

# **General Science Notes for UPSC and State Services Exams** **by Gradeup**

Keeping the upcoming UPSC and state examinations in mind, we have designed the Science Digest which contains all the essential topics. This Science PDF includes all the important topics from Physics, Chemistry and Biology that will help you boost your score in the upcoming exams.

## **Part-1 : PHYSICS**

### **WORK**

Work is said to be done, if force acting on a body is able to actually move it through some distance in the direction of the force. Its SI unit is a **joule**.

### **ENERGY**

- Energy is a scalar quantity and its unit is **Joule**.
- The sum of all kinds of energies in an isolated system remains constant at all times. This is the law of conservation of energy.

### **POWER**

Its unit is **watt**.

- **1 watt hour** = 3600 Joule
- **1 kilowatt hour** =  $3.6 \times 10^6$  joule
- **1HP** = 746 watt

### **GRAVITATION**

- Everybody in the universe attracts other body by a force called force of gravitation.
- The gravitational force of the earth is called **gravity**.
- The acceleration produced in a body due to force of gravity is called **acceleration** due to gravity ( $g$ ) and its value is **9.8 m/s<sup>2</sup>**
- Acceleration due to gravity is independent of shape, size and mass of the body.
- Escape velocity is the minimum velocity with, which an object just crosses the Earth's gravitational field and never returns. Escape velocity at the Earth's surface is **11.2 km/s**.
- Escape velocity at the **Moon's** surface is **2.4 km/s**. Due to low escape velocity there is no atmosphere on the moon.
- Value of  $g$  decreases with height or depth from Earth surface.
- $g$  is maximum at **poles**.
- $g$  is minimum at **equator**.
- $g$  decreases due to **rotation of Earth**.
- $g$  decreases if angular speed of Earth increases and increases if angular speed of Earth decreases.
- The acceleration due to gravity at the moon is **one-sixth** that of the Earth. So, the weight of a person on the surface of the moon will be **1/6** of his actual weight on the Earth.

### **SATELLITE**

- Satellites are natural or artificial bodies revolving around a planet under its gravitational force of attraction.
- **Moon** is a **natural satellite**, while **INSAT-B** is an artificial satellite of Earth.
- The period of revolution of satellite revolving near the surface of earth is 1 hour 24 minutes (34 minutes).
- Geo-stationary satellite revolves around the Earth at a height 36000 km (approx).
- Time period of rotation of geo-stationary satellite is 24 hours.
- The Earth rotates on its axis from **West to East**. This rotation makes the Sun and the stars appear to be moving across the sky from **East to West**.
- A **geosynchronous satellite** is a satellite in geosynchronous orbit, with an orbital period the same as the Earth's rotation period.
- A special case of geosynchronous satellite is the **geostationary satellite**, which has a geostationary orbit – a circular geosynchronous orbit directly above the Earth's equator.
- **Geo-stationary satellite is used** to telecast. TV programmes from one part of the world to another, in weather forecasting, in predictions of floods and droughts.
- Polar Satellite Revolves around the earth in polar orbit at a height of **800km** (app.) Time periods of these satellites is **84 min**.

## **ATOMIC AND NUCLEAR PHYSICS**

### **Cathode Rays**

**Cathode rays, discovered by Sir William Crooke and its properties are**

- travel in **straight lines**.
- Produce fluorescence.
- can penetrate through thin foils of metal and deflected by both electric and magnetic fields.
- have velocity ranging **1/30th** to **1/10th** of the velocity of light.

### Positive or Canal Rays

- These rays were discovered by **Goldstein**.
- The positive ray consists of **positively charged particles**.
- These rays travel in **straight line**.
- These rays are deflected by **electric and magnetic fields**.
- These rays can produce ionization in gases.

### X-Rays

- X-rays are electromagnetic waves with wavelength **range 0.1 Å-100 Å**.
- X-rays were discovered by **Roentgen**.
- X-rays travel in **straight line**.
- Long exposures of X – rays are injurious for human body.
- X – rays show **photoelectric effect**.

### Uses of X-Rays

- **In medical sciences** X-rays are used in surgery for the detection of fracture, diseased organs, foreign matter like bullet, stones etc. They are used in treatment of cancer and in skin diseases.
- **In Engineering**, X-rays are used in detecting faults, cracks, flaws and gas pockets in the finished metal products and in heavy metal sheets.
- **In Scientific Work**, X-rays are used in studying crystal structure and complex molecules.
- **In Custom Department** X-rays are used in custom department for detection of banned materials kept hidden.

### Radioactivity

- Radioactivity was discovered by **Henry Becquerel**, **Madame Curie** and **Pierre Curie** for which they jointly won Nobel Prize.

### Nuclear Fission

- Atom Bomb is based on nuclear fission.  $U^{235}$  and  $Pu^{239}$  are used as fissionable material.
- Nuclear fission was first demonstrated by **Hahn** and **Fritz Strassmann**.

### Nuclear Fusion

- When two or more light nuclei combined together to form a heavier nucleus is called as **nuclear fusion**.
- For the nuclear fusion, a temperature of the order of  **$10^8$  K** is required.
- **Hydrogen Bomb** was made by the American Scientist in **1952**. This is based on **nuclear fusion**. It is **1000** times more powerful than atom bomb.

### Nuclear Reactor or Atomic Pile

- Nuclear reactor is an arrangement, in which controlled nuclear fission reaction takes place.
- **First nuclear reactor was** established in Chicago University under the supervision of **Prof Enrico Fermi**.
- Heavy water, graphite and beryllium oxide are used to slow down the fast moving neutrons. They are called moderator.
- **Uses of Nuclear Reactor**
  - (i) To produce electrical energy from the energy released during fission.
  - (ii) To produce different isotopes, this can be used medical, physical and agriculture science.

**There are several components of nuclear reactor which are as follows**

- Fissionable Fuel  $U^{235}$  or  $U^{239}$  is used.
- Moderator decreases the energy of neutrons, so that they can be further used for fission reaction.
- **Heavy water** and graphite are used as moderator.
- **Control Rod rods of cadmium** or boron are used to absorb the excess neutrons produced in fission of uranium nucleus, so that the chain reaction.

### NEWTON'S LAWS OF MOTION

- **First Law:** Everybody maintains its initial state of rest or motion with uniform speed on a straight line unless an external force acts on it. It is also called Galileo's law or law of inertia.

**Example** While jumping from a slowly moving train/bus one must run for short distance, in the direction of motion.

- **Second Law:** The force acting on an object is directly proportional to the product of the mass of the object and the acceleration produced on it.
- **Third Law:** To every action, there is an equal and opposite reaction.

**Example :** Bogies of the trains are provided with buffers to avoid severe jerks during shunting of trains. Rocket moves up due to reaction of downward ejection of gas.

### CIRCULAR MOTION

- When an object moves along a circular path, its motion is called circular motion.
- The external force required to act radially inward over the circular motion of the body is called **Centripetal force**.
- **Centrifugal force** is such a pseudo force that is equal and opposite to **Centripetal force**.
- Cream separator, centrifugal dryer work on the principle of centrifugal force.

### **FRICTION**

- In the opposing force that is set-up between the surfaces of contact, when one body slides or rolls or tends to do so on the surface of another body.
- Due to friction, we are able to move on the surface of Earth.
- While applying brakes in automobiles, it stops only due to friction.

### **Pascal's Law of Pressure**

- Hydraulic lift, hydraulic press and hydraulic brakes are based on the **Pascal's law of pressure**.

### **Archimedes Principle**

- When a body is immersed partly or wholly in a liquid, there is an apparent loss in the weight of the body, which is equal to the weight of liquid displaced by the body.
- The weight of water displaced by an iron ball is less than its own weight. Whereas water displaced by the immersed portion of a ship is equal to its weight. So, small ball of iron ball sink in water, but large ship float.
- A fat person will quickly learn the swimming as compared to a slim person because he will displace more water. So, it will be more balanced.
- Hydrogen filled balloon float in air because hydrogen is lighter than air. A person can lift more weight in water.

## **WAVE**

A wave is a disturbance, which propagates energy from one place to the other without the transportation of matter.

**Waves are broadly of two types:**

- Mechanical wave (longitudinal wave and transverse wave)
- Electromagnetic wave
- Following are the electromagnetic (Non-mechanical) waves-
  - a. Gamma rays (**Highest frequency**)
  - b. X-rays
  - c. UV rays
  - d. Visible radiation
  - e. infra-red rays
  - f. short radio waves
  - g. Long radio waves (**Lowest frequency**)

All are in decreasing order of the frequency

Following waves are not electromagnetic.

- a. Cathode rays

- b. Canal rays
- c. alpha rays
- d. beta rays
- e. sound wave
- f. ultrasonic wave

### **Longitudinal Waves**

- In this wave the particles of the medium vibrate in the direction of propagation of wave.
- Waves on springs or sound waves in air are examples of longitudinal waves.

### **Transverse Waves**

- In this wave, the particles of the medium vibrate perpendicular to the direction of propagation of wave.
- Waves on strings under tension, waves on the surface of water are the examples of transverse waves.

### **Electromagnetic Waves**

- The waves, which do not require medium for their propagation i.e., which can propagate even through the vacuum are called electromagnetic waves.
- Light radio waves, X-rays etc are the examples of electromagnetic wave. These waves propagate with the velocity of light in vacuum.

### **Sound Waves**

Sound waves are longitudinal mechanical waves. Based on their frequency range sound waves are divided into following categories.

- The sound waves which lie in the frequency range 20 Hz to 20000 Hz are called audible waves.
- The sound waves having frequencies less than 20 Hz are called infrasonic
- The sound waves having frequencies greater than 20000 Hz are called ultrasonic waves.
- Ultrasonic waves are used for sending signals, measuring the depth of sea, cleaning clothes and machinery parts, removing lamp soot from chimney of factories and in ultrasonography.

### **Speed of Sound**

- Speed of sound is **maximum in solids minimum in gases**.
- When sound goes from one medium to another medium, its speed and wave length changes, but frequency remain unchanged. The speed of sound remains unchanged by the increase or decrease of pressure.
- The speed of sound increases with the increase of temperature of the medium.
- The speed of sound is more in humid air than in dry air because the density of humid air is less than the density.

**Echo:** The repetition of sound due to reflection of sound waves is called an echo.

**Intensity:** It is defined as amount of energy passing normally per unit area held around that point per source unit time.

**Pitch:** The sensation of a frequency is commonly referred to as the pitch of a sound.

**Sonar:** It stands for sound navigation and ranging. It is used to measure the depth of a sea, to locate the enemy submarines and shipwrecks.

### Doppler's Effect

If there is a relative motion between source of sound and observer, the apparent frequency of sound heard by the observer is different from the actual frequency of sound emitted by the source. This phenomenon is called

**Doppler's Effect.**

## LIGHT

- Light is a form of energy, which is propagated as **electromagnetic wave**.
- It is the radiation which makes our eyes able to 'see' the object. Its speed is  **$3 \times 10^8 \text{ m/s}$** . It is the form of energy. It is a **transverse wave**.
- It takes **8 min 19s** to reach on the earth from the sun and the light reflected from moon takes **1.28s** to reach earth.
- **Primary Colours**- Blue, Red, Green
- **Secondary Colours**- The colours produced by mixing any two primary colors
- **Complementary Colours**- Any two colours when added produce white light.
- Blue colour of sky is due to scattering of light.
- The brilliant red colour of rising and setting sun is due to scattering of light.

### Human Eye

- Least distance of distinct vision is 25 cm.
- Myopia or short sightedness- far objects cannot see clear
- Hyperopia or hypermetropia or Long-sightedness- Near objects cannot see clear
- Presbyopia- in elder person, both far and near cannot see clear

### Reflection of Light

- When a ray of light falls on a boundary separating two media comes back into the same media, then this phenomenon is called reflection of light.

### Reflection from Plane Mirror

- If an object moves towards a plane mirror **with speed  $v$** , relative to the object it moves towards it with a **speed  $2v$** .

- To see his full image in a plane mirror, a person required a mirror of at least half of his height.

## Spherical Mirror

Spherical mirrors are of two types

1. **Concave mirror**
2. **Convex mirror**

- Image formed by a convex mirror is always virtual, erect and diminished.
- Image formed by a concave mirror is generally real and inverted.

### Uses of Concave Mirror

- (i) As a shaving mirror
- (ii) As a reflector for the head lights of a vehicle, search light
- (iii) In ophthalmoscope to examine eye, ear, nose by doctors.
- (iv) In solar cookers.

### Uses of Convex Mirror

- (i) As a rear-view mirror in vehicle because it provides the maximum rear field of view and image formed is always erect.
- (ii) In sodium reflector lamp.

## Refraction of Light

- The bending of the ray of light passing from one medium to other medium is called refraction. When a ray of light enters from one medium to other medium, its frequency and phase do not change, but wavelength and velocity change. Due to refraction from Earth's atmosphere, the stars appear to twinkle.

### Critical Angle

- The angle of incidence in a denser medium for which the angle of refraction in rarer medium becomes  $90^\circ$ , is called the critical angle.

### Total Internal Reflection

- Sparkling of diamond, mirage and looming, shining of air bubble in water and optical Fiber are examples of total internal reflection.

### Power of a lens

- Power of a lens is its capacity to deviate a ray. It is measured as the reciprocal of the focal length in meters.
- SI Unit of Power is diopter.

## ELECTRICITY AND MAGNETISM

### Charge

Charge is the basic property associated with matter due to which it produces and experiences electrical and magnetic effects. Similar charges repel each other and opposite charges attract each other. The SI unit of charge is **coulomb**.

**Conductor:** Conductors are those materials, which allow electricity to pass through them. Metals like silver, iron, copper and earth acts like a conductor. Silver is the best conductor.

**Insulator:** Insulators are those materials which do not allow electricity to flow through them. Metals like wood, paper, mica, glass, ebonite are insulators.

### Electric Current

- Its unit is Ampere. It is a scalar quantity.
- **An electric bulb makes a bang when it is broken** because there is a vacuum inside the electric bulb, when the bulb is broken air rushes at great speed from all sides to fill the vacuum. The rushing of air produces a noise generally referred to as the bang.
- Shunt is a wire of very small resistance
- A Galvanometer can be converted into an ammeter by connecting a shunt parallel to it.
- A Galvanometer can be converted into a voltmeter by connecting a very high resistance in its series.
- The sodium and mercury street lamps light up due to atomic emission.
- The purpose of choke coil in fluorescent is to produce high voltage to ionize the gas in the tube required for high current to flow through filament.

### Magnetism

- Diamagnetic substance- when placed in magnetic field, acquire feeble magnetism opposite to the direction of the magnetic field.  
Examples- Gold, Diamond, Copper, Water, Mercury etc.
- Paramagnetic substance- when placed in magnetic field, acquire feeble magnetism in the direction of the magnetic field.  
Example- Al, Na, Mn etc.
- Ferromagnetic substance-when placed in magnetic field, are strongly magnetized in the direction of the magnetic field.  
Examples- Iron, Cobalt, Nickel
- Curie temp- the Curie temperature (TC), or Curie point, is the temperature at which certain materials lose their permanent magnetic properties, to be replaced by induced magnetism.

- **Isogonic lines** are lines on the Earth's surface along which the declination has the same constant value, and lines along which the declination is zero are called **agonic lines**.
- **Isoclinic lines** are imaginary lines on the earth's surface connecting points where the earth's magnetic field has the same angle.
- **The aclinic line** is the magnetic equator, where the magnetic field is inclined neither north or south, so it's a special case of an isoclinic line.
- **Isodynamic line-** A line on a map connecting points of equal strength of the earth's magnetic field.

### Surface Tension and capillary

- Lubricating oil spread easily on all parts because of their low surface tension.
- Dirt get removed when detergents are added while washing clothes because surface tension of water is reduced.
- The absorption of ink by a blotting paper is due to capillary action
- The supply of water to the leaves at the top of even a tall tree is through capillary rise.

### Heat

- Unit of heat-  
C.G.S- Calorie  
F.P.S- British Thermal Unit (B. Th. U)
- Absolute Zero Temp- minus 273 K (-273 K)
- 1 calorie= 4.2 J
- The specific heat is the amount of heat per unit mass required to raise the temperature by one degree Celsius.
- Consider 1 kg of water at 0 °C. When it is heated from 0 °C, it actually contracts rather than expanding, up to 4 °C. The volume of water is minimum at 4 °C. Beyond 4 °C, water starts expanding. This behaviour of water between 0 °C and 4 °C is called **anomalous expansion of water**.
- **Newton's Law of Cooling** states that the rate of change of the temperature of an object is proportional to the difference between its own temperature and the ambient temperature (i.e. the temperature of its surroundings).
- **Hoar Frost**-is the reverse process of sublimation.

### MEASUREMENT UNITS

- **Angstrom** : For measuring length of light waves
- **Barrel** : For measuring liquids. One barrel is equal to 31½ gallons or 7,326.5 cubic inches
- **Cable**: For measuring length of cables. It is about 183m. in length



- **Carat** : Used for measuring precious stones. It is also a measure for the purity of gold alloy
- **Fathom** : It is used for measuring depth of water. One fathom is equal to 4 inches
- **Knot**: For measuring speed of ships
- 1 inch = 2.54 cm
- 1 nm = m = 10 A
- 1 pm = m = 1000 fm
- 1 light year = 9.46 m
- 1 = 1000 L = 35.3 = 264 gal

## **SOME CONVERSION FACTORS**

### **Mass and Density**

- 1 Kg = 1000 g = 6.02 u
- 1 Slug = 14.6 kg
- 1 u = 1.66 kg

### **Length and Volume**

- 1 m = 100 cm = 39.4 inch = 3.28 ft
- 1 mile = 1.61 km = 5280 ft

### **Angular Measure**

- 1 m/s = 3.28 ft/ s = 2.24 mi / h
- 1 km / h = 0.621 mi / h = 0.278 m/s

### **Force and Pressure**

- 1 lb = 4.45 N
- 1 ton = 2000 lb
- 1 Pa = 1 N/ = 10 dyne/ = 1.45 lb/
- 1 atm =  $1.01 \times 10^5$  Pa = 14.7 lb/ = 76 cm – Hg

## **SOME IMPORTANT SCIENTIFIC INSTRUMENTS**

- **Accumulator**: Electrical energy is stored
- **Altimeter**: Used in aircraft for measuring altitudes
- **Ammeter**: Measuring the electrical current in amperes
- **Anemometer**: Measuring the strength of winds
- **Audiometer**: Measuring intensity of wind
- **Audiophone**: It is used for improving imperfect sense of hearing.
- **Barometer**: Measuring atmospheric pressure
- **Binocular**: An optical instrument designed for magnified view of distant objects by both eyes simultaneously
- **Bolometer**: To measure heat radiation
- **Cardiogram**: For recording the heart movements
- **Calorimeter**: Measuring of quantities of heat
- **Chronometer**: A clock that keeps very accurate time as the one that is used to determine longitude at sea.
- **Colorimeter**: An instrument for comparing intensities of colour.
- **Commutator**: An instrument to change or remove the direction of an electric current, in dynamo used to convert alternating current into direct current.
- **Cyclotron**: Studying the properties of atoms by smashing them.
- **Dynamo**: A device for converting mechanical energy into electrical energy
- **Dynamometer**: An instrument for measuring the electrical power
- **Electroscope**: An instrument for detecting the presence of electric charge.
- **Endoscope**: To examine internal parts of the body
- **Fathometer**: Measure depth of the ocean
- **Galvanometer**: For detecting and measuring electric current
- **Hygrometer**: Measure level of humidity
- **Phonograph**: For reproducing sound
- **Pyrometer**: Measure very high temperature
- **Quartz Clock**: A highly accurate clock used in astronomical observations and other precision work
- **Radar**: Radio, angle, detection and range is used to detect the direction and range of an approaching aeroplane by means of radio micro waves
- **Radiometer**: An instrument for measuring the emission of radiant energy

- **Radio Micrometer:** An instrument for measuring heat radiations
- **Rain Gauge:** An instrument for measuring rainfall
- **Rectifier:** An instrument used for the conversion of AC into DC.
- **Refractometer:** An instrument used to measure the refractive index of a substance
- **Resistance Thermometer:** Used for determining the electrical resistance of conductors
- **Salinometer:** A type of hydrometer used to determine the concentration of salt solutions by measuring their densities
- **Seismometer (Seismograph):** An Apparatus for measuring and recording earthquake shock
- **Sextant:** For guiding ships or surveying land.
- **Spectroscope:** An instrument used for spectrum analysis
- **Speedometer:** It registers the speed at which the vehicle is moving
- **Spherometer:** For measuring curvature of surfaces
- **Sphygmomanometer:** An instrument used to detect blood pressure in a human body. It is also called B.P.Apparatus
- **Sphygmophone:** Instrument with the help of which, a pulse beat makes a sound
- **Spring Balance:** Useful for measuring weight
- **Stereoscope:** It is used to view two dimensional pictures.
- **Stethoscope:** An instrument which is used by the doctors to hear and analyze heart and lung sounds.
- **Stroboscope:** It is used to view rapidly moving objects.
- **Tachometer:** An instrument used in measuring speeds of aero planes and motor boats.
- **Teleprinter:** This instrument receives and sends typed messages from one place to another.
- **Telescope:** It views distant objects in space.
- **Theodolite:** It measures horizontal and vertical angles.
- **Transistor:** A small device which may be used to amplify currents and perform other functions usually performed by a thermionic valve
- **Vernier:** An adjustable scale for measuring small sub divisions of scale
- **Viscometer:** For measuring viscosity
- **Voltmeter:** To measure potential difference between two points
- **Udometer:** Rain guage

### **Some Previous Year Questions asked in PCS & SSC Exams**

1. **SI unit of luminous intensity is \_\_\_\_\_ ?**

- A. lumen
- B. lux
- C. candela
- D. watt

**Ans. C**

Luminous intensity is a measure of the wavelength-weighted power emitted by a light source in a particular direction per unit solid angle, based on the luminosity function, a standardized model of the sensitivity of the human eye. The SI unit of luminous intensity is the candela (cd).

2. **If a bomb dropped from an airplane explodes in mid-air \_\_\_\_\_?**

- A. its KE increases
- B. its total energy increases
- C. its total energy decreases
- D. its total momentum decreases

**Ans. A**

The kinetic energy of an object is the energy that it possesses due to its motion. It is defined as the work needed to accelerate a body of a given mass from rest to its stated velocity. Having gained this energy during its acceleration, the body maintains this kinetic energy unless its speed changes.

3. **Fat can be separated from milk in a cream separator because of \_\_\_\_\_?**

- A. cohesive force
- B. gravitational force
- C. centripetal force
- D. centrifugal force

**Ans. D**

The centrifugal separator was invented in 1897. By the turn of the century it had altered the dairy industry by making centralised dairy processing possible for the first time. It also allowed removal of cream and recovery of the skim milk in a fresh state.



4. **Melting point of ice \_\_\_\_\_.**

- A. increases with increase of pressure
- B. decreases with increase of pressure
- C. is independent of pressure
- D. None of these

**Ans. B**

The melting point of ice at 1 atmosphere of pressure is very close to 0 °C (32 °F, 273.15 K); this is also known as the ice point.

5. **Radioactivity was discovered by \_\_\_\_\_?**

- A. J.J. Thomson
- B. W. Roentgen
- C. H. Becquerel
- D. M. Curie

**Ans. C**

Antoine-Henri Becquerel is known for his discovery of radioactivity, for which he received the Nobel Prize for Physics in 1903.

Unstable atomic nuclei will spontaneously decompose to form nuclei with a higher stability. The decomposition process is called radioactivity.

6. **If the temperature inside a room is increased, the relative humidity will \_\_\_\_\_?**

- A. increase
- B. decrease
- C. remain unchanged
- D. none of these

**Ans. B**

This is because temperatures in the home can be much different than the temperature outside. This is because of that important relationship between temperature and how much maximum moisture can be in the air.

7. **In a transistor, the base is \_\_\_\_\_.**

- A. an insulator
- B. a conductor of low resistance
- C. a conductor of high resistance
- D. an extrinsic semiconductor

**Ans. D**

A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit.

8. **Nights are cooler in the deserts than in the plains because \_\_\_\_\_.**

- A. Sand radiates heat more quickly than the earth
- B. The sky remains clear most of the time
- C. Sand absorbs heat more quickly than the earth
- D. Of none of the above reasons

**Ans. A**

Because desert air contains less moisture and because cloud cover is less frequent in deserts, temperatures vary more widely between day and night in deserts than in other areas. Deserts may experience temperature variations of 30-40 degrees between day and night (vs 20-30 degrees in other areas), this means a nighttime low of 70-80 degrees after a 110-degree day

9. **When we hear a sound, we can identify its source from \_\_\_\_\_.**

- A. wave length of sound
- B. the overtones present in the sound
- C. the intensity of sound
- D. the amplitude of sound

**Ans. B**

An overtone is any frequency higher than the fundamental frequency of a sound. Using the model of Fourier analysis, the fundamental and the overtones together are called partials. Harmonics, or more precisely, harmonic partials, are partials whose frequencies are integer multiples of the fundamental.

10. **A boy is standing in front of a plane mirror at a distance of 3 m from it. What is the distance between the boy and his image?**

- A. 3 m
- B. 6 m
- C. 4.5 m
- D. None of these

**Ans. B**

The image formed by a plane mirror is always virtual upright, and of the same shape and size as the object it is reflecting. A virtual image is a copy of an object formed at the location from which the light rays appear to come

11. **Energy is continuously generated in the sun due to \_\_\_\_\_.**

- A. Nuclear fusion
- B. Nuclear fission
- C. Radioactivity
- D. Artificial radioactivity

**Ans. A**

Nuclear fusion is a nuclear reaction in which two or more atomic nuclei come very close and then collide at a very high speed and join to form a new type of atomic nucleus. During this process, matter is not conserved because some of the matter of the fusing nuclei is converted to photons.

12. **Hydrogen bomb is based upon the principle of \_\_\_\_\_.**

- A. Nuclear fission
- B. Nuclear fusion
- C. Controller nuclear reaction
- D. None of these

**Ans. B**

The hydrogen bomb eventually relies upon atomic fusion (adding to the atomic nucleus) to release energy. Nuclear fusion is a nuclear reaction in which two or more atomic nuclei come very close and then collide at a very high speed and join to form a new type of atomic nucleus. During this process, matter is not conserved because some of the matter of the fusing nuclei is converted to photons

**13. The south pole of the earth's magnet is near the geographical \_\_\_\_\_.**

- A. south
- B. east
- C. west
- D. north

**Ans. D**

The South Pole of the Earth's magnet is in the geographical North because it attracts the North Pole of the suspended magnet and vice versa. Thus, there is a magnetic S-pole near the geographical North, and a magnetic N-pole near the geographical South

**14. Number of basic SI unit is \_\_\_\_\_.**

- A. 4
- B. 7
- C. 6
- D. 5

**Ans. B**

International System of Units (SI) is the modern metric system of measurement and the dominant system of international commerce and trade. It has seven base units.

**15. The wire having a green plastic covering is a \_\_\_\_\_.**

- A. Line wire
- B. Neutral wire
- C. Earth wire
- D. None of these

**Ans. C**

The earth wire is a crucial part of the home electrical system and is designed to protect against electric shock.

**16. The working principle of a Washing Machine is \_\_\_\_\_.**

- A. Centrifugation
- B. Dialysis
- C. Reverse osmosis
- D. Diffusion

**Ans. A**

Washing machine works on the principle of centrifugal force.

**17. Sound and light waves both \_\_\_\_\_.**

- A. have similar wavelength
- B. obey the laws of reflection
- C. travel as longitudinal waves
- D. travel through vacuum

**Ans. B**

The two laws of reflection of light are applicable to sound waves as well. The incident wave, the normal to the reflecting surface and the reflected wave at the point of incidence lie in the same plane. The angle of incidence is equal to the angle of reflection  $\angle i = \angle r$ .

**18. In an electric motor, the energy transformation is from \_\_\_\_\_.**

- A. electrical to chemical
- B. chemical to light
- C. mechanical to electrical
- D. electrical to mechanical

**Ans. D**

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this would be the conversion of mechanical energy into electrical energy and is done by an electric generator.

**19. The focal length of a plane mirror is \_\_\_\_\_.**

- A. Positive
- B. Negative
- C. Zero
- D. Infinity

**Ans. D**

A plane mirror is a mirror with a flat reflective surface. The focal length of a plane mirror is infinity. Its optical power is zero.

**20. A dynamo converts \_\_\_\_\_.**

- A. Mechanical energy into sound energy
- B. Mechanical energy into electrical energy
- C. Electrical energy into mechanical energy
- D. None of these

**Ans. B**

The dynamo, by attaching it in between the two tires, converts the mechanical energy (which of course, is produced by paddling) into electrical energy, and by connecting the wires going out of the dynamo to light, it glows without any flaw.

**21. Which of the following is used in oven?**

- A. X-rays
- B. UV-rays
- C. Microwaves
- D. Radio waves

**Ans. C**

An oven is a thermally insulated chamber used for the heating, baking or drying of a substance and most commonly used for cooking.

**22. Decibel is the unit of \_\_\_\_\_.**

- A. Speed of light
- B. Intensity of sound
- C. Intensity of heat
- D. None of these

**Ans. B**

Decibel (dB) unit is used for expressing the ratio between two amounts of electric or acoustic power for measuring the relative loudness of sounds.

**23. The ozone layer in the atmosphere is at a height of about \_\_\_\_\_.**

- A. 25 km                      B. 50 km  
C. 100 km                    D. 200 km

**Ans. B**

Ozone is mainly found in two regions of the Earth's atmosphere. Most ozone (about 90%) resides in a layer that begins between 10 to 17 kilometers above the Earth's surface and extends up to about 50 kilometers

**24. A camera uses a \_\_\_\_\_ to form an image on a piece of film at the back.**

- A. convex lens              B. concave lens  
C. diverging lens          D. none of these

**Ans. A**

A camera consists of three main parts.

- The body which is light tight and contains all the \_\_\_\_\_ mechanical parts.
- The lens which is a convex lens.
- The film or a charged couple device in the case of a digital camera.

**25. Newton is used to measure\_\_\_\_\_.**

- A. Speed                      B. Volume  
C. Force                      D. Area

**Ans. C**

The newton (N) is the International System of Units (SI) derived unit of force. It is named after Isaac Newton in recognition of his work on classical mechanics, specifically Newton's second law of motion.

**26. X- rays are \_\_\_\_\_ waves.**

- A. Longitudinal              B. Transverse  
C. Electromagnetic          D. Elastic

**Ans. C**

X-rays are a form of electromagnetic radiation as are radio waves.

**27. The technique used by bats to find their way or to locate food is \_\_\_\_\_.**

- A. SONAR  
B. RADAR  
C. Echolocation  
D. Flapping

**Ans. C**

Bats use echolocation to navigate and find food in the dark. To echolocate, bats send out sound waves from their mouth or nose. When the sound waves hit an object they produce echoes

**28. Radian per second is unit of \_\_\_\_\_.**

- A. Momentum                      B. Moment of Inertia  
C. Frequency                      D. Angle Velocity

**Ans. D**

The SI unit of angular velocity is radians per second.

**29. Which law states, "The rate of loss of heat by a body is directly proportional to the difference in temperature between the body and the surroundings"?**

- A. Doppler's Effect  
B. Newton's law of cooling  
C. Kirchhoff's Law  
D. Stefan's Law

**Ans. B**

Newton's Law of Cooling states that the rate of change of the temperature of an object is proportional to the difference between its own temperature and the ambient temperature.

**30. The loudness of sound depends upon\_\_\_\_\_.**

- A. Velocity  
B. Pitch  
C. Amplitude  
D. Wavelength

**Ans. C**

Loudness is the characteristic of a sound that is primarily a psychological correlate of physical strength (amplitude).

**31. SI Unit of Time is \_\_\_\_\_.**

- A. Second                      B. Meter  
C. Kilogram                      D. Angstrom

**Ans. A**

The SI unit of time is second, symbol is (s).

**32. SI unit for the surface tension is \_\_\_\_\_.**

- A. kg/m<sup>2</sup>                      B. kg/m<sup>3</sup>  
C. N/m                      D. kg/m

**Ans. C**

Surface tension is measured in force per unit length. Its SI unit is newton per meter.

**33. A player making a long jump is an example of \_\_\_\_\_.**

- A. Projectile motion  
B. Rotatory motion  
C. Spinning motion  
D. Horizontal motion

**Ans. A**

Projectile motion is a form of motion in which an object or particle is thrown near the earth's surface and it moves along a curved path under the action of gravity only.

34. The angular velocity depends upon the rate of change of the \_\_\_\_\_.

- A. Angular Distance
- B. Angular acceleration
- C. Angular Displacement
- D. torque

Ans. C

The angular velocity is defined as the rate of change of angular displacement and is a vector quantity which specifies the angular speed of an object and the axis about which the object is rotating.

35. Radio waves, microwaves, infra-red spectrum, ultraviolet rays, X-rays and gamma rays are classified as \_\_\_\_\_.

- A. light waves
- B. electromagnetic waves
- C. electric waves
- D. magnetic waves

Ans. B

Electromagnetic radiation is the radiant energy released by certain electromagnetic processes. It consists of electromagnetic waves which are synchronized oscillations of electric and magnetic fields that propagate at the speed of light through a vacuum.

36. A rocket works on the principle of conservation of \_\_\_\_\_.

- A. mass
- B. linear momentum
- C. energy
- D. angular momentum

Ans. B

A rocket works by expelling gases from one end at a very high velocity. The escaping gases have a very high speed and this with their mass translates to a very large momentum. Due to the principle of conservation of momentum the body of the rocket is pushed forward. If both the momentum of the gases as well as that of the rocket are added the sum is zero.

37. Sound waves in air are \_\_\_\_\_.

- A. transverse
- B. longitudinal
- C. electromagnetic
- D. polarised

Ans. B

Sound can propagate through compressible media such as air, water and solids as longitudinal waves and also as a transverse wave in solids.

38. Who among the following is the scalar quantity \_\_\_\_\_.

- A. force
- B. pressure
- C. velocity
- D. acceleration

Ans. B

Pressure is a scalar quantity. It relates the vector surface element with the normal force acting on it.

39. Sound of frequency below 20 Hz is called \_\_\_\_\_.

- A. audio sounds
- B. infrasonic
- C. ultrasonic
- D. supersonics

Ans. B

The term "infrasonic" applied to sound refers to sound waves below the frequencies of audible sound and nominally includes anything under 20 Hz.

## Part-2 : CHEMISTRY

### MATTER

- In general it exists in 3 states i.e.,

- (i) Solid
- (ii) liquid
- (iii) gas.

- Now-a-days there is a discussion on two more states of matter i.e., **Plasma** (Ionised gases containing super energetic and super excited particles and **Bose-Einstein** condensates or BEC (a gas at super low temperatures with extremely low density).

### Boiling Point

- The temperature at which liquid converts in to vapours is called its boiling point.

- Boiling point of water is 100°C.
- The boiling point **increases in the presence of impurities**. That's why boiling point of **sea water is more than the boiling** point of pure water (as the former contains impurity).
- **It usually decreases at high altitudes**, that's why at high altitudes, the boiling point of water is less than 100°C and **more time is required to cook a food**.

### Melting Point

- It is a temperature at which a substance **converts from its solid state to liquid state**.
- Melting point of **ice is 0°C**; It decrease in the presence of impurity

### Atom, Molecule and Element

- Atom is the smallest particle of a matter that takes part in chemical reactions, but cannot exist in free state.
- Atom is made 43 of electrons**, protons and neutrons.
- Protons and neutrons reside in the nucleus (**at the centre of atom**) whereas electrons revolve around the nucleus.
- Atoms combine to form molecules**, the smallest part of matter which can exist in free state.

### Isotopes and Isobars

- Isotopes have the same number of protons** (i.e., atomic number), but different number of neutrons and mass number (atomic number + number of neutrons), e.g.,  $^{111}_{11}\text{H}^2$ .
- Isobars have the same mass number** but different atomic number.

**Example:**  $^{40}_{18}\text{Ar}$ ,  $^{40}_{19}\text{K}$

### Dating Techniques

- Radiocarbon** dating is used to **determine the age of carbon** bearing materials like wood, animal fossils etc.
- Uranium** dating is used to **determine the age of Earth, minerals and rocks**.

### Battery

- Battery is a device, used to convert **chemical energy into electrical energy** and is of two types

(i) **Primary batteries** (non-rechargeable) act as galvanic cell, e.g., dry cell, mercury cell etc.

(ii) **Secondary Batteries:** (rechargeable) Act as galvanic as well as voltaic cell E.g., lead storage battery, nickel cadmium battery etc.

### Corrosion

- The oxidative deterioration of a metal surface by the action of environment is called **corrosion**, an electrochemical process.
- When **iron exposed in to air, iron surface turns brown** due to the formation of **hydrated ferric oxide** ( $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ ) which is also called rust,
- Silver - Surface turns black** due to the formation of **silver sulphide** ( $\text{Ag}_2\text{S}$ )

### Renewable Non-renewable Natural Resources

- Renewable resources are available in** large excess, i.e., never ends, e.g, air, sunlight etc.
- Non-renewable resources are** available in limited quantity and end, if used excessively, after a limited period of time. e.g., mineral, coal, petroleum, natural gas etc.

### Fuels

- The substance, which produce heat and light on combustion are called fuels.
- A strong foul smelling substance, called ethyl mercaptan is added to LPG to detect its leakage as LPG is an odourless gas.

### Some important fuels and their compositions

Fuel	Composition	Sources
<b>Water Gas</b>	Carbon monoxide (co) + hydrogen(h <sub>2</sub> )	By passing stream over red hot coke
<b>Producer Gas</b>	Carbon monoxide (CO) + Nitrogen (N <sub>2</sub> )	By passing insufficient air over red hot coke
<b>Coal Gas</b>	Hydrogen + methane + Ethylene + Acetyene + CO +Nitrogen	By fractional distillation
<b>Natural Gas</b>	Methane(83%) + Ethane	From petroleum

<b>Liquefied Petroleum Gas (LPG)</b>	Butane (CH <sub>4</sub> ) 95%	From petroleum
<b>Compressed Natural Gas (CNG)</b>	Methane (CH <sub>4</sub> ) 95%	From petroleum
<b>Biogas or Gobar Gas</b>	Methane (CH <sub>4</sub> ) + Carbon dioxide (CO <sub>2</sub> ) + Hydrogen (H <sub>2</sub> ) + Nitrogen (N <sub>2</sub> )	From organic wastes

### Physical and Chemical Changes

- Physical changes are the change, which only affect the physical properties like colour, hardness, density, melting point etc. of matter, but do not affect the composition and chemical properties of matter.
- A physical change is temporary, while a chemical change is **permanent**.
- Crystallisation, sublimation, 'boiling, melting, vaporisation, cutting of trees, dissolving sugar or salt in water etc. are physical changes.
- Chemical changes affect the composition as well as chemical properties of matter and result in the formation of a new substance.
- Burning of fuel, burning of candle and paper, electrolysis of water, photo synthesis, ripening of fruits etc, are examples of chemical changes

### Coal

Coal is obtained by carbonization of vegetable matter and is available in different varieties:

- Peat**- 60% C
- Lignite or Brown Coal** – 70% C
- Bituminous** – 60 to 80 % C
- Anthracite Coal – 90% C
- Fame

### Flame contains three parts

- Innermost Part**- which is black due to the presence of unburned carbon particles- has lowest temperature.
- Middle part** – is yellow due to incomplete of fuel.
- Outermost part**- which is blue due to complete combustion of fuel is the hottest and used by goldsmith to heat the gold.

### Fire Extinguishers

- Water extinguishes fire because **as it evaporates**, the vapours surround the burning substance, cutting off the oxygen supply, thus inhibiting burning process.
- In case of **electrical or oil (petrol) fires**, water cannot be used as extinguisher. This is because water is a conductor of electricity **and heavier than oil**. Thus, oil floats over it and continues to burn.
- Carbon dioxide, which is generated by the reaction of baking soda with acid, is used to extinguish electrical or oil fires. Quality of petrol is measured in terms of octane number and that of diesel in terms of cetane number.

### Safety Matches

In safety matches, the stick consists of mixture of antimony trisulphide and potassium chlorate at its one end. The box side contains a mixture of powdered glass and phosphorus.

### Acids, Bases and Salts

#### Acids

- These are the substance, which **have sour taste** and turn blue litmus red.
- These are **good conductor of electricity** in aqueous solution.
- Pickles are always kept in glass jar because acid present in them reacts with metal to **produce hydrogen gas**.

#### Bases

- These are the substances, **which have bitter taste and turn red litmus**, blue.
- They give different colours in acid and base solutions.



### Salts

- These are the product of **neutralisation reaction between an acid and a base.**
- **pH** is the measure of **acidity/basicity.**

## INORGANIC AND ORGANIC CHEMISTRY

### Carbon Dioxide

- It is an acidic oxide of carbon and is used by green plants for photosynthesis. It does not help in burning.

***Air and our breath contain carbon dioxide. Thus, when lime water is kept in air or we pass our breath into it, the lime water turns milky.***

### Carbon Monoxide

- It is a neutral oxide of air and has more affinity towards haemoglobin than oxygen (about 200 times more). That's why in the environment of carbon monoxide – which is a non- poisonous gas – people die for the need of oxygen.

***It is dangerous to sleep in an unventilated room with fire burning inside because the fire produces carbon monoxide and carbon dioxide gases.***

### Plaster of Paris

- It is chemically calcium sulphate hemihydrate ( $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ ) and is prepared by heating gypsum – which is calcium sulphate dehydrate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) at 373 K.
- On Mixing with water, plaster of Paris further sets into a hard solid, called gypsum. Thus, it is used to plaster fractured bones, for making toys, materials for decoration and for making surfaces smooth.

### Portland Cement

- It is a complex mixture of silicates and aluminates of calcium with small amount of gypsum. Raw materials used for the manufacture of Portland cement are **limestone and clay.**
- The composition of Portland cement is calcium oxide (50-60%), alumina (5-10%), and magnesium oxide (2-3%). Gypsum is added to cement to decrease its rate of setting.
- In cement, if lime is in excess, cement cracks during setting and if lime is less, cement is of weak strength.
- Mortar a mixture of sand, cement and water is used for joining bricks and plastering walls.

- **Concrete**—a mixture of gravel, sand, cement and water is used for flooring and making roads.
- Reinforced Concrete Cement (RCC)— which is concrete with steel bars and wires is used for constructing roofs, bridges and pillars

### Glass

- Glass—an amorphous solid or super- cooled liquid—contains maintz silica ( $\text{SiO}_2$ ).

### Different substances are added to obtain glass of different colours

Colour	Substance Added
Red	Copper oxide ( $\text{CuO}$ )
Green	Chromium oxide ( $\text{Cr}_2\text{O}_3$ )
Blue	Cobalt oxide ( $\text{CoO}$ )
Brawn	Iron oxide ( $\text{Fe}_2\text{O}_3$ )

### Heavy water

- Heavy water is water that contains **heavy hydrogen or deuterium**. Deuterium differs from the hydrogen usually found in water, protium, in that each atom of deuterium contains a proton and a neutron. Heavy water may be deuterium oxide, **D<sub>2</sub>O** or it may be deuterium protium oxide, DHO. Note: **Heavy water occurs naturally, although it is much less common than regular water. Approximately one water molecule per twenty million water molecules is heavy water.**

### Hard Water

- The water in which soluble bicarbonates oil calcium and magnesium are present, is called temporary hard water and in which soluble sulphates and chlorides of magnesium and calcium are present is called **permanent hard water.**
- The temporary hardness of water is removed by boiling or by adding calcium hydroxide,  $\text{Ca(OH)}_2$ — the **Clark's process** The permanent hardness of water is removed by adding sodium carbonate ( $\text{Na}_2\text{CO}_3$ ), or calgon (sodium hexametaphosphate,  $\text{Na}_2[\text{Na}_4(\text{P}_3\text{O}_{10})_6]$ )

### Hardening of Oil (Hydrogenation)

Oil, an unsaturated fat when heated with nickel catalyst and hydrogen gets converted into a solid mass, called ghee, a saturated fat. This process is called hardening of oil and is carried out through hydrogenation in the presence of nickel as a catalyst.

## Some Important Ores of Metals

**Ores** - Those minerals from which the metals are extracted commercially and economically and with minimum effort are called Ores of Metals.

Name of Elements	Ores	Chemical Formulae
1. Aluminum (Al)	(a) Bauxite (b) Corundum (c) Kryolite	$Al_2O_3 \cdot 2H_2O$ $Al_2O_3$ $Na_3AlF_6$
2. Iron (Fe)	(a) Hematite (b) Magnetite (c) Iron Pyrite (d) Siderite	$Fe_2O_3$ $Fe_3O_4$ $FeS_2$ $FeCO_3$
3. Copper (Cu)	(a) Copper Pyrite (b) Copper Glance (c) Malachite	$CuFeS_2$ $Cu_2S$ $2CuCO_3 \cdot Cu(OH)_2$
4. Zinc (Zn)	(a) Zinc Blende (b) Calamine	$ZnS$ $ZnCO_3$
5. Sodium (Na)	(a) Rock Salt (b) Sodium Carbonate	$NaCl$ $Na_2CO_3$
6. Potassium (K)	(a) Karnalite (b) Salt Petre	$KCl \cdot MgCl_2 \cdot 6H_2O$ $KNO_3$
7. Lead (Pb)	(a) Galena (b) Anglesite	$PbS$ $PbCl_2$
8. Tin (Sn)	(a) Tin Pyrites (b) Cassiterite	$Cu_2FeSnS_4$ $SnO_2$
9. Silver (Ag)	(a) Silver Glance	$Ag_2S$
10. Gold (Au)	(a) Calve rite (b) Sybarite	$AuTe_2$ $AgAuTe_2$
11. Mercury (Hg)	(a) Cinnabar (b) Calomel	$HgS$ $Hg_2Cl_2$
12. Magnesium (Mg)	(a) Dolomite (b) Karnalite	
13. Calcium (Ca)	(a) Lime Stone (b) Dolomite	$CaCO_3$ $MgCO_3 \cdot CaCO_3$
14. Phosphorous (P)	(a) Phosphorite (b) Floreopetite	$Ca_3(PO_4)_2 \cdot CaFe_2$ $3Ca_3(PO_4)_2 \cdot CaFe_2$

## Some Previous Year Questions asked in PCS & SSC Exams

1. The father of modern chemistry is ?

- A. Priestley                      B. Lavoisier  
C. Dalton                        D. Mendeleeff

**Ans: B**

**Antoine Lavoisier** was a **French** nobleman and chemist central to the 18th-century chemical revolution and a large influence on both the history of chemistry and the history of biology. He is widely considered in popular literature as the "**father of modern chemistry**".

2. Which one is not metal ?

- A. sulphur                      B. sugar  
C. nitrogen                    D. all

**Ans: All**

A **metal** is a material (an element, compound, or alloy) that is **typically hard**, opaque, shiny and has good **electrical** and **thermal** conductivity.

3. Which one is the pure element?

- A. glass                        B. cement  
C. sodium                    D. none of these

**Ans: C**

A pure element is a chemical element consisting of only one stable isotope.

4. What are the elements present in urea ?

- A. C,H,O                        B. C,N,O  
C. C,N,H                        D. C,O,N,H

**Ans: D**

Urea is an **organic compound** with the chemical formula  $\text{CO}(\text{NH}_2)_2$ . The molecule has functional group.

5. A radioactive substance emits ?

- A. alpha particle              B. beta particle  
C. gamma particle            D. all of the three

**Ans: All of the three**

**Radioactive** substances are continually producing **three kinds of dangerous** radiation: **alpha particles, beta particles** and **gamma rays**. These types of radiation are invisible to the naked eye, and so you won't see a green glow.

6. The fuel in atomic pile is?

- A. carbon                      B. sodium  
C. petroleum                D. uranium

**Ans: D**

In the pile, the neutron-producing **uranium pellets** were separated from one another by graphite blocks. Some of the free neutrons produced by the natural decay of uranium would be absorbed by other uranium atoms, causing nuclear fission of those atoms and the release of additional free neutrons.

7. Which of the following is the lightest metal?

- A. Mercury                      B. Silver  
C. Lithium                       D. Lead

**Ans: C**

The lightest or least dense metal that is a pure element is lithium, which has a density of 0.534 g/cm<sup>3</sup>. This makes lithium nearly half as dense as water, so if lithium was not so reactive, a chunk of the metal would float on water.

8. The element present in the largest amount in rocks and minerals is?

- A. carbon                        B. silicon  
C. hydrogen                    D. aluminium

**Ans: B**

Silicon is the eighth most common element in the universe by mass, but very rarely occurs as the pure free element in nature. It is most widely distributed in dusts, sands, planetoids, and planets as various forms of silicon dioxide (silica) or silicates. Over 90% of the Earth's crust is composed of silicate minerals, making silicon the second most abundant element in the Earth's crust after oxygen.

9. German silver is an alloy of?

- A. copper, nickel and silver  
B. silver, copper and aluminium  
C. zinc, copper and nickel  
D. silver, zinc and copper

**Ans: C**

German silver is a copper alloy with nickel and often zinc. The usual formulation is 60% copper, 20% nickel and 20% zinc.

10. The inert gas abundantly found in widely distributed is?

- A. Xe                              B. Kr  
C. He                              D. Ar

**Ans: D**

Argon (Ar) is the most prevalent of the noble gases in Earth's crust with the element composing 0.00015% of this crust.

11. Vinegar is used as a condiment, and in the pickling of vegetables and other foods. What is the constituent of vinegar?

- A. Butanoic acid                B. Methanoic acid  
C. Ethanoic acid                D. Hexanoic acid

**Ans: C**

When ethanol reacts with oxygen it forms a weak acid called ethanoic acid. In an open bottle of beer or wine, the reaction happens naturally in the presence of bacteria, and it is the ethanoic acid that can make beer or wine taste sour. Vinegar is typically 4-18% acetic acid by mass. Vinegar is used directly as a condiment, and in the pickling of vegetables and other foods

**12.** Which one of the following is correct? Setting of plaster of Paris is\_.

- A. dehydration
- B. oxidation with atmospheric oxygen
- C. hydration leading to another hydrate
- D. combination with atmospheric carbon dioxide

**Ans: D**

To make lime plaster, limestone (calcium carbonate) is heated to produce quicklime (calcium oxide). Water is then added to produce slaked lime, which is sold as a wet putty. Additional water is added to form a paste prior to use. The paste may be stored in airtight containers. When exposed to the atmosphere, the calcium hydroxide very slowly turns back into calcium carbonate through reaction with atmospheric carbon dioxide, causing the plaster to increase in strength.

**13.** Which of the following is the best conductor of electricity?

- A. Ordinary water
- B. Sea water
- C. Boiled water
- D. Distilled water

**Ans: B**

Sea water is a "good" conductor. It has a resistance and resistance increases by distance. So if you dip a very high voltage electric wire in the ocean, the area around it (even 100 meters or more based on how high it is) gets electric.

**14.** Which one among the following substances evolved heat when dissolved in water?

- A. Glucose
- B. Fructose
- C. Quick lime
- D. Salt peter

**Ans: C**

Quicklime is a widely used chemical compound. It is a white, caustic, alkaline, crystalline solid at room temperature. When limestone is heated, at about 1000° C it undergoes thermal decomposition. It loses carbon dioxide and turns into quicklime (calcium oxide).

**15.** Which one among the following polymers is used for making bullet-proof material?

- A. Polyvinyl chloride
- B. Polystyrene
- C. Polyethylene
- D. Polyamide

**Ans: C**

A bullet-proof material is made of polyethylene. It is a higher grade of the plastic found in Tupperware.

**16.** Hydrogen was discovered by ?

- A. Cavendish
- B. Lavoisier
- C. Rutherford
- D. Scheele

**Ans: A**

In 1766, Henry Cavendish was the first to recognize hydrogen gas as a discrete substance, by naming the gas from a metal-acid reaction "flammable air".

**17.** Carbon reacts with metal to form.

- A. Carbide
- B. Carbonate
- C. Hydroxide
- D. Oxide

**Ans: A**

Carbon reacts with reactive metals, such as tungsten, carbon forms either carbides to form alloys with high melting points.

**18.** Which one of the following elements is metalloid?

- A. Si
- B. Pb
- C. Ge
- D. C

**Ans: C**

A metalloid is a chemical element with properties in between metals and nonmetals. Germanium (Ge) is a chemical element. It is a lustrous, hard, grayish-white metalloid in the carbon group.

**19.** Which one of the following is used in the preparation of antiseptic solution?

- A. Potassium nitrate
- B. Iodine
- C. Iodine chloride
- D. Potassium chloride

**Ans: B**

Antiseptics are chemical agents that slow or stop the growth of micro-organisms (germs) on external surfaces of the body and help prevent infections.

**20.** The name catalysis was given by .

- A. Ratherford
- B. landmuir
- C. Graham
- D. Berzelius

**Ans: B**

Catalysis is the increase in the rate of a chemical reaction due to the participation of an additional substance called a catalyst. With a catalyst, reactions occur faster and with less energy. Because catalysts are not consumed, they are recycled. Often only tiny amounts are required.

**21.** Which of the following is not a natural polymer?

- A. Wool
- B. Silk
- C. Cotton
- D. Teflon

**Ans: D**

Natural polymers occur in nature and can be extracted. They are often water-based. Examples of naturally occurring polymers are silk, wool, DNA, cellulose, cotton and proteins.

**22.** Gamma rays are .

- A. High energy electrons
- B. Low energy electrons
- C. High energy electromagnetic
- D. High energy positron waves

**Ans: C**

Gamma rays ( $\gamma$ ) refer to electromagnetic radiation of an extremely high frequency and therefore consist of high-energy photons.

**23.** The ultrapure metal is obtained by\_?

- A. Calcination
- B. Sublimation
- C. zone refining
- D. None of these

**Ans: C**

The principal stages in the production of ultrapure metals are the preparation of pure chemical compounds, the reduction of the compounds to the elementary state and further purification. Pure compounds are obtained by sorption, extraction, distillation, rectification, ion exchange, and recrystallization from aqueous solutions

24. The gas used in a refrigerator is\_?

- A. cooled down on flowing
- B. heated up on flowing
- C. cooled down when compressed
- D. cooled down when expanded

**Ans: D**

Common refrigerants used in various applications are ammonia, sulfur dioxide, and non-halogenated hydrocarbons such as propane. Compressing these gasses into liquids they are made to give up their heat.

25. Which one of the following petroleum refinery products has the lowest boiling point?

- A. Kerosene
- B. Gasoline
- C. Diesel
- D. Lubricating oil

**Ans: D**

Lubricating oil is the most commonly used lubricant because of its wide range of possible applications. The two basic categories of lube oil are mineral and synthetic. Mineral oils are refined from naturally occurring petroleum, or crude oil. Synthetic oils are manufactured polyalphaolefins, which are hydrocarbon-based polyglycols or ester oils.

26. Compound having tetrahedral structure is\_\_\_\_\_.

- A. C<sub>2</sub>H<sub>4</sub>
- B. C<sub>2</sub>H<sub>2</sub>
- C. CH<sub>4</sub>
- D. None of these

**Ans: C**

**Methane** is a **tetrahedral** molecule with four equivalent **C-H** bonds. Its electronic structure is described by four bonding molecular orbitals resulting from the overlap of the valence orbitals on **C** and **H**.

27. The constant temperature, the product of pressure and volume of a given amount of a gas is constant . This is \_\_\_\_\_ .

- A. Gay-Lussac law
- B. Charles's law
- C. Boyle's law
- D. Pressure law

**Ans: C**

Boyle's law is a **gas law**, stating that the **pressure** and **volume** of a gas have an **inverse** relationship, when temperature is held constant. If **volume** increases, then **pressure** decreases and **vice versa** when temperature is held constant.

28. Modern periodic law had been given by .

- A. Moseley
- B. Mendeleev
- C. Lothar-Mayer
- D. Lavoisier

**Ans: A**

In 1913, **H.G.J Moseley** in England proved that the more **fundamental** properties of an element are its **atomic number**. Therefore he suggested that the basis of **classification** of elements should be atomic number.

29. In Nuclear reactors graphite is used as .

- A. Lubricant
- B. Fuel
- C. Linear of the reactor
- D. Modulator

**Ans: D**

**Nuclear reactors** are used at nuclear power plants for **electricity** generation. These are generally **graphite moderated** and CO<sub>2</sub> cooled.

30. An acid is a substance which \_\_\_\_\_ .

- A. Donates a proton
- B. Accepts an electron
- C. Give H<sup>+</sup> in water
- D. All

**Ans: D**

An **acid** is a **chemical substance** whose aqueous solutions are characterized by a **sour taste**, the ability to turn blue **litmus** red and the ability to react with bases and certain **metals** to form salts.

31. A mixture of carbon monoxide and hydrogen is called\_.

- A. Producer gas
- B. Water gas
- C. Natural gas
- D. None

**Ans: B**

**Water gas** is a synthesis gas, containing **carbon monoxide** and **hydrogen**. It is a useful product but requires careful handling due to its flammability and the risk of carbon monoxide poisoning. The gas is made by passing **steam** over a **red-hot carbon fuel** such as coke.

32. The compound of a metal found in nature is called.

- A. Mineral
- B. Ore
- C. Flux
- D. Slag

**Ans: A**

**Metals** are an integral part of our planet and are found in almost all rocks and soils. Most metals form compounds called **minerals**, which are naturally occurring, inorganic solids with regular chemical compositions and crystal structures.

33. Freon is used as .

- A. Oxidant
- B. Refrigerant
- C. Catalyst
- D. Both A and B

**Ans: B**

**Freon** uses for a number of halocarbon products. They are stable, nonflammable, moderately toxic gases or liquids which have typically been used as **refrigerants** and as aerosol propellants.

34. Which gas is used in filling electric bulbs\_.

- A. Neon
- B. Argon
- C. Radon
- D. Krypton

**Ans: B**

**Argon** is used to **fill** incandescent **light bulbs** to inhibit the evaporation of the **tungsten** filaments and increase bulb life.

35. Lead pencil contains .

- A. Lead nitrate
- B. Graphite
- C. Lead peroxide
- D. Lead Sulphate

**Ans: B**

Most pencil cores are made of **graphite** mixed with a **clay binder** which leaves grey or black marks that can be easily erased.



36. Air is ?

- A. Compound B. Element  
C. Mixture D. Solution

Ans: C

Pure air is a **mixture** of several gases that are invisible and colourless. It consists of about **78% nitrogen, 21% oxygen**, and less than **1% of argon, carbon dioxide** and other **gases**, as well as varying amounts of water vapour.

37. Which of the following is a noble gas ?

- A. Argon B. Hydrogen  
C. Oxygen D. Nitrogen

Ans: A

Noble gas, **any of the seven chemical elements that make up Group 18 (VIIIa) of the periodic**

38. Study of old age is called?

- A. Gerontology B. Pedology  
C. Ornithology D. Anthropology

Ans: A

**Gerontology** is the study of the aging process itself. Geriatrics is sometimes called medical gerontology.

39. The chemical name for common salt is

- A. Sodium chloride B. Sodium hydroxide  
C. Sodium chlorate D. Potassium chloride

Ans: A

**Sodium chloride** is also known **common salt** is an ionic compound with the chemical formula **NaCl**, representing a 1:1 ratio of sodium and chloride ions.

40. Liquid metal is ?

- A. Mercury B. Sodium  
C. Antimony D. None

Ans: A

Liquid metal consists of gallium-containing alloys with very low melting points which are liquid at **room temperature**. The standard metal formerly is **mercury**.

41. Match sticks are made of ?

- A. Red phosphorus B. blue phosphorus  
C. lead nitrate D. None

Ans: A

Red phosphorus is used in matches. Ferrophosphorus, a **combination of phosphorus with iron**, is used as an ingredient in high-strength low-alloy steel.

42. Chemical that is used in photography ?

- A. Copper sulphate B. Silver bromide  
C. Magnesium sulphate D. None

Ans: B

Silver bromide (**AgBr**) is a **soft pale-yellow, water-insoluble salt well for its unusual sensitivity to light**. This property has allowed silver halides to become the basis of modern photographic materials. AgBr is widely used in photographic films and is believed by some to have been used for making the Shroud of Turin.

43. 'Plaster of Paris' chemically known as

- A. Sodium Aluminate B. Calcium sulphate

- C. Sodium bicarbonate D. Sodium acetate

Ans: B

Calcium sulphate is a calcium salt that is used for a variety of purposes. It exists in various forms and states of hydration. **Plaster of Paris** is a mixture of powdered and heat-treated **gypsum**.

44. When iron rusts, its weight?

- A. decreases B. increases  
C. Constant D. None

Ans: B

**Iron rust** when they come into contact with **water and oxygen**. They rust faster in salty water or acid rain.

45. Which is not a type of elements?

- A. Metals B. Non Metals  
C. Metalloids D. Gases

Ans: C

**Element** is a chemical substance consisting of atoms having the same number of protons in their atomic nuclei.

There are **118 elements** that have been identified. The elements classified as **metalloids** are boron, silicon, germanium, arsenic, antimony, tellurium and polonium.

46. Which acid is present in lemon?

- A. malic acid B. citric acid  
C. lactic acid D. tartaric acid

Ans: B

**Citric acid** is a weak **organic acid** with the formula **C<sub>6</sub>H<sub>8</sub>O<sub>7</sub>**. The **juice** of the **lemon** is about **5% to 6%** citric acid, which gives a sour taste.

47. What among following is used to produce artificial rain?

- A. copper oxide B. carbon monoxide  
C. silver iodide D. silver nitrate

Ans: C

**Artificial rain** is produced by **spraying clouds** with substances like **Silver Iodide** (costly) or cheaper ones like **solid carbon dioxide** (dry ice) or even finely powdered **Sodium Chloride**.

48. Which is used in preparation of dynamite?

- A. glycerol B. ethyl alcohol  
C. methyl alcohol D. glycol

Ans: A

Dynamite is an explosive material based on nitroglycerin, using diatomaceous earth or another adsorbent substance such as powdered shells or clay

49. Nail polish remover contains?

- A. benzene B. acetic acid  
C. acetone D. petroleum ether

Ans: C

The **most** common solvents are **acetone**. It is powerful and effective but can be harsh on skin and nails. Acetonitrile has been used as a nail polish remover.



50. Human bone does not contain\_.

- A. calcium                      B. carbon  
C. oxygen                      D. phosphorous

Ans: C

**Human Bones** are primarily formed from salts of **calcium, carbon** and **phosphate**, the major salt being **hydroxyapatite**.

## Part-3 : BIOLOGY

*Biology is one of the important subjects from the exam point of view. In this post we have come up with Short Notes from the **Biology** part of the **General Knowledge** section. A good number of questions are asked in every exam. Thus, the post is very helpful for the upcoming **SSC & Railway Exams***

### Vitamins:

- Organic compound required in small amounts in the die to maintain normal metabolic functions are known as 'Vitamins'.
- The term vitamin was changed to vitamin when it was realized that not all vitamins are amines.
- Many vitamins act as (or) are converted into coenzymes; they neither provide energy nor are incorporated into tissues.
- These also regulate the Bio-chemical processes in the body.

### **Vitamins are classified into two groups**

- Fat soluble vitamins** (A, D, E, K). These are rich in liver cells.
- Water soluble vitamins** (C, B-complex). These are present in much smaller amounts in cells.

### Fat soluble vitamins:

#### Vitamin A:

- Vitamin A is also known as '**Retinol**'.
- Deficiency diseases:** Night blindness, redness in eyes (Exophthalmia), degeneration of lachrymal glands.

#### Vitamin D:

- Vitamin D is also known as 'Calciferol'.
- Deficiency diseases:** Rickets in children, Osteomalacia in adults.

#### Vitamin E:

- Vitamin E is also known as 'Tocopherol'.
- Deficiency diseases:** Sterility nutritional nuclear dystrophy, neurosis of heart muscles.

#### Vitamin K:

- Vitamin K is also known as '**Anti hemorrhagic**'.
- Deficiency diseases:** Blood coagulation is prevented, continuous bleeding occurs.

### Water soluble vitamins:

**Vitamin 'B Complex':** Vitamin B Complex is a mixture of B1, B2, B3, B5, B6, B7, B9, and B12.

#### Vitamin B1:

- Vitamin B1 is also known as **Thiamin**.
- Deficiency diseases:** Beri Beri disease which affects the legs.

#### Vitamin B2:

- Vitamin B2 is also known as Riboflavin.
- Deficiency diseases:** Dark red tongue, dermatitis, cheilosis occurs at the corners of mouth & lips.

#### Vitamin B3:

- Vitamin B3 is also known as **Pentothenic acid**.
- Deficiency diseases:** Burning sensations of feet.

#### Vitamin B5:

- Vitamin B5 is also known as Nicotinic acid/Niacin.
- Deficiency diseases:** Pellagra, dermatitis, diarrhea.

#### Vitamin B6:

- Vitamin B6 is also known as **Pyridoxine**.
- Deficiency diseases:** Dermatitis and convulsions.

#### Vitamin B7:

- Vitamin B7 is also known as **Biotin** (also considered as vitamin H).
- Deficiency diseases:** Dermatitis, blood cholesterol increases, loss of hair and paralysis.

#### Vitamin B9:

- Vitamin B9 is also known as Folic acid.
- Deficiency diseases:** Anemia, inflammation of tongue, gastro intestinal disorders.

#### Vitamin B12:

- Vitamin B12 is also known as '**Cynocobal amine**'.
- Deficiency diseases:** Pernicious anemia, hyperglycemia.

#### Vitamin C:

- Vitamin C is also known as '**Ascorbic acid**'.
- Deficiency diseases:** Scurvy, delay in wound healing.

### Human Diseases Caused by Fungi :-

- Ringworm caused by Microsporum, Trichophyton by direct contact from unbathed cats and dogs or objects handled by infected individuals.
- Athlete's foot caused by Trichophyton by Bad foot hygiene where skin remains warm and moist for long period, fungi finds optimal condition, invade dead outer layer of skin.

### Human Diseases Caused by Viruses

- Smallpox** caused by Variola Virus by direct contact (droplets), indirect by infected articles.

- **Chicken pox** caused by Varicella virus by direct contact (droplets) indirected
- by infected objects.
- **Common cold** caused by Rhinovirus by contact.
- Influenza/Flu caused by Orthomixovirus by contact (droplets) virus transmitted through discharge from respiratory tracts of persons infected with disease
- **Mumps** caused by Mumps virus by direct contact, virus in Saliva and secretion of nose invades salivary glands.
- **Viral encephalitis** caused by Encephalitis virus (arbovirus) by some domestic animals' reservoir of virus, transmitted by mosquito bite to man.
- **Poliomyelitis** caused by Poliovirus by contact, houseflies, fleas, food and water.
- **Rabies** (Hydrophobia) caused by Rabies virus (Rhabdovirus) by Bite a mad
- (rabid) dog
- **Dengue** fever or breakbone fever caused by Dengue virus (arbovirus) by Mosquito (Aedes) bite.
- Acquired Immunodeficiency Syndrome (**AIDS**) caused by Human Tcell
- Lenkemia virus (**HTLVIII**) also called LAV (Retrovirus) by blood and sperm among homosexuals, heterosexuals, intravenous drug users, haemophiliacs, promiscuous individuals and prostitutes.

#### Human Diseases Caused by Bacteria

- **Septic sore throat** caused by Streptococcus Sp by Bacteria infect throat and nasal membranes by droplets and direct contact.
- **Diphtheria** caused by Irregular rod (Corynebacterium diphtheria) by Bacteria infect respiratory tract by carrier, through contact, droplets and food items.
- **Pneumonia** caused by Diplococcus pneumonia by Bacteria transmitted to respiratory tract, including the lungs by droplet infection.
- **Tuberculosis** caused by Irregular rod (Mycobacterium tuberculosis) by Bacteria transmitted to lungs, bones and other organs by direct contact droplet infection, food and milk.
- **Plague** or **Bubonic** caused by Short rod (Yersinia pestis) by Rat flea spreads disease from rat to man.
- **Tetanus** or **LockJaw** caused by Clostridium tetani by Bacteria in soil, enter through wound.
- **Typhoid** or enteric fever caused by, Salmonella typhi by Flies, food, faces water and carriers.
- **Cholera** caused by Vibrio cholerae by Flies food, stools, water and carriers.

- **Bacillary** dysentery caused by short rod (Shigella dysenteriae) by Flies, food, faeces, water and carriers.
- **Whooping cough** caused by small short rod (Hemophilus pertussis) by Droplets protected during coughing and sneezing.
- **Syphilis** caused by Spiralshaped organism (Treponema pallidam) by direct contact, chiefly sexual intercourse.
- **Leprosy** caused by Mycobacterium Leprae by long and close contact with infected persons
- **Botulism** caused by Clostridium botulinum by organism produces poison in food.

#### Human Diseases Caused by Protozoans

- **Amoebic dysentery** (Amoebiasis) caused by Entamoeba histolytica by Transmission from man to man through ingestion of cysts in drinking water vegetables and food contaminated with faeces.
- **Diarrhea 'Giardiasis'** caused by Giardia intestinalis by Transmission from man to man through ingestion of cysts in drinking water vegetables and food contaminated with faces.
- **Malaria** caused by Plasmodium vivax by Transmitted to man by bite of an infected female auophelise mosquito.
- **Sleeping** sickness (Trypanosomiasis) caused by Trypanosoma brucei by Transmitted by bite of tsetse fly

### **Some Important Information & Facts Related to Biology**

1. **Melvin Kelvin** was awarded Nobel Prize for his work on Photosynthesis
2. The **largest flower** in the world is Refflessia and the **smallest one** is wolfessia.
3. **Penicillin** is obtained from **penicillium Notatum**.
4. Reserpine derived from the plant 'serpentine' is used to alleviate high blood pressure.
5. Plants, living in acidic soils, are called **oxalophytes**.
6. **Photosynthesis** is most **active** in **blue** and red light in which light energy is converted into chemical energy and O<sub>2</sub> is not a limiting process during this process.
7. **The smallest bone**, lies **stapes** is found in the human ear.
8. **Enzymes** are basically **proteins**.
9. **Mitochondria** is called the '**power house of the cell**'
10. **Pancreas** is both an endocrine and **exocrine gland**.

11. Persons of blood group '**O**' are called '**Universal Donor**' while that of '**AB**' are called '**Universal Acceptors**'.
12. **Seedless** fruits are formed by **parthenogenesis**.
13. Simple plants that contain **no chlorophyll** are called **fungi**.
14. **Spirogyra** is commonly known as '**pond silk**'
15. The **longest muscle** in the human body is found **in thigh**.
16. In a leaf, the opening between two guard cells is **stomata**.
17. **Gibberellins** are responsible for cell elongation.
18. The chemical **name of chlorophyll** is magnesium Dihydro prophydin.
19. **Bile** is produced in liver and stored in **gel bladder**.
20. All arteries, except pulmonary artery carry oxygenated blood.
21. The main function of **W.B. C.** is to produce **antibodies**.
22. **Retina** in the eye, acts as a film in the **camera**.
23. Human tears contain a mild antibacterial agent, named **Lysozyme**.
24. The biggest bone in the human body is **femur**.
25. Vitamin **B12** is almost never found in plants.
26. **Agrostology** is the study of **grasses**.
27. **Phycology** is the study of a algae while the study of fossils is called paleontology
28. **Hydroponics** is cultivating plants without using soil.
29. Palco botany is the study of fossils of **botanical specimens**.
30. **Pepsin** & **Lactose** enzymes ad on proteins in the digestive system.
31. The water soluble vitamins are **vitamin B and C**
32. A chemical change in **DNA molecule** is called **mutation**.
33. **Glycogen** acts as a short term food reserve in animals.
34. **Estrogen** is a female sex **hormone**.
35. The enzyme amylase aids in the digestion of starch.
36. **ATP** synthesis takes place in **mitochondria**.
37. **70%** of the body weight of a man is **water**.
38. The tough transparent membrane that protects the eye ball is called cornea.
39. Energy is produced in human body by Carbohydrates.
40. Sugar is the product of the dark reactions of photosynthesis.

### Important One-liner Type Questions-

1. Banana Freckle, a plant disease, is caused by \_\_\_\_\_. - **Fungus**
2. What is the scientific name of Neem? - **Azadirachta Indica**
3. Who discovered the Bacteria? - **Van Leeuwenhoek**
4. To which phylum does the Amoeba belong? - **Protozoa**
5. Who is known as The Father of the Green Revolution? - **Norman Ernest Borlaug**
6. Pneumonia affects which part of the Human Body? - **Lungs**
7. Who is known as The Father of Genetics? - **Gregor Mendel**
8. Which is the second largest gland of the Human Body? - **Pancreas**
9. The deficiency of vitamin B-1 causes \_\_\_\_\_. - **Beri-Beri**
10. Which drug is yielded from Cinchona tree to cure Malaria? - **Quinine**
11. What is the common name of the Retinol? - **Vitamin A**
12. Human Skin have \_\_\_\_\_ layers? - **Three**
13. What is the full form of DNA? - **Deoxyribonucleic Acid**
14. Beetroot is which portion of the plant? - **Tap Root**
15. \_\_\_\_\_ is the basic unit of heredity. - **Gene**
16. Who is also known as Father of Microbiology? - **Van Leeuwenhoek**
17. Which scientist had developed the Theory of Evolution? - **Charles Darwin**
18. Which branch of science is concerned with the classification of organisms? - **Taxonomy**
19. In plants, respiration takes place through \_\_\_\_\_. - **Stomata**
20. Dermatitis is a \_\_\_\_\_ disease. - **Fungal**
21. In which form, Glucose is stored in our body? - **Glycogen**
22. Plants synthesize proteins from \_\_\_\_\_. - **Amino Acids**
23. Which organ is also known as The Biochemical Laboratory of the Human Body? - **Liver**
24. What is responsible for the yellow colour of urine? - **Urochrome**
25. Who discovered the Antibiotics? - **Alexander Flaming**

26. The functional unit of the Kidney is known as \_\_\_\_\_. - **Nephrons**
27. Leprosy is caused by \_\_\_\_\_. Bacteria
28. Lipase, the fat-digesting enzyme is secreted by \_\_\_\_\_. - **Pancreas**
29. Scientists who proposed The Cell Theory?  
- **Theodor Schwann and Matthias Jakob Schleiden**
30. Who proposed the Mutation Theory? - **Hugo de Vries**
31. What does ATP stand for? - **Adenosine triphosphate**
32. Which bacteria causes Typhoid? - **Salmonella typhi**
33. Who wrote "Systema Naturae"? - **Carl Linnaeus**
34. Acacia arabica is the scientific name of which plant? - **Babul Tree**
35. Who coined the term "Ecology"? - **Ernst Haeckel**
36. Johannes Friedrich Miescher discovered the \_\_\_\_\_. - **Nucleic Acids**
37. The "study of Classification of Organisms" is known as \_\_\_\_\_. - **Taxonomy**
38. Which is the confirmatory test for AIDS? - **ELISA**
39. Jute is obtained from which part of the plant? - **Stem**
40. Which plant is also called Herbal Indian Doctor? - **Amla**
41. What is the energy currency of the cell? - **ATP**
42. Which human gland is responsible for the secretion of insulin? - **Pancreas**
43. Which pigment is responsible for the colour of the skin? - **Melanin**
44. Which pigment is responsible for the yellow colour of urine? - **Urochrome**
45. Which organ breaks Fat to produce cholesterol? - **Liver**
46. Quinine is used in the treatment of which disease? - **Malaria**
47. which is also known as the tear gland of the human body? - **Lacrimal Glands**
48. What is the name of the first test tube baby? - **Louise Joy Brown**
49. Which gland is also known as ductless gland? - **Endocrine Glands**
50. The green colour of the leaves is due to \_\_\_\_\_. - **Chlorophyll** (*Don't get confused, Chloroplast is a cell organelle in which chlorophyll pigment is present.*)

51. Weil's disease is caused due to the \_\_\_\_\_ infection. - **Bacterial**
52. Who invented the stethoscope? - **René Laennec**
53. Har Govind Khorana shared the Nobel Prize in the field of \_\_\_\_\_. - **Medicine (Physiology)**
54. \_\_\_\_\_ is also known as milk sugar. - **Lactose**
55. \_\_\_\_\_ mosquito is the carrier of Zika Virus. - **Aedes**
56. Which is the largest artery in the human body? - **Aorta**
57. What kind of process Fermentation is? - **Anaerobic Respiration**
58. Quinine is obtained from the bark of \_\_\_\_\_. - **Cinchona**

### Important Objective Type Questions

1. DOTS is a treatment given to patients suffering from \_\_\_\_\_.  
A. Polio B. AIDS  
C. Hepatitis D. Tuberculosis  
Ans. D.
2. Polyploidy arises due to change in the  
A. number of chromatids  
B. structure of genes  
C. number of chromosomes  
D. structure- of chromosomes  
Ans. A.
3. The suicidal bags of the cell are  
A. Lysosomes B. Ribosomes  
C. Dictyosomes D. Phagosomes  
Ans. A.
4. Who among the following is credited with starting the work on plant tissue culture?  
A. F.C. Steward B. P. Maheshwari  
C. P.R. White D. Haberlandt  
Ans. D.
5. Which of the following uses the spawn mechanism to duplicate itself?  
A. Trojan horse B. Worm  
C. Keystroke logger D. Logic bomb  
Ans. B.
6. What is the main purpose of white blood corpuscles?  
A. to carry nutrients B. to combat infection  
C. to carry oxygen D. to give strength  
Ans. B.
7. The layer where the decrease in temperature with increasing altitude is totally absent is  
A. Troposphere B. Ionosphere  
C. Stratosphere D. Mesosphere  
Ans. C.

8. Siderosis is a disease caused by the inhalation of  
A. silica dust                      B. iron dust  
C. zinc dust                        D. coal dust

Ans. B.

9. The largest artery in human body is  
A. Aorta                              B. Capillary  
C. Vena cava                        D. Pulmonary vein

Ans. A.

10. Nitrification is the biological process of converting  
A.  $N_2$  into nitrate  
B.  $N_2$  into nitrite  
C. Ammonia into nitrite  
D. Ammonia into  $N_2$

Ans. C.

11. Blood is red in colour due to the presence of \_\_\_\_\_.  
A. Cytochrome                      B. Chlorophyll  
C. Hemocyanin                        D. Haemoglobin

Ans. D.

12. Which one of the following events in a botanical garden is never directly influenced by light?  
A. Flowering                        B. Photosynthesis  
C. Transpiration                        D. Fertilization

Ans. D.

13. Which of the following is usually not an airpollutant?  
A. Hydrocarbons                      B. Sulphur dioxide  
C. Carbon dioxide                        D. Nitrous oxide

Ans. D.

14. Which of the following is the treatment of water pollution?  
A. Bag house filter  
B. Windrow composting  
C. Venturi scrubber  
D. Reverse Osmosis

Ans. D.

15. Which cells in pancreas produce Insulin ?  
A. Thymus                              B. Estrogen  
C. Corpus epididymis                        D. Islets of Langerhans

Ans. D.

16. The waste management technique that involves the use of micro-organisms to remove or neutralize pollutants from contaminated site is called  
A. Bio sensor                        B. Bio magnification  
C. Bio remediation                        D. Bio concentration

Ans. C.

17. The source of energy that causes the least global warming is  
A. coal                                  B. Geothermal energy  
C. Natural Gas                        D. Petroleum

Ans. B.

18. The oxygen liberated during photosynthesis comes from  
A. Water                              B. Carbon dioxide  
C. Glucose                              D. Chlorophyll

Ans. A.

19. The term 'Higgs Boson' is associated with  
A. Nano Technology  
B. Oncology  
C. God Particle  
D. Stem Cell Research

Ans. C.

20. The hormone that stimulates heart beat is  
A. Thyroxine                        B. Gastrin  
C. Glycogen                        D. Dopamine

Ans. A.

21. The presence of air bubble in blood stream is dangerous to life because  
A. Air combines with blood forming a complex  
B. The flow of blood increases manifold  
C. The flow of blood is obstructed  
D. The pressure of blood increases manifold

Ans. C.

22. The study of relation of animals and plants to their surroundings is called  
A. Ecology                              B. Ethology  
C. Genealogy                        D. Iconology

Ans. A.

23. Which of the following plays an important role in photosynthesis?  
A. Chloroplast                        B. Centrosome  
C. Tonoplast                        D. Nematoblast

Ans. A.

24. The xylem in plants are responsible for:  
A. transport of water  
B. transport of food  
C. transport of amino acids  
D. transport of oxygen

Ans. A.

25. Project 'Sankalp' started for the purpose  
A. To eradicate illiteracy  
B. To eradicate Polio  
C. To eliminate AIDS/HIV  
D. To eliminate unemployment

Ans. C.

26. Which of the following bacterium causes crown gall disease in plants?  
A. Bacillus thurigiensis  
B. Agrobacterium tumefaciens  
C. Pseudomonas fluorescens  
D. None of these

Ans. B.



27. Eustachian Tube is located in which part of human body?

- A. Nose                      B. Ear  
C. Eyes                      D. Throat

Ans. B.

28. Which part of the brain plays an important role in motor control?

- A. Cerebellum              B. Cerebrum  
C. Medulla                  D. Pons

Ans. A.

29. Meibomian glands are located in

- A. Eye                        B. Ear  
C. Nose                      D. Skin

Ans. A.

30. Which of the following vitamins are water soluble?

- A. Vit. A & Vit. B          B. Vit. B & Vit. C  
C. Vit. C & Vit. D          D. Vit. A & Vit. K

Ans. B.

31. Sphygmomanometer measures the blood pressure in the

- A. Veins                      B. Arteries  
C. Eyes                      D. Synovial

Ans. B.

32. The reverse effect of X-ray emission is

- A. Raman effect  
B. Compton effect  
C. Zeeman effect  
D. Photo-electric effect

Ans. D.

33. The connective tissue that connects a muscle to a bone is

- A. Cartilage                  B. Ligament  
C. Tendon                   D. Interstitial fluid

Ans. C.

34. Goitre is caused by the deficiency of \_\_\_\_\_

- A. Zinc                        B. Calcium  
C. Iodine                      D. Chlorine

Ans. C.

35. Which organ gets affected in Weil's disease?

- A. Liver                      B. Lung  
C. Heart                      D. Kidney

Ans. D.

36. What does the term 'Ebola' stand for?

- A. A viral disease outbreak in West Africa  
B. A viral disease outbreak in Bangladesh  
C. A city in Syria destroyed by ISIS.  
D. None of the these

Ans. A.

37. The virus of AIDS affects the growth of \_\_\_\_\_

- A. Haemoglobin  
B. RBCs in blood  
C. T cells in blood  
D. Grey cells in brain

Ans. C.

38. Bacterial decomposition of biological material under anaerobic condition is

- A. fermentation          B. fertilization  
C. contamination          D. composting

Ans. A.

39. The elements known as primary nutrients for plants

- A. Nitrogen, Phosphorus and Potassium  
B. Nitrogen, Oxygen and Silicon  
C. Potassium, Boron and Nitrogen  
D. Nitrogen, Phosphorus and Iron

Ans. A.

40. A genetically engineered form of brinjal known as the BT-brinjal has been developed. The objective of this is

- A. to make it pest resistant  
B. to improve its taste and nutritive value  
C. to make it drought resistant  
D. to make its shelf-life longer

Ans. A.

41. Blood group was discovered by

- A. Alexander Fleming  
B. William Harvey  
C. Landsteiner  
D. Paulov

Ans. C.

42. Decoding and interpretation of visual information in brain is associated with

- A. Frontal lobe              B. Occipital lobe  
C. Temporal lobe          D. Parietal lobe

Ans. C.

43. \_\_\_\_\_ is a byproduct of sewage treatment and can be decomposed to produce bio-gas

- A. Sewage                    B. Sludge  
C. Sewer                      D. Scum

Ans. B.

44. The food in Onion is stored in the form of \_\_\_\_\_

- A. Cellulose                  B. Protein  
C. Starch                      D. Sugar

Ans. A.

45. Motor cortex are associated with which part of the brain?

- A. Frontal lobe              B. Parietal Lobe  
C. Temporal lobe          D. Occipital Lobe

Ans. A.

46. Which enzyme is present in all members of the animal kingdom except Protozoa?

- A. Insulin                    B. Pepsin  
C. Renin                      D. Amylase

Ans. D.



47. The most serious air pollutant causing health hazard is

- A. Sulphur dioxide      B. Carbon monoxide  
C. Ozone                  D. Nitrogen oxide

Ans. A.

48. Companion cells are unique to

- A. Bryophytes              B. Pteridophytes  
C. Angiosperms          D. Gymnosperms

Ans. C.

49. Lacrimal glands are situated in the

- A. Palms                    B. Buccal cavity  
C. Eye orbit                D. Stomach

Ans. C.

50. Depletion of ozone layer causes

- A. Breast cancer          B. Skin cancer  
C. Lung cancer            D. Blood cancer

Ans. B.

51. Majority of the fungal bionts of lichens belong to

- A. Baridiomycetes        B. Ascomycetes  
C. Gomycetes              D. Deuteromycetes

Ans. B.

52. Which of the following has open vascular system?

- A. Cockroach              B. Human  
C. Rat                        D. Birds

Ans. A.

53. The human faeces is yellow in colour due to the presence of a pigment called

- A. Pepsin                    B. Renin  
C. Amylase                D. Urobilin

Ans. D.

54. What is contained in Chlorophyll?

- A. sodium                  B. potassium  
C. manganese            D. magnesium

Ans. D.

55. Epigraphy is the study of which of the following?

- A. Coins                    B. Inscriptions  
C. Temples                D. Birds

Ans. B.

56. Why is Carbon Monoxide a pollutant?

- A. Reacts with haemoglobin  
B. Makes nervous system inactive  
C. It reacts with Oxygen

D. It inhibits glycolysis

Ans. A.

57. Silk worms feed on

- A. Basil leaves  
B. Curry leaves  
C. Rose leaves  
D. Mulberry leaves

Ans. D.

58. The sexual reproductive organs of aspergillus are:

- A. Spermatium and Oogonium  
B. Antheridium and Oogonium  
C. Spermatium and Ascogonium  
D. Antheridium and Ascogonium

Ans. D.

59. Ornithophily is effected by

- A. snails                    B. bats  
C. insects                  D. birds

Ans. D.

60. Science dealing with study of soil is called

- A. Pedology                B. Pedagogy  
C. Ecology                D. Pomology

Ans. A.

61. If waste materials contaminate the source of drinking water, which of the following diseases will spread?

- A. Scurvy                    B. Typhoid  
C. Malaria                  D. Anaemia

Ans. B.

62. Pneumonia is a bacterial disease caused by the type of bacteria called \_\_\_\_\_

- A. Bacilli                    B. Cocci  
C. Sprilli                    D. Vibrio

Ans. B.

63. Which mosquito is the carrier of Zika virus?

- A. Culex                    B. Aedes  
C. Anopheles              D. Culiseta

Ans. B.

64. Root cap is derived from

- A. Dermatogen            B. Calypetrogen  
C. Protoderm              D. Histogen

Ans. B.

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