What is the composition of safety match heads?**
A) Phosphorus and potassium chlorate
B) Antimony trisulphide and potassium chlorate
C) Powdered glass and red phosphorus
D) Antimony trisulphide and red phosphorus
- 93. Which substance is used in the composition of safety matchbox sides?**
A) Phosphorus
B) Powdered glass
C) Red phosphorus
D) Antimony trisulphide

94. **What property allows acids to turn blue litmus red?**
A) Sour taste
B) Bitter taste
C) Soapy touch
D) Conductivity
95. **In terms of taste, how are bases described?**
A) Sour
B) Bitter, soapy to touch
C) Salty
D) Sweet
96. **Which oxide is used in photosynthesis and turns lime water milky in the presence of air or breath?**
A) Carbon Monoxide
B) Carbon Dioxide
C) Nitrogen Dioxide
D) Sulphur Dioxide
97. **What is the dangerous oxide in unventilated rooms with fire, causing suffocation?**
A) Nitrogen Dioxide
B) Carbon Dioxide
C) Carbon Monoxide
D) Sulphur Dioxide
98. **What is the chemical formula of Plaster of Paris?**
A) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
B) $\text{Ca}(\text{OH})_2$
C) CaCO_3
D) $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
99. **Which raw materials are used to make Portland Cement?**
A) Limestone and clay
B) Gypsum and sand
C) Silica and alumina
D) Calcium carbonate and water
100. **What is the composition of glass mainly made of?**
A) Silica (SiO_2)
B) Calcium carbonate (CaCO_3)
C) Sodium chloride (NaCl)
D) Potassium hydroxide (KOH)
101. **Which substance is added to glass to give it a blue color?**
A) Copper oxide (CuO)
B) Chromium oxide (Cr_2O_3)
C) Gold chloride (AuCl_3)
D) Cobalt oxide (CoO)
102. **What type of water hardness can be removed by boiling or adding calcium hydroxide (Clark's process)?**
A) Temporary Hard Water
B) Permanent Hard Water
C) Both
D) Neither
103. **What is the purpose of adding sodium carbonate (Na_2CO_3) or calgon in removing permanent hardness?**

- A) To harden water
B) To soften water
C) To filter impurities
D) To increase acidity
- 104. What is the composition of heavy water?**
A) Deuterium oxide (D₂O)
B) Hydrogen peroxide (H₂O₂)
C) Oxygen (O₂)
D) Deuterium peroxide (D₂O₂)
- 105. Which type of water contains soluble bicarbonates of calcium and magnesium?**
A) Temporary Hard Water
B) Permanent Hard Water
C) Soft Water
D) Distilled Water
- 106. What is the process of converting unsaturated oil into a solid mass using nickel catalyst and hydrogen?**
A) Hydrolysis
B) Saponification
C) Hydrogenation
D) Oxidation
- 107. Which substance is used to color glass red?**
A) Copper oxide (CuO)
B) Chromium oxide (Cr₂O₃)
C) Gold chloride (AuCl₃)
D) Cobalt oxide (CoO)
- 108. Which category of medicines is used to treat stress and mental diseases?**
A) Analgesics
B) Antibiotics
C) Tranquilizers
D) Antiseptics
- 109. What is the purpose of antiseptics?**
A) Reduce pain
B) Treat stress and mental diseases
C) Prevent microorganism growth on living tissues
D) Destroy microorganisms
- 110. Which medication is used to cure malaria?**
A) Antibiotic
B) Analgesic
C) Antacid
D) Antimalarial
- 111. What is the monomer for the synthesis of Nylon-6 (Perlon)?**
A) Caprolactum
B) Adipic acid + hexamethylene diamine
C) Ethylene glycol + terephthalic acid
D) Terephthalic acid + 1,4-diamino benzene
- 112. Which fiber is produced using ethylene glycol and terephthalic acid as monomers?**
A) Nylon-6,6
B) Nylon-6 (Perlon)
C) Terylene

- D) Kevlar
- 113. What is the monomer combination for the synthesis of Kevlar?**
- A) Terephthalic acid + 1,4-diamino benzene
 - B) Ethylene glycol + terephthalic acid
 - C) Diethyl carbonate + bis-phenol-A
 - D) Toluene diisocyanate + ethylene glycol
- 114. Which industrial compound has the chemical formula NaHCO_3 ?**
- A) Sodium chloride
 - B) Sodium bicarbonate
 - C) Sodium carbonate
 - D) Sodium hydroxide
- 115. In which human system does hydrolysis convert complex food into simple components?**
- A) Respiratory System
 - B) Circulatory System
 - C) Digestive System
 - D) Nervous System
- 116. What type of respiration involves the oxidation of food substances?**
- A) Anaerobic Respiration
 - B) Aerobic Respiration
 - C) Photosynthesis
 - D) Fermentation
- 117. What is the primary function of Vitamin A in the body?**
- A) Energy metabolism
 - B) Collagen synthesis
 - C) Vision, immune system, and skin health
 - D) Red blood cell formation
- 118. Which vitamin is essential for DNA synthesis and cell division?**
- A) Vitamin B3
 - B) Vitamin B9
 - C) Vitamin C
 - D) Vitamin E
- 119. What is the primary function of Vitamin D?**
- A) Antioxidant
 - B) Calcium absorption and bone health
 - C) Energy metabolism
 - D) Fatty acid synthesis
- 120. Which water-soluble vitamin is crucial for collagen synthesis and immune support?**
- A) Vitamin B5
 - B) Vitamin B2
 - C) Vitamin B12
 - D) Vitamin C
- 121. What is the role of water in the human body?**
- A) Provides energy
 - B) Crucial for digestion and transportation
 - C) Aids in hormone synthesis
 - D) Supports bone metabolism
- 122. What is the main component of roughage that aids in water retention within the body?**

- A) Starch
 - B) Cellulose
 - C) Protein
 - D) Fat
- 123. Which component constitutes about 60% of blood volume and is pale yellow and transparent?**
- A) Red Blood Corpuscles (RBCs)
 - B) Plasma
 - C) Hemoglobin
 - D) Fibrinogen
- 124. What is the pH range of blood in the human body?**
- A) Acidic (pH < 7)
 - B) Neutral (pH = 7)
 - C) Slightly alkaline (pH 7.3-7.4)
 - D) Basic (pH > 7)
- 125. Which blood cells are non-nucleated and contain hemoglobin?**
- A) Red Blood Cells (RBCs)
 - B) Platelets
 - C) White Blood Corpuscles (WBCs)
 - D) Plasma Cells
- 126. What is the composition of plasma in blood?**
- A) 90-92% organic substances
 - B) 7% water
 - C) 1% inorganic substances
 - D) 60% water, 7% organic substances, 1% inorganic substances
- 127. Which white blood cell type is non-phagocytic and increases during chickenpox?**
- A) Eosinophils
 - B) Basophils
 - C) Neutrophils
 - D) Monocytes
- 128. Where is salivary amylase produced, and in which part of the digestive system is it active?**
- A) Stomach, Small intestine
 - B) Pancreas, Stomach
 - C) Salivary glands, Mouth
 - D) Pancreas, Small intestine
- 129. What is the main breakdown product of lipase acting on triglycerides?**
- A) Nucleotides
 - B) Free fatty acids and monoglycerides
 - C) Amino acids
 - D) Peptide fragments
- 130. Where does the breakdown of DNA and RNA into nucleotides occur in the digestive system?**
- A) Stomach
 - B) Small intestine
 - C) Liver
 - D) Mouth and B

- 131. What is the blood group phenotype that has antigens A and antibodies against B in plasma?**
A) Blood Group O
B) Blood Group AB
C) Blood Group B
D) Blood Group A
- 132. Which blood component is known as the "policemen of blood" and increases during tuberculosis?**
A) Lymphocytes
B) Platelets
C) Monocytes
D) Erythrocytes
- 133. What component of the lymphatic system produces antibodies and increases during viral infection?**
A) Monocytes
B) Platelets
C) Lymphocytes
D) Erythrocytes
- 134. What is the lifespan of non-nucleated platelets (thrombocytes) in the blood?**
A) 1 to 2 days
B) 8 to 10 days
C) 20 to 30 days
D) 60 to 90 days
- 135. Which factor discovered by Landsteiner and Weiner is responsible for erythroblastosis feotalis disease?**
A) Rh Factor
B) Fibrinogen
C) Thromboplastin
D) Prothrombin
- 136. What is the primary function of the sino-atrial node in the human heart?**
A) Initiates contraction (systole)
B) Initiates relaxation (diastole)
C) Regulates blood pressure
D) Produces heart sounds
- 137. Which statement about urine is correct?**
A) Urine pH is highly acidic (pH < 6)
B) Specific gravity of urine is 1.030-1.040
C) Urine color is dark brown due to bilirubin
D) Urine composition includes 95% urea
- 138. What is the site of consciousness, sensation, memory, and intelligence in the body?**
A) Heart
B) Kidneys
C) Brain
D) Lungs
- 139. Which disease is caused by the Varicella virus, has an incubation period of 12-20 days, and is preventable by the Varicella vaccine?**
A) Chickenpox
B) Smallpox

- C) Measles
D) Mumps
- 140. Which pathogen causes Tuberculosis, and what is the recommended preventive vaccine?**
A) Streptococcus pneumoniae, DPT vaccine
B) Vibrio cholerae, Cholera vaccine
C) Mycobacterium tuberculosis, BCG vaccine
D) Clostridium tetani, ATS vaccine
- 141. What is the causative agent of Dengue, and what is the recommended treatment for the disease?**
A) Salmonella enteritidis, RASV vaccine
B) H1N1 flu virus, Antiviral drugs
C) RNA virus of genus Flavivirus, No specific antiviral drug
D) Ebola virus, Immune therapies
- 142. Which virus causes COVID-19, and what is the incubation period of the disease?**
A) Novel Coronavirus, 1-4 days
B) H1N1 flu virus, 2-21 days
C) Ebola virus, 3-14 days
D) RNA virus of genus Alphavirus, 5-14 days
- 143. What is the primary symptom of Plague, and what is the recommended preventive measure?**
A) Fever, Rat control
B) Diarrhea, RASV vaccine
C) Hemorrhagic fever, TAB vaccine
D) Genital inflammation, Avoid prostitution
- 144. What disease is characterized by symptoms such as muscle pain, headache, sore throat, and internal/external bleeding, and currently has no licensed vaccine?**
A) Swine Flu
B) Dengue
C) Chikungunya
D) Ebola Virus Disease
- 145. Which disease is caused by Salmonella typhi, has an incubation period of 1-3 weeks, and can be prevented by the TAB vaccine?**
A) Pneumonia
B) Typhoid
C) Plague
D) Gonorrhoea
- 146. Which disease affects the immune system of the body?**
A) Arthritis
B) AIDS
C) Asthma
D) Cataract
- 147. What part of the body is affected by Tuberculosis?**
A) Lungs
B) Intestines
C) Joints
D) Brain
- 148. Which fungal disease is caused by Candida albicans?**
A) Aspergillosis

- B) Blastomycosis
- C) Candidiasis
- D) Chromomycosis

149. What is the affected body part in Osteoporosis?

- A) Lungs
- B) Pancreas
- C) Bones
- D) Kidneys

150. Which disease involves the inflammation of the tonsils gland in the throat?

- A) Meningitis
- B) Tonsillitis
- C) Hepatitis
- D) Gastroenteritis

151. Which disease affects the immune system of the body?

- A) Arthritis
- B) AIDS
- C) Asthma
- D) Cataract

152. What part of the body is affected by Tuberculosis?

- A) Lungs
- B) Intestines
- C) Joints
- D) Brain

153. Which fungal disease is caused by Candida albicans?

- A) Aspergillosis
- B) Blastomycosis
- C) Candidiasis
- D) Chromomycosis

154. What is the affected body part in Osteoporosis?

- A) Lungs
- B) Pancreas
- C) Bones
- D) Kidneys

155. Which disease involves the inflammation of the tonsils gland in the throat?

- A) Meningitis
- B) Tonsillitis
- C) Hepatitis
- D) Gastroenteritis

156. What disease is characterized by the inflammation of the tonsils gland in the throat?

- A) Meningitis
- B) Tonsillitis
- C) Hepatitis
- D) Gastroenteritis

157. Which fungal disease is associated with Candida albicans?

- A) Aspergillosis
- B) Blastomycosis
- C) Candidiasis
- D) Chromomycosis

- 158. Which part of the body is affected by Arthritis?**
A) Lungs
B) Joints
C) Pancreas
D) Kidneys
- 159. What is the incubation period for Ebola Virus Disease?**
A) 2-5 days
B) 6-14 days
C) 15-21 days
D) 22-30 days
- 160. Which fungal disease is caused by an RNA virus of the genus Flavivirus?**
A) Ebola Virus Disease
B) Dengue
C) Chikungunya
D) COVID-19
- 161. What are the common symptoms of COVID-19?**
A) Fever, sore throat, and cough
B) Muscle pain, swollen lymph nodes, and rash
C) Hemorrhagic fever, muscle pain, and headache
D) Dry cough, tiredness, and loss of taste or smell
- 162. Which antibiotic is derived from *Streptomyces aureofaciens* and used for viral pneumonia, osteomyelitis, and eye infections?**
A) Penicillin
B) Griseofulvin
C) Tetracyclines/Aureomycin
D) Oxytetracycline/Terramycin
- 163. Who made the important discovery of antibiotics in 1928?**
A) William Harvey
B) Joseph Lister
C) Alexander Fleming
D) Robert Koch
- 164. In which country was the CT Scan discovered by Godfrey Hounsfield in 1973?**
A) Scotland
B) England
C) France
D) Dutch
- 165. Who introduced the term "ecosystem" in 1935?**
A) Sir Thomas Allbutt
B) Scipione Riva-Rocci
C) A G Tansley
D) Hans Berger
- 166. What is the longest bone in the human body?**
A) Tibia
B) Ulna
C) Radius
D) Femur
- 167. Which component of the ecosystem involves sunlight, temperature, precipitation, wind, and humidity?**
A) Autotrophs
B) Climate

- C) Decomposers
D) Inorganic Substances
- 168. How many teeth are there in the dental formula for adults?**
A) 32
B) 28
C) 22
D) 26
- 169. Which institute is located in Kolkata, Paschim Banga, and is involved in nuclear physics research?**
A) Bhabha Atomic Research Centre
B) Tata Institute of Fundamental Research
C) Saha Institute of Nuclear Physics
D) Indira Gandhi Centre for Atomic Research
- 170. What is the normal blood pressure (BP) value?**
A) 110/70 mm Hg
B) 120/80 mm Hg
C) 130/90 mm Hg
D) 140/100 mm Hg
- 171. Who discovered X-rays in 1895?**
A) WC Roentgen
B) Ian Donald
C) Rene Laennec
D) Scipione Riva-Rocci
- 172. What is the primary difference between a Grazing Food Chain and a Detritus Food Chain?**
A) The number of trophic levels
B) The involvement of decomposers
C) The type of producers
D) The flow of energy
- 173. What does an Ecological Pyramid of Number illustrate?**
A) Total weight of organisms at each trophic level
B) Number of individuals at each trophic level
C) Energy content at each trophic level
D) Feeding relationships among organisms
- 174. What is a key feature of a Food Web within an ecosystem?**
A) Linear energy transfer
B) Representing trophic structure
C) Flexibility in feeding on multiple organisms
D) Highlighting ecological pyramids
- 175. What is a notable effect of water pollution mentioned in the text?**
A) "Itai-itai" disease
B) Greenhouse effect
C) Noise pollution
D) Mercury persistence
- 176. How is Noise Pollution measured, and at what level is sound considered noise?**
A) Decibels; above 60 dB
B) Decibels; above 80 dB
C) Sound index; above 100
D) Sound index; above 50
- 177. Which city is mentioned as the most noise-polluted in the provided information?**

- A) Chernobyl
B) Nagasaki
C) Hiroshima
D) Kanpur
- 178. What is the primary source of Radioactive Pollution mentioned, and which elements are highlighted as causing health issues?**
A) Nuclear explosions; Strontium-90, Cesium-137
B) Biotechnology; Gene Therapy
C) Cloning; Dolly the sheep
D) Test Tube Baby; In Vitro Fertilisation (IVF)
- 179. Who introduced the Seed Village Concept, and in which village did it originate?**
A) Dr. Ian Wilmut; Jounti village
B) Dr. Swaminathan; Jounti village
C) Dr. Swaminathan; Hiroshima
D) Louise Joy Brown; Kanpur
- 180. What is the primary action of the antibiotic Griseofulvin, and which condition is it used to treat?**
A) Antifungal; Thrush
B) Antifungal; Ringworm
C) Antiviral; Typhoid
D) Broad-spectrum antibacterial; Salmonella and Shigella
- 181. Which branch of biology involves the insertion of foreign genes into DNA?**
A) Biochemistry
B) Genetics
C) Anatomy
D) Anthropology
- 182. Who is credited with the discovery of the antibiotic, which revolutionized medicine in 1928?**
A) Joseph Lister
B) William Harvey
C) Alexander Fleming
D) Robert Koch
- 183. Which country is associated with the discovery of blood circulation, credited to William Harvey in 1628?**
A) France
B) Germany
C) Britain
D) Netherlands
- 184. What is the gestation period in humans, according to the provided information?**
A) 9 months
B) 6 months
C) 3 months
D) 12 months
- 185. In the list of National Laboratories and Research Institutions, which institute is located in Kolkata, Paschim Banga?**
A) National Physical Laboratory
B) Central Leather Research Institute
C) Saha Institute of Nuclear Physics
D) National Institute of Mental Health and Neurosciences

- 186. What type of computer is primarily used for scientific and engineering purposes, measuring physical quantities and converting them to numerical values?**
- A) Digital Computer
 - B) Analog Computer
 - C) Hybrid Computer
 - D) Super Computer
- 187. Which component of the computer is known as the brain and consists of Arithmetic Logic Unit (ALU) and Control Unit (CU)?**
- A) Input Unit
 - B) Output Unit
 - C) Central Processing Unit (CPU)
 - D) Memory
- 188. What type of memory is volatile and used for temporary storage in a computer?**
- A) ROM (Read Only Memory)
 - B) Secondary Memory
 - C) RAM (Random Access Memory)
 - D) Primary Memory
- 189. Which networking category involves the communication between computers within a limited geographic area, such as an office or building?**
- A) Wide Area Network (WAN)
 - B) Local Area Network (LAN)
 - C) Metropolitan Area Network (MAN)
 - D) Super Network
- 190. What is the main function of antivirus software in a computer system?**
- A) Enhance computer speed
 - B) Identify and prevent malware
 - C) Create temporary storage for data
 - D) Convert digital signals to analog
- 191. Which method does antivirus software use to compare files against a database of known virus signatures?**
- A) Cache Memory
 - B) Heuristics Algorithm
 - C) Modulator-Demodulator
 - D) Virus Signature Definitions
- 192. What does "On-Access Scanning" in antivirus software primarily involve?**
- A) Enhancing file storage efficiency
 - B) Real-time scanning of emails and open files
 - C) Converting source code into machine-readable code
 - D) Analyzing behavior to detect potential viruses
- 193. What is the primary role of antivirus software?**
- A) Enhance computer speed
 - B) Identify and prevent malware
 - C) Creating temporary storage for data
 - D) Virus Signature Definition
- 194. Which method does antivirus software use to analyze behavior and detect potential virus-like patterns?**
- A) Cache Memory
 - B) Heuristics Algorithm

- C) Behavior-based detection
- D) All of the above

- 195. Which supercomputer, developed in Japan, operates on a custom Linux system?**
- A) Frontera
 - B) IBM Summit
 - C) Fugaku
 - D) Titan
- 196. What is the function of PKZIP software?**
- A) System Monitoring
 - B) File Compression and Archiving
 - C) Data Recovery
 - D) Antivirus Protection
- 197. Who is credited with the invention of the safety razor?**
- A) King C. Gillette
 - B) Walter Hunt
 - C) James Harrison
 - D) Alexander Graham Bell
- 198. Which component is considered the "brain" of the computer, consisting of both Arithmetic Logic Unit (ALU) and Control Unit (CU)?**
- A) Output Unit
 - B) Input Unit
 - C) Central Processing Unit (CPU)
 - D) Memory
- 199. What is the primary function of an Antivirus software on a computer?**
- A) File Compression
 - B) Data Recovery
 - C) Protection against malicious software
 - D) System Monitoring
- 200. Which unit of measurement represents approximately one trillion bytes of data storage?**
- A) Kilobyte (KB)
 - B) Megabyte (MB)
 - C) Petabyte (TB)
 - D) Terabyte (PB)

ANSWER KEY

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	11	B	21	D	31	A	41	C
2	C	12	A	22	B	32	C	42	A
3	D	13	B	23	C	33	D	43	A
4	C	14	B	24	C	34	C	44	D
5	D	15	C	25	D	35	A	45	C

6	B	16	B	26	B	36	B	46	C
7	B	17	D	27	C	37	C	47	D
8	B	18	B	28	B	38	C	48	C
9	A	19	B	29	B	39	D	49	B
10	A	20	C	30	C	40	C	50	D

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
51	C	61	B	71	C	81	D	91	C
52	D	62	D	72	B	82	C	92	B
53	A	63	B	73	C	83	C	93	C
54	D	64	B	74	D	84	A	94	A
55	A	65	A	75	B	85	B	95	B
56	A	66	B	76	C	86	A	96	B
57	B	67	D	77	A	87	C	97	C
58	D	68	A	78	B	88	C	98	D
59	B	69	B	79	B	89	A	99	A
60	C	70	B	80	A	90	C	100	A

Q	Ans								
101	D	111	A	121	B	131	D	141	C
102	A	112	C	122	B	132	C	142	A
103	B	113	A	123	B	133	C	143	A
104	A	114	B	124	C	134	B	144	D
105	A	115	C	125	A	135	A	145	B
106	C	116	B	126	C	136	A	146	B
107	B	117	D	127	B	137	B	147	A

108	C	118	B	128	C	138	C	148	C
109	C	119	B	129	B	139	A	149	C
110	D	120	D	130	B	140	C	150	B

Q	Ans								
151	B	161	D	171	A	181	B	191	D
152	A	162	C	172	B	182	C	192	B
153	C	163	C	173	B	183	C	193	B
154	C	164	B	174	C	184	A	194	B
155	B	165	C	175	D	185	C	195	C
156	B	166	D	176	B	186	B	196	B
157	C	167	B	177	D	187	C	197	A
158	B	168	A	178	A	188	C	198	C
159	C	169	C	179	B	189	B	199	C
160	B	170	B	180	B	190	B	200	D

www.smartachievers.online