

**TENTH STD SCIENCE**  
**SLOW LEARNERS MATERIAL**  
**2022 -2023**

**10 – SCIENCE**  
**DIXDAR**

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## 1. LAWS OF MOTION

### 1. Define inertia. Give its classification.

#### Inertia:

The inherent property of a body to resist any change in its state of rest or motion is called inertia.

**Types of inertia:** 1. Inertia of rest.      2. Inertia of motion      3. Inertia of direction

### 2. Classify the types of force based on their application?

**Types of Force:** 1. Like parallel force    2. Unlike parallel force

### 3. If a 5 N and a 15 N forces are acting opposite to one another. Find the resultant force and the direction of action of the resultant force

Given,  $F_1 = 5N$        $F_2 = 15N$

Two forces acting opposite to one another. Therefore, Resultant force is,

$$F_{\text{net}} = F_2 - F_1$$

$$F_{\text{net}} = 15 - 5 = 10N.$$

Resultant Force = 10 N. The direction of  $F_{\text{net}}$  is 15 N.

### 4. Differentiate mass and weight.

Mass	Weight
Fundamental quantity	Derived quantity
Quantity of matter	Gravitational force
Its unit Kg	Its unit Newton
scalar quantity	vector quantity

### 5. Define moment of a couple.

- ♣ The product of the forces and the perpendicular distance is called moment of a couple  $M = F \times S$
- ♣ Its SI unit is Nm.

### 6. State the principle of moments.

- ♣ At equilibrium, the algebraic sum of the moments of all the individual forces about any point is equal to zero.

### 7. State Newton's second law.

- ♣ The force acting on a body is directly proportional to the rate of change of linear momentum of the body  $F = ma$

### 8. Why a spanner with a long handle is preferred to tighten screws in heavy vehicles?

- ♣ High torque with less force
- ♣ Moment of force =  $F \times d$

### 9. While catching a cricket ball the fielder lowers his hands backwards. Why?

- ♣ Increase the time of contact
- ♣ Decrease the impulse
- ♣ Thus he pulls back his hand while catching the ball.

### 10. How does an astronaut float in a space shuttle?

- ♣ Space station and astronauts have equal acceleration, they are under free fall condition.
- ♣ Hence, both the astronauts and the space station are in the state of weightlessness.

**Answer in detail:****1. What are the types of inertia? Give an example for each type.****Types of Inertia**

1. Inertia of rest
2. Inertia of motion
3. Inertia of direction

**a) Inertia of rest:**

- ♣ To resist a body to change its state of rest Ex: After Shaking leaves fall down

**b) Inertia of motion:**

- ♣ To resist a body to change its state of Motion Ex: An athlete runs some distance before jumping

**c) Inertia of direction**

- ♣ To resist a body to change its direction. Ex: a sharp turn while driving a car, you tend to lean side ways.

**2. State Newton's laws of motion?****a) Newton's First law**

- ♣ Everybody continues to be in its state of rest or the state of uniform motion along a straight line unless it is acted upon by some external force.

**b) Newton's second law**

- ♣ The force acting on a body is directly proportional to the rate of change of linear momentum of the body  $F = ma$

**c) Newton's third law**

- ♣ For every action, there is an equal and opposite reaction.  $F_B = - F_A$

**3. Describe rocket propulsion.**

- ♣ Based on Law of conservation of linear momentum and Newton's III law of motion.
- ♣ Filled with fuel in the propellant tank
- ♣ When the rocket is fired, producing a huge momentum.
- ♣ This momentum makes the rocket project forward.
- ♣ The mass of the rocket gradually decreases, until the fuel is completely burnt out.
- ♣ The mass of the rocket decreases with altitude, which results in gradual increase in velocity of the rocket.
- ♣ At one stage, it reaches escape velocity

**4. Give the applications of universal law of gravitation.**

- ♣ Dimensions of heavenly bodies can be measured
- ♣ Mass, radius of the Earth, acceleration due to gravity can be calculated.
- ♣ Helps in discovering new stars and planets.
- ♣ To Explain the germination of roots using geotropism.
- ♣ To predict the path of the astronomical bodies.

**Short Answers****1. What is refractive index?**

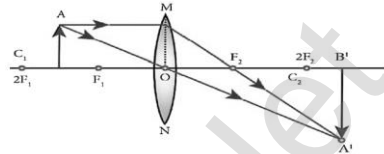
- ♣ The ratio of speed of light in vacuum to the speed of light in a medium is refractive index.

$$\mu = \frac{c}{v}$$

**2. State Snell's law.**

- ♣ The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media.

$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$$

**3. Draw a ray diagram to show the image formed by a convex lens when the object is placed between F and 2F.****4. Define dispersion of light**

- ♣ When a beam of white light refracted through any transparent media. It is split into its component colours. This phenomenon is called dispersion of light.

**5. State Rayleigh's law of scattering**

- ♣ The amount of scattering of light is inversely proportional to the fourth power of its wavelength.

$$S \propto \frac{1}{\lambda^4}$$

**6. Differentiate convex lens and concave lens.**

Convex lens	Concave lens
Thicker in the middle than at edge	Thinner in the middle than at edge.
Converging lens	Diverging lens
It is used to treat Hypermetropia	It is used to treat myopia
Produces mostly real images	Produces virtual images

**7. What is power of accommodation of eye?**

- ♣ The ability of the eye lens to focus nearby as well as the distant objects is called power of accommodation of the eye.

**8. What are the causes of 'Myopia'?**

- ♣ Lengthening of eye ball.
- ♣ The focal length of eye lens is reduced
- ♣ The image of distance objects are formed before retina.

**9. Why does the sky appear in blue colour?**

- ♣ The blue colour of shorter wavelength is scattered to a great extent
- ♣ This scattering causes the sky to appear in blue colour.

**10. Why are traffic signals red in colour?**

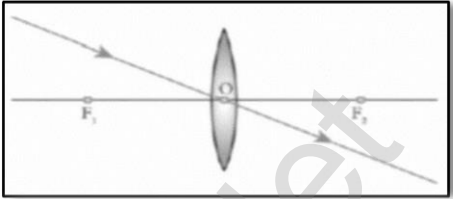
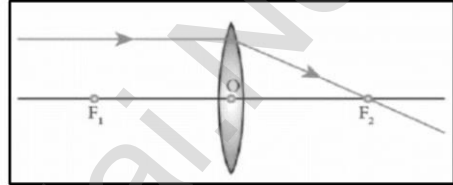
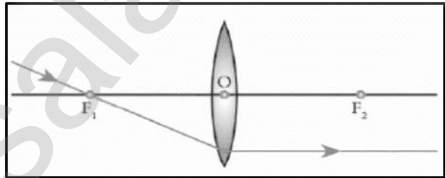
- ♣ Red light has longest wavelength.
- ♣ The Red light travels long distance. Therefore, red colour used in traffic signals.

**Answer in detail:**

**1. List any five properties of light. (Write any five points)**

- ♣ Light is a form of energy.
- ♣ Light always travels along a straight line.
- ♣ Light does not need medium for its propagation.
- ♣ The speed of light in air is  $C = 3 \times 10^8 \text{ms}^{-1}$
- ♣ Light is in the form of waves,  $C = \nu \lambda$
- ♣ Violet light has the lowest wavelength, and red light has the highest wavelength.

**2. Explain the rules for obtaining images formed by a convex lens with the help of ray diagram.**

<p><b>Rule 1</b> When a ray of light strikes the convex lens obliquely at its optical centre, it continues to follow its path without any deviation.</p>	
<p><b>Rule 2</b> When rays parallel to the principal axis strikes a convex lens, the refracted rays are converged to the principal focus.</p>	
<p><b>Rule 3</b> When a ray passing through the principal focus strikes a convex lens the refracted ray will be parallel to the principal axis.</p>	

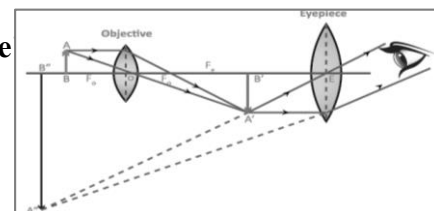
**3. Differentiate the eye defects: Myopia and Hypermeteropia**

Myopia	Hypermeteropia
short sightedness	long sightedness.
Lengthening of eye ball	Shortening of eye ball.
Nearby objects can be seen clearly but distant objects cannot be seen clearly.	Distant objects can be seen clearly but nearby objects cannot be seen clearly.
The image of distant objects are formed before retina.	The image of nearby objects are formed behind retina.
This defect can be corrected using concave lens.	This defect can be corrected using convex lens.

**4. Explain the construction and working of a 'Compound Microscope**

**Construction**

- ❖ It consists of two convex lenses
- ❖ The lens is placed near the object is called as objective lens
- ❖ The lens with near the observer's eye is called eye lens
- ❖ Both lens area fixed in a narrow tube with adjustable provision.



**Working**

- ❖ The object AB is placed at a distance slightly greater than the focal length of objective lens
- ❖ A real, inverted and magnified image A'B' is formed at the other side of the objective lens.
- ❖ This image A'B' behaves as the object for the eye lens.
- ❖ The position of the eye lens is adjusted in such a way, that the image falls within the principal focus of the eyepiece.
- ❖ This eyepiece forms a virtual, enlarged and erect image A''B'' on the same side of the object.

**Short Answers****1. Define one calorie.**

- ♣ One calories is defined as the amount of heat energy required to rise the temperature of 1 gram of water through 1°C.

**2. Distinguish between linear, arial and superficial expansion.**

Linear Expansion	Arial / Superficial Expansion
When a body is heated, the length of the body changes	When a body is heated, the area of the body changes
Coefficient of linear expansion $\alpha_L = \frac{\Delta L}{L_0 \Delta T}$	Coefficient of Arial expansion $\alpha_A = \frac{\Delta A}{A_0 \Delta T}$

**3. What is co-efficient of cubical expansion?**

- ♣ The ratio of increase in volume of the body per degree rise in temperature to its unit volume is called as coefficient of cubical expansion.
- ♣ The SI unit is  $K^{-1}$   $\alpha_v = \frac{\Delta V}{V_0 \Delta T}$

**4. State Boyle's law.**

- ♣ When the temperature of a gas is kept constants, the volume of a fixed mass of gas is inversely proportional to its pressure.  $P \propto \frac{1}{V}$

**5. State-the law of volume.**

- ♣ When the pressure of gas is kept constant, the volume of a gas is directly proportional to the temperature of the gas.  $V \propto T$

**6. Distinguish between ideal gas and real gas.**

Ideal gas	Real gas
If the atoms or molecules of a gas do not interact with each other	If the molecule or atom of a gas interact with each other
Force of attraction is very weak	There is no force of attraction

**7. What is co-efficient of real expansion?**

- ♣ The ratio of the true rise in the volume of the liquid per degree rise in temperature to its unit volume.
- ♣ The SI unit is  $K^{-1}$

**8. What is co-efficient of apparent expansion?**

- ♣ The ratio of the apparent rise in the volume of the liquid per degree rise in temperature to its unit volume.
- ♣ The SI unit is  $K^{-1}$ .

**9. State Avogadro's Law?**

- ♣ At constant pressure and temperature, the volume of a gas is directly proportional to number of atoms or molecules present in it.  $V \propto n$

**10. What is Avogadro's number?**

- ♣ Avogadro's number ( $N_A$ ) is the total number of atoms per mole of the substance.
- ♣ It is equal to  $6.023 \times 10^{23}/\text{mol}$ .



**Answer in detail:****1. Derive the ideal gas equation.**

An ideal gas obeys Boyle's law, Charles's law and Avogadro's law.

According to Boyle's law  $PV = \text{Constant}$

According to Charles's law  $\frac{V}{T} = \text{Constant}$

According to Avogadro's law  $\frac{V}{n} = \text{Constant}$

Combine these three equations

$$\frac{PV}{nT} = \text{Constant}$$

Substitute  $n = \mu N_A$  value we get

$$\frac{PV}{\mu N_A T} = \text{Constant}$$

The Constant =  $K_B$  (Boltzman constant)

$$\frac{PV}{\mu N_A T} = K_B$$

$$PV = \mu N_A K_B T$$

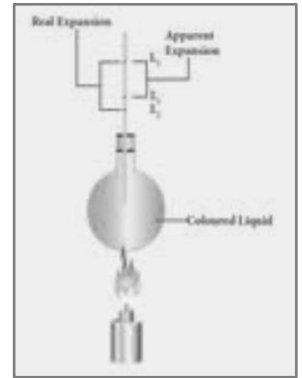
Here  $\mu N_A K_B = R$ . (Universal Constant)

$$R = 8.31 \text{ mol}^{-1} \text{K}^{-1}$$

$$PV = RT$$

**2. Explain the experiment of measuring the real and apparent expansion of a liquid with a neat diagram.**

- ❖ The liquid whose real and apparent expansion is to be determined is poured in container up to a level. Mark this level as  $L_1$ .
- ❖ Now, heat the container and the liquid using a burner. Initially the container receives the thermal energy and it expands.
- ❖ As a result, the volume of the liquid appears to have reduced. Mark this reduced level of liquid as  $L_2$ .
- ❖ On further heating, the thermal energy supplied to the liquid through the container results in the expansion of the liquid. Hence, the level of liquid rises to  $L_3$ .
- ❖ The difference between the levels  $L_1$  and  $L_3$  is called as apparent expansion. Apparent expansion =  $L_3 - L_1$
- ❖ The difference between the levels  $L_2$  and  $L_3$  is called real expansion. Real expansion =  $L_3 - L_2$

**4. ELECTRICITY****Short Answers****1. Define the unit of current.**

- ❖ The SI unit of electric current is ampere (A).
- ❖ The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross section of a conductor, in one second.  $\mathbf{1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}}$

**2. What happens to the resistance, as the conductor is made thicker?**

- ❖ The resistance decreases, as the conductor is made thicker.

**3. Why is tungsten metal used in bulbs, but not in fuse wires?**

- ❖ Tungsten has high melting point, it can bear high heat for glowing.
- ❖ But in fuse wire, the wire used in it should melt.
- ❖ So a metal wire which has low melting point should be used in a fuse wire, but not tungsten wire.

**4. Name any two devices, which are working on the heating effect of the electric current.**

1. Electric iron
2. Electric heater.

5. Define electric potential and potential difference.

**Electric potential**

- ♣ The amount of work done in moving a unit positive charge from infinity to that point against the electric force.

**Potential difference.**

- ♣ The electric potential difference between two points is defined as the amount of work done in moving a unit positive charge from one point to another point against the electric force.  $V = \frac{W}{Q}$

6. What is the role of the earth wire in domestic circuits?

- ♣ The earth wire provides a low resistance path to the electric current.
- ♣ The earth wire sends the current from the body of the appliance to the earth
- ♣ Thus, the earth wire serves as a protective conductor, which saves us from electric shocks.

7. State Ohm's law.

- ♣ At a constant temperature, the steady current 'I' flowing through a conductor is directly proportional to the potential difference 'V' between two ends of the conductor.  $V = IR$

8. Distinguish between the resistivity and conductivity of a conductor.

Resistivity	Conductivity
The resistance of a conductor of unit length and unit of cross section.	The reciprocal electrical resistivity
It's unit is ohm metre	It's unit is mho metre <sup>-1</sup> .

9. What connection is used in domestic appliances and why?

- ♣ All the circuits in a house are connected in parallel, so that the disconnection of one circuit does affect the other circuit.

**Answer in detail:**

1. a) What is meant by electric current? b) Name and define its unit. c) Which instrument is used to measure the electric current? How should it be connected in a circuit?

a) Electric current

- ♣ The rate of flow of charges in a conductor.  $I = \frac{Q}{t}$

b) Name and define its unit.

- ♣ The SI unit of electric current is ampere (A).
- ♣ The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross section of a conductor, in one second. ,  $1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}$

c) Which instrument is used to measure the electric current? How should it be connected in a circuit?

Ammeter. It should be connected in a series in a circuit.

2. a) State Joule's law of heating. b) An alloy of nickel and chromium is used as the heating element. Why? c) How does a fuse wire protect electrical appliances?

a) Joule's law of heating

Joules' law of heating states that the heat produced in any resistor is

- ♣ Directly proportional to the square of the current passing through the resistor.
- ♣ Directly proportional to the resistance of the resistor.
- ♣ Directly proportional to the time for which the current passing through the resistor.  $H = I^2Rt$

b) An alloy of nickel and chromium is used as the heating element. Why?

- It has high resistivity.
- It has a high melting point.
- It is not easily oxidized.



c) How does a fuse wire protect electrical appliances?

♣ When a large current passes through the circuit, the fuse wire melts due to joule's heating effect and hence the circuit gets disconnected

3. Explain about domestic electric circuits.(circuit diagram not required)

- ♣ Important components of the main box are (i) a fuse box and (ii) meter.
- ♣ Two insulated wire 1) Red wire → Live wire 2) Black wire → neutral wire.
- ♣ An electrical potential at 220 V.
- ♣ Both, the live wire and the neutral wire enter into box where the main switch
- ♣ It passes to main switch which has to two separate circuits.  
1) 5A rating. 2) 15 A rating.
- ♣ It should be noted that all the circuits in a house are connected in parallel.

4. a) What are the advantages of LED TV over the normal TV? b) List the merits of LED bulb.

a) The advantages of LED TV over the normal TV

- ♣ It has brighter picture quality.
- ♣ It is thinner in size.
- ♣ It used less power and consumes very less energy.
- ♣ Its life span is more.
- ♣ It is more reliable.

b) List the merits of LED bulb.

- ♣ Low power , No loss of energy
- ♣ It is not harmful to the environment.
- ♣ A wide range of colours is possible here.
- ♣ Mercury and other toxic material are not required.

## 5. ACOUSTICS

### Short Answers

1. What is a longitudinal wave?

- ♣ These are the waves in which the particles of the medium vibrate along the direction of wave motion is called longitudinal wave.

2. What is the audible range of frequency?

- ♣ 20 Hz to 20 kHz

3. What is the minimum distance needed for an echo?

- ♣ 17.2 m

4. Name three animals, which can hear ultrasonic vibrations.

- 1) Mosquito      2) Dogs      3) Bats

5. Why does sound travel faster on a rainy day than on a dry day?

- ♣ Presence of moisture in air decreases the density of air.
- ♣ Velocity increases with the decrease in density
- ♣ Hence, velocity of sound increases on a rainy day.

6. Why does an empty vessel produce more sound than a filled one?

- ♣ The amplitude of vibration of air molecules is greater than liquid molecules, so empty vessel produces more sound than a filled one.

7. Explain why, the ceilings of concert halls are curved.
- ❖ The ceiling of concert halls are made curved so that sound, after reflection from the curved ceiling, reaches all the paths of the hall.
  - ❖ A curved ceiling actually acts like a large concave soundboard and reflection sound down onto the audience sitting in the Hall.
8. Mention two cases in which there is no Doppler effect in sound?
- ❖ When source (S) and listener (L) both are at rest.
  - ❖ When source S and L are moving in mutually perpendicular direction.
  - ❖ When S and L move in such a way that distance between them remains constant.
9. Difference between the Sound and Light waves.

SOUND	LIGHT
Medium is required for the propagation	Medium is not required for the propagation.
Longitudinal.	Transverse.
A speed of about $340\text{ms}^{-1}$ at NTP.	A speed of $3 \times 10^8 \text{ms}^{-1}$ .

**Answer in detail:**

**1. What are the factors that affect the speed of sound in gases?**

**Effect of density :**

The velocity decreases as the density of the gas increases.  $V \propto \sqrt{\frac{1}{d}}$

**Effect of temperature :**

The velocity of sound in a gas increases with the increase in temperature.  $V \propto \sqrt{T}$ .

**Effect of relative humidity :**

Humidity increases, the speed of sound increases.

**2. a) What do you understand by the term ‘ultrasonic vibration’?**

These are sound waves with a frequency greater than 20 kHz.

**b) State three uses of ultrasonic vibrations.**

- ❖ Used in SONAR to measure the depth of sea.
- ❖ Used for scanning the position of stones in the kidney.
- ❖ To make an image of a person’s internal body structure.

**c) Name three animals, which can hear ultrasonic vibrations.**

1. Mosquito, 2. Dogs, 3. Bats

**3. What is an echo? a) State two conditions necessary for hearing an echo. b) What are the medical applications of echo?c) How can you calculate the speed of sound using echo?**

**Echo :**

An echo is the sound reproduced due to the reflection of the original sound

**a) Two conditions necessary for hearing an echo:**

1. The minimum time gap between the original sound and an echo must be 0.1 s.
2. The minimum distance required to hear an echo is 17.2 m.

**b) The medical applications of echo:**

Echo is used in obstetric ultrasonography,

**a) Calculation speed of sound :**

$$\text{Speed of Sound} = \frac{\text{Distance travelled}}{\text{Time taken}} = \frac{2d}{t}$$

## 6. NUCLEAR PHYSICS

### Short Answers

1. Who discovered natural radioactivity? Henri Becquerel
2. Which radioactive material is present in the ore of pitchblende? Uranium, Radium
3. Write any two elements, which are used for inducing radioactivity? Boron, Aluminium
4. Write the name of the electromagnetic radiation, which is emitted during a natural radioactivity. Gamma
5. If A is a radioactive element which emits an  $\alpha$  - particle and produces  ${}_{104}\text{Rf}^{259}$ . Write the atomic number and mass number of the element A. Mass number = 263, Atomic number = 106
6. What is the average energy released from a single fission process? 200MeV (or)  $3.2 \times 10^{-11}$  J
7. Which hazardous radiation is the cause for the genetic disease? Gamma ray
8. What is the amount of radiation that may cause death of a person when exposed to it? 600 R
9. When and where was the first nuclear reactor built? 1942 at Chicago, U.S.A
10. Give the SI unit of radioactivity. Becquerel (Bq)
11. Which material protects us from radiation? Lead
12. Write any three features of natural and artificial radioactivity.

Natural radioactivity	Artificial radioactivity
Self- disintegration of a nucleus.	Disintegration of nucleus through induced process.
Alpha, beta and gamma radiations are emitted.	Mostly elementary particles such as neutron, positron, etc. are emitted.
Spontaneous process.	Induced process.
This cannot be controlled.	This can be controlled.

### 13. Define Critical mass.

- ♣ The minimum mass of a fissile material necessary to sustain the chain reaction is known as 'critical mass'.

### 14. Define one Roentgen.

- ♣ The quantity of radioactive substance which produces a charge of  $2.58 \times 10^{-4}$  coulomb in 1 kg of air under standard conditions of pressure, temperature and humidity.

### 15. State Soddy and Fajan's displacement law.

- ♣ When a radioactive element emits an alpha particle, a daughter nucleus is formed whose mass number is less by 4 units and the atomic number is less by 2 units, than the mass number and atomic number of the parent nucleus.
- ♣ When a radioactive element emits a beta particle, a daughter nucleus is formed whose mass number is the same and the atomic number is more by 1 unit, than the atomic number of the parent nucleus.

### 16. Give the function of control rods in a nuclear reactor.

- ♣ To control the number of neutrons
- ♣ To control chain reaction.
- ♣ Mostly boron or cadmium rods are used as control rods.

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17. In Japan, some of the newborn children are having congenital diseases. Why?
- ♣ Due to high exposure of radiation
  - ♣ Caused by atom bomb during second world war
18. Mr. Ramu is working as an X - ray technician in a hospital. But, he does not wear the lead aprons. What suggestion will you give to Mr. Ramu?
- ♣ Lead coated aprons and lead gloves should be used .
  - ♣ Avoid eating while handling radioactive materials.
  - ♣ Dosimeters should be worn by the users to check the level of radiation.
19. What is stellar energy?
- ♣ Fusion reaction that takes place in the cores of the stars like Sun emit a large amount of energy, which is called as ‘stellar energy’.
20. Give any two uses of radioisotopes in the field of agriculture?
- ♣ The radioisotope of phosphorous (P-32) helps to increase the productivity of crops.
  - ♣ To kill the insects and parasites and prevent the wastage of agricultural products.

**Answer in detail:**

1. Explain the process of controlled and uncontrolled chain reactions.

**Controlled chain reaction:**

- ♣ In the controlled chain reaction, the number of neutrons released is maintained to be one.
- ♣ The energy released due to a controlled chain reaction can be utilized for constructive purposes.
- ♣ Controlled chain reaction is used in a nuclear reactor to produce energy in a sustained and controlled manner.

**Uncontrolled chain reaction:**

- ♣ In the uncontrolled chain reaction, the number of neutrons multiplies indefinitely and causes fission in a large amount of the fissile material.
- ♣ This results in the release of a huge amount of energy within a fraction of a second.
- ♣ This kind of chain reaction is used in the atom bomb to produce an explosion.

2. Compare the properties of alpha, beta and gamma radiations.

<b><math>\alpha</math> rays</b>	<b><math>\beta</math> rays</b>	<b><math>\gamma</math> rays</b>
Helium nucleus	electrons ( ${}_{-1}e^0$ ),	photons.
Positively charged	Negatively charged	Neutral particles.
Ionising power greater than $\beta$ rays and $\gamma$ rays.	Ionising power Comparatively low	Ionising power Very less ionization power
Penetrating power Low	Penetrating power is greater than that of $\alpha$ rays.	They have a very high penetrating power
Deflected by both Effect of electric of magnetic field	Deflected by both Effect of electric of magnetic field	They are not deflected by both Effect of electric of magnetic field
1/10 to 1/20 times the speed of light.	9/10 times the speed of light.	They travel with the speed of light.

3. What is a nuclear reactor? Explain its essential parts with their functions.

**Nuclear reactor:**

- ♣ A device in which the nuclear fission reaction takes place in a self-sustained and controlled manner to produce electricity.

**Fuel:**

- ♣ A fissile material is used as the fuel.
- ♣ The commonly used fuel material is uranium.

**Moderator:**

- ♣ It is used to slow down the high energy neutrons to provide slow neutrons.
- ♣ Graphite and heavy water are the commonly used moderators.

**Control rod:**

- ♣ To control the number of neutrons in order to have sustained chain reaction.
- ♣ Mostly boron or cadmium rods are used as control rods.

**Coolant:**

- ♣ A coolant is used to remove the heat produced in the reactor core, to produce steam.
- ♣ This steam is used to run a turbine in order to produce electricity.

**Protection wall**

- ♣ A thick concrete lead wall is built around the nuclear reactor in order to prevent the harmful radiations from escaping into the environment.
- ♣ Water, air and helium are some of the coolants.

**4. Compare Nuclear fission and nuclear fusion.**

Nuclear Fission	Nuclear Fusion
The process of breaking up (splitting) of a heavy nucleus into two smaller nuclei is called ' <b>nuclear fission</b> '.	Nuclear fusion is the combination of two lighter nuclei to form a heavier nucleus.
Can be performed at room temperature.	Extremely high temperature and pressure is needed.
Alpha, beta and gamma radiations are emitted.	Alpha rays, positrons, and neutrinos are emitted.
Fission leads to emission of gamma radiation.	Only light and heat energy is emitted.

**5. Explain uses of Radioactivity in medicine****Uses of Radioactivity in medicine**

- ♣ Radio sodium ( $\text{Na}^{24}$ ) is used for the effective functioning of heart.
- ♣ Radio - Iodine ( $\text{I}^{131}$ ) is used to cure goiter.
- ♣ Radio - iron is ( $\text{Fe}^{59}$ ) is used to diagnose anemia and also to provide treatment for the same.
- ♣ Radio phosphorous ( $\text{P}^{32}$ ) is used in the treatment of skin diseases.
- ♣ Radio cobalt ( $\text{Co}^{60}$ ) and radio - gold ( $\text{Au}^{198}$ ) are used in the treatment of skin cancer.
- ♣ Radiations are used to sterilize the surgical devices as they can kill the germs and microbes.

**7. ATOMS AND MOLECULES****Short Answers****1. Define: Relative atomic mass.**

Relative atomic mass of an element is the ratio between the average mass of its isotope to  $1/12^{\text{th}}$  part of the mass of a carbon-12 atom.

$$\text{Relative atomic mass } A_r = \frac{\text{Average mass of the isotopes of the element}}{1/12^{\text{th}} \text{ of the mass of one carbon 12 atom}}$$

**2. Write the different types of isotopes of oxygen and its percentage abundance.**

Isotope	Mass (amu)	% abundance
${}_8\text{O}^{16}$	15.9949	99.757
${}_8\text{O}^{17}$	16.9991	0.038
${}_8\text{O}^{18}$	17.9992	0.205

The atomic mass of oxygen =  $(15.9949 \times 0.99757) + (16.9991 \times 0.00038) + (17.9992 \times 0.00205)$

$$= 15.999 \text{ amu.}$$

## 3. Define: Atomicity.

The number of atoms present in the molecule is called atomicity.

## 4. Give any two examples for heterodiatomic molecules.

HCl, HF

## 5. What is Molar volume of a gas?

- ❖ Molar volume of a gas: One mole of any gas occupies 22.4 litre (or) 22400 ml at STP. This volume is called Molar Volume.

## 6. Find the percentage of nitrogen in ammonia. (N-14, H-1)

$$\text{Molar mass of NH}_3 = 14 + 3 = 17 \text{ g}$$

$$\text{Mass \% of Nitrogen} = \frac{14}{17} \times 100 = 82.35 \%$$

## 7. Calculate the number of water molecule present in one drop of water, which weighs 0.18 g.

$$\begin{aligned} \text{Number of molecules} &= \frac{\text{Avogadro number} \times \text{mass of water}}{\text{Gram molecular mass}} \\ &= \frac{6.023 \times 10^{23} \times 0.18}{18} = 0.06023 \times 10^{23} \\ \text{The no of water molecules} &= 6.023 \times 10^{25}. \end{aligned}$$

8.  $\text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3$ 

(The atomic mass of nitrogen is 14, and that of hydrogen is 1)

1 mole of nitrogen (\_\_\_ g) + 3 moles of hydrogen (\_\_\_ g)  $\rightarrow$  2 moles of ammonia (\_\_\_ g)

(The atomic mass of N is 14 and that of hydrogen is 1)



1 mole of nitrogen (28g) + 3 moles of hydrogen (6g)  $\rightarrow$  2 moles of ammonia (34 g)

9. Calculate the number of moles in i) 27g of Al ii)  $1.51 \times 10^{23}$  molecules of  $\text{NH}_4\text{Cl}$ 

## i) 27g of Al:

$$\text{Number of moles} = \frac{\text{Mass of Al}}{\text{Atomic mass of Al}} = \frac{27}{27} = 1 \text{ mole.}$$

ii)  $1.51 \times 10^{23}$  molecules of  $\text{NH}_4\text{Cl}$  :

Molecular mass of  $\text{NH}_4\text{Cl} = 53.5 \text{ g}$

$$\begin{aligned} \text{Number of mole} &= \frac{\text{Number of Molecules}}{\text{Avogador's number}} \\ &= \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}} = \frac{1}{4} = 0.25 \text{ mole.} \end{aligned}$$

## Answer in detail:

## 1. Give the salient features of "Modern atomic theory".

- ❖ An atom is no longer indivisible (after the discovery of electron; Proton and neutron)
- ❖ Atoms of the same element may have different atomic mass (isotopes  $_{17}\text{Cl}^{35}$ ,  $_{17}\text{Cl}^{37}$ )
- ❖ Atoms of different elements may have same atomic masses (isobars  $_{18}\text{Ar}^{40}$ ,  $_{20}\text{Ca}^{40}$ ).
- ❖ Atom of one element can be transmitted into atoms of other elements. In other words, atom is no longer in destructive (artificial transmutation).
- ❖ Atoms may not always combine in a simple whole number ratio. (Eg: Glucose.
- ❖ Atom is the smallest particle that takes part in a chemical reaction.
- ❖ The mass of an atom can be converted into energy. ( $E = mc^2$ )



## 2. Derive the relationship between Relative molecular mass and Vapour density.

### (i) Relative Molecular Mass (Hydrogen scale)

The Relative Molecular Mass of a gas is the ratio between the mass of one molecular of the gas of one atom of Hydrogen

### (ii) Vapour Density:

Vapour density is the ratio of the mass of a certain volume of a gas or vapour to the mass of an equal volume of hydrogen, measured under the same conditions of temperature and pressure.

$$\text{Vapour density (V.D)} = \frac{\text{mass of a given volume of gas at STP}}{\text{mass of the same volume of Hydrogen}}$$

### According to Avogadro's law

$$\text{Vapour Density (at STP)} = \frac{\text{mass of n molecules of a gas at STP}}{\text{mass of n molecules of hydrogen}}$$

### Hydrogen is diatomic molecule so,

$$\text{Vapour Density} = \frac{\text{mass of 1 molecule of gas at STP}}{2 \times \text{mass of 1 atom of hydrogen}}$$

$$2 \times \text{Vapor density} = \frac{\text{Mass of 1 molecule of a gas at STP}}{\text{mass of 1 atom of hydrogen}}$$

$$2 \times \text{Vapour density} = \text{Relative molecular mass of a gas.}$$

$$\text{Relative molecular mass} = 2 \times \text{Vapour density.}$$

## 3. Distinguish between atoms and molecules.

Atom	Molecule
The smallest particle of an element.	The smallest particle of an element or compound
Does not exist in free state (Except Noble gas)	Molecule exists in free state.
highly reactive. (Except Noble gas)	Molecules are less reactive.
Atom does not have a chemical bond.	Atoms in a molecule are held by chemical bonds.

## 4. Write the application of Avogadro's law

- ♣ Explains Gay – Lussac's Law.
- ♣ To determine Atomicity of gases
- ♣ To derive molecular formula of gases
- ♣ To derive the relationship between molecular mass and vapour density
- ♣ To determine gram molecular mass ( 22.4 litre at STP)

## 8. PERIODIC CLASSIFICATION OF ELEMENTS

### Short Answers

#### 1. What is rust? Give the equation for formation of rust.

hydrated ferric oxide is known as rust.



#### 2. State two conditions necessary for rusting of iron.

- (i) Presence of moist air
- (ii) Presence of water
- (iii) Presence of oxygen

#### 3. Define Alloys?

- ♣ It is a homogeneous mixture of two or more metals or one or two more metals with non metals

#### 4. What is Amalgam ? Give Example?

- ♣ An alloy of mercury with metal
- ♣ Ex: Silver tin Amalgam

**Answer in detail:****1. What are the methods include to preventing of corrosion.**

(i) **Alloying** : The metals can be alloyed to prevent the process of corrosion. **Eg:** Stainless steel.

(ii) **Surface Coating**: It involves application of a protective coating over the metal.

*It is of the following types.*

<b>Galvanization</b>	zinc on iron sheets
<b>Electroplating</b>	coating the metal by electric current.
<b>Anodizing</b>	Change the corrosion resistant. Ex: Aluminium
<b>Cathodic Protection</b>	corrodible metal act as anode and the protected metal act as cathode

**2. a) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite.**

**b) Along with cryolite and alumina, another substance is added to the electrolyte mixture. Name the substance and give one reason for the addition.**

a) Bauxite ore does not dissolved in ordinary solution by adding caustic soda it can be dissolved

b) Fluorspar – Lowers the fusion – temperature of electrolyte

**9. SOLUTIONS****Short Answers****1. Define the term: Solution**

♣ A solution is a homogeneous mixture of two or more substances.

**2. What is mean by binary solution.**

♣ A solution consisting of two components are called binary solution.

**3. Give an example each i) gas in liquid ii) solid in liquid iii) solid in solid iv) gas in gas**

i) Gas in liquid - soda water

ii) Solid in liquid - salt in water (NaCl dissolved in water)

iii) Solid in solid - copper dissolved in gold

iv) Gas in gas - mixture of Helium and oxygen.

**4. What is aqueous and non-aqueous solution? Give an example.**

<b>Aqueous solution</b>	The solution in which water acts as a solvent	<b>E.g :</b> salt in water, Sugar in water,
<b>Non - Aqueous solution</b>	The solution in which any liquid other than water acts as a solvent	<b>E.g :</b> Sulphur dissolved in carbon - disulphide

**5. Define Volume percentage**

♣ The percentage by volume of solute (in ml) present in the given volume of the solution.

**6. The aquatic animals live more in cold region Why?**

♣ The solubility of gas is more at lower temperature where as it decreases with increasing temperature.

**7. Define Hydrated salt.**

♣ The ionic substances, which contain water of crystallization, are known as hydrated salts.

**8. A hot saturated solution of copper sulphate forms crystals as it cools. Why?**

♣ solubility increases with increase in temperature while decreases with decrease in temperature. The solubility of copper sulphate at 25°C is 20.7 g in 100g of water.

## 9. Classify the following substances into deliquescent, hygroscopic.

(Conc. Sulphuric acid, Copper sulphate penta hydrate, Silica gel, Calcium chloride, and Gypsum salt.)

Deliquescent substances	Hygroscopic substances
Calcium chloride	Conc. Sulphuric acid, Silica gel, Gypsum salt

**Answer in detail:****1. Write notes on i) saturated solution ii) unsaturated solution****i) Saturated solution:**

A solute in which no more solute can be dissolved in a definite amount of the solvent at a given temperature.

**Example :** 36 g of sodium chloride in 100g of water at 25°C forms saturated solution.

**ii) Un saturated solution:**

solution is one that contains less solute than that of the saturated solution at a given temperature.

**Example :** 10 g or 20 g or 30 g of sodium chloride dissolved in 100g of water at 25°C forms an unsaturated solution.

**2. Write notes on various factors affecting solubility.**

There are three main factors which govern the solubility of a solute.

They are,

- i) Nature of the solute and solvent
- ii) Effect of Temperature
- iii) Pressure

**i) Nature of the solute and solvent**

❖ Non polar compounds do not dissolve in polar solvents. Polar compounds do not dissolve in non polar solvents.

**ii) Effect of temperature****a) Solubility of solid in liquid:**

- ❖ solubility of a solute in a liquid solvent increases with increase in temperature.
- ❖ In endothermic process solubility increases with increase in temperature.
- ❖ In exothermic process, solubility decreases with increase in temperature.

**b) Solubility of gases in liquid:**

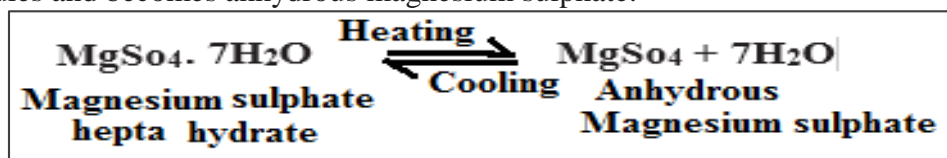
❖ The solubility of gas is more at lower temperature whereas it decreases with increasing temperature.

**iii) Effect of Pressure:**

❖ Effect of pressure is observed only in the case of solubility of a gas in a liquid. When the pressure is increased, the solubility of a gas is also increased.

**3. a) What happens when MgSO<sub>4</sub>.7H<sub>2</sub>O is heated? Write the appropriate equation****b) Define solubility**

a) When magnesium sulphate heptahydrate crystals are gently heated, it loses seven water molecules and becomes anhydrous magnesium sulphate.



b) Solubility is defined as the number of grams of a solute that can be dissolved in 100g of a solvent to form its saturated solution at a given temperature and pressure.

**Ex:** 36 g of sodium chloride need to be dissolved in 100g of water to form its saturated solution.

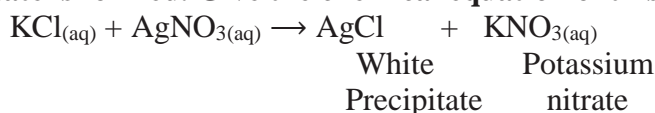
4. In what way hygroscopic substances differ from deliquescent substances.

Hygroscopic substances	Deliquescence substances
1. They absorb moisture and do not dissolve.	1. They absorb moisture and dissolve.
2. Do not change its physical state	2. Change its physical state
3. amorphous solids or liquids.	3. Substance are crystalize solids.

## 10. TYPES OF CHEMICAL REACTION

### Short Answers

1. When an aqueous solution of potassium chloride is added to an aqueous solution of silver nitrate, a white precipitate is formed. Give the chemical equation of this reaction.



2. Why does the reaction rate of a reaction increase on raising the temperature?

- ♣ Most of the reactions go faster at higher temperature. Because adding heat to the reactants,
- ♣ it provides energy to break more bonds. So, speed of the reaction is increased.

3. Define combination reaction. Give one example for an exothermic combination reaction.

A combination reaction is a reaction in which two or more reactants combine to form a compound..Ex :

$$\text{H}_2(g) + \text{H}_2(g) \rightarrow 2\text{HCl}(g)$$

4. Differentiate reversible and irreversible reactions.

Reversible reaction	Irreversible reaction
It can be reversed under suitable condition.	It cannot be reversed
Both forward and backward reactions take place relatively slow	It proceeds only in forward direction.
It attain equilibrium	completely converted into products.
	Equilibrium is not attained.

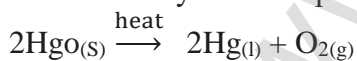
### Answer in detail:

1. What are called thermolysis reactions?

In this type of reaction, the reactant is decomposed by applying heat.

#### Example: 1

Mercury II oxide is decomposed into mercury metal and oxygen gas. As the molecule is dissociated by the absorption of heat. It is otherwise called "Thermolysis."



#### Example: 2

Calcium carbonate is heated, it breaks down into calcium oxide and carbon dioxide. It is a type of compound to compound / compound decomposition reaction.



Commonly decomposition reactions are endothermic reaction.

2. Explain the types of double displacement reactions with examples.

- ♣ When two compounds react with each other if their ions are interchanged, then the reaction is called double displacement reaction.

#### (i) Precipitate reaction :

When the clear aqueous solutions of potassium iodide and lead II nitrate are mixed, a double displacement reaction takes place between them.

Potassium and lead displace to one other and form a yellow precipitate of lead II oxide.

**(ii) Neutralization reaction :**

Sodium hydroxide with hydrochloric acid is a typical neutralization reaction. Here sodium replaces hydrogen from hydrochloric acid forming sodium chloride and water.

**3. Explain the factors influencing the rate of a reaction.****1. Nature of reactant:**

- ♣ The reaction of sodium with hydrochloric acid is faster than that with acetic acid.

**2. Concentration of the reactants:**

- ♣ Changing the amount of the reactants also increases the reaction rate.

**3. Temperature:**

- ♣ Most of the reactions go faster at higher temperature.

**4. Pressure:**

- ♣ If the reactants are gases, increasing their pressure increases the reaction rate.

**5. Catalyst:**

- ♣ A catalyst is a substance, which increases the reaction rate without being consumed in the reaction.

**6. Surface area of the reactants:**

- ♣ Powdered reactants have more surface area. The collision of reactant particle is increased.

**4. How does pH play an important role in everyday life?**

- ♣ Our body works within the pH range of 7.0 to 7.8. If any increases (or) decreases in this value leads to disease.
- ♣ pH of the saliva normally ranges between 6.5 to 7.5. When the pH of the mouth saliva falls below 5.5, the enamel get weathered.
- ♣ Toothpastes are generally basic it can neutralize the excess acid and prevent tooth decay.
- ♣ Citrus fruits require slightly alkaline soil, while rice require acidic soil and sugarcane requires neutral soil.
- ♣ The  $P^H$  of rain water is approximately 7. its  $P^H$  less than 7. It is called acid rain.

**5. What is a chemical equilibrium? What are its characteristics?**

**Chemical equilibrium:** Rate of forward reaction = Rate of backward reaction.

**Characteristics of equilibrium:**

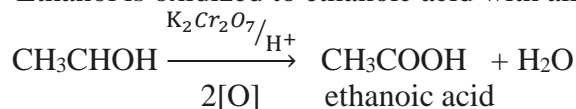
- ❖ In a chemical equilibrium the rates of the forward and backward reactions are equal.
- ❖ Pressure, concentration, colour, density, viscosity etc., of the system remain unchanged with time.
- ❖ Both the forward and backward reactions continue to occur even though it appears static externally.
- ❖ In physical equilibrium, the volume of all the phases remain constant.

**11. CARBON AND ITS COMPOUNDS****Short Answers****1. Name the simplest ketone and give its structural formula.**

- ♣  $(\text{CH}_3\text{COCH}_3)$  - Acetone

**2. How is ethanoic acid prepared from ethanol? Give the chemical equation.**

Ethanol is oxidized to ethanoic acid with alkaline  $\text{KmnO}_4$  or acidified  $\text{K}_2\text{Cr}_2\text{O}_7$





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3. How do detergents cause water pollution? Suggest remedial measures to prevent this pollution?

- ❖ Some detergents having a branched hydrocarbon chain are not fully biodegradable by micro-organisms present in water. So they cause water pollution.

**Remedial measures**

- ❖ Replacing detergents with branched hydro carbon chains with linear hydro carbon chains which are biodegradable.

5. Differentiate soaps and detergents.

Soap	Detergent
Sodium salt of long chain fatty acid	Sodium salts of sulphonic acids.
Biodegradable.	Non-biodegradable.
Poor foaming capacity	Rich foaming capacity
Prepared from animal fats or vegetable oils.	Prepared from hydrocarbon obtained from crude oil.
It form a scum in hard water.	Does not form a scum in hard water

**Answer in detail:**

1. What is called homologous series? Give any three of its characteristics?

- ❖ A group of organic compounds having same general formula and similar chemical are called homologous series.

**Important characteristics of homologous series:**

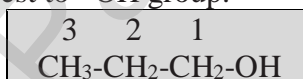
- Each series differs from  $\text{CH}_2$  group, molecular mass of 14 amu.
- All members of homologous series contain the same elements and function group.
- Chemical properties of the members of a homologous series are similar
- All the members can be prepared by a common method.

2. Arrive at, systematically, the IUPAC name of the compound:  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$ .

Step1: The present chain consists of 3 carbon atoms. The root word is “prop”

Step2: There are single bonds between the carbon atoms of the chain. So the primary suffix is “ane”.

Step3: The compound contain  $\text{-OH}$  group, it is an alcohol. The carbon chain is numbered from the end which is closest to  $\text{-OH}$  group.



Step 4: The locant number of  $\text{-OH}$  group is 1 and thus the secondary suffix is 1-ol

So the name of the compound is

Prop + ane + 1 - ol = Propan - 1 - ol

3. How is ethanol manufactured from sugarcane?

- ❖ Ethanol is manufactured from molasses. Molasses obtained the manufacture of sugar from sugarcane.

(i) Dilution of molasses

- ❖ Molasses is first diluted with water to bring down the concentration of sugar to about 8 to 10 percent.

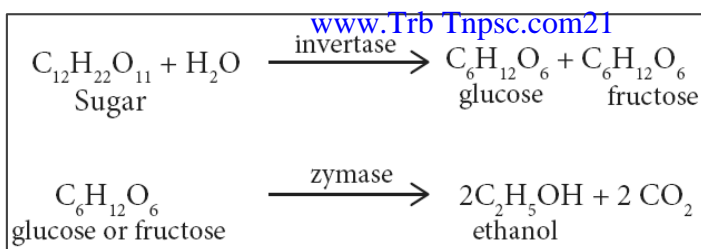
(ii) Addition of Nitrogen Source

- ❖ If the nitrogen content of the molasses is poor, it may be fortified by the addition of ammonium sulphate (or) ammonium phosphate.

(iii) Addition of yeast

- ❖ The solution obtained in step (ii) is collected to in large fermentation tanks and yeast is added to it. The mixture is kept at about 303 K for few days. During this period, the enzymes invertase about the conversion of sucrose.



**(iv) Distillation of Wash.**

- ❖ The fermented liquid containing 15 to 18 percent alcohol, is now subjected to fractional distillation.
- ❖ The main fraction drawn is an aqueous solution of ethanol which contains 95.5 % ethanol and 4.5 % of water. This is called rectified spirit.
- ❖ This mixture is then refluxed over quick lime for about 5 to 6 hours and then allowed to stand for 12 hours.
- ❖ On distillation of this mixture, pure alcohol (100%) is obtained. This is called absolute alcohol.

**5. Explain the mechanism of cleansing action of soap.**

- i) Polar end is attracted to water.
- ii) Non-polar end is attracted to dirt on the cloth.
- iii) The non polar end of the soap molecule traps the dirt
- iv) The polar end make the entire molecule soluble in water.
- v) When a soap is dissolved in water, the molecules join together as clusters called micelles.
- vi) The polar end of the soap molecules makes the micelles soluble in water.
- vii) Thus the dirt is washed away with the soap.

**6. Write the important of organic compound in our daily life.**

- ❖ Fuels like LPG, petrol, kerosene.
- ❖ Polymeric materials like tyre, plastic containers.
- ❖ Alcohols used as a solvent and an antiseptic agent.
- ❖ Formaldehyde used as a disinfectant.
- ❖ Ketones used as a solvent and stain remover.
- ❖ Ethers are used to anaesthetic agent and pain killer.
- ❖ All the cooking oils and lipids contain esters.

**12. PLANT ANATOMY AND PLANT PHYSIOLOGY****Short Answers****1. What is collateral vascular bundle?**

- ❖ Xylem lies towards the centre and phloem lies towards the periphery.

**2. Where does the carbon that is used in photosynthesis come from?**

- ❖ Carbon dioxide taken from atmosphere

**3. What is the common step is aerobic and anaerobic path way?**

- ❖ Glycolysis

**4. Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.**

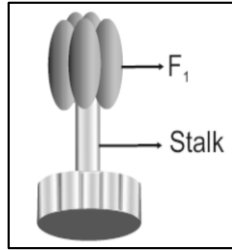
- ❖ Anaerobic respiration.

**5. Give an account on vascular bundle of dicot stem.**

- ❖ Vascular bundles of dicot stem are conjoint collateral, endarch and open.
- ❖ They are arranged in the form of a ring around the pith.

**6. Write a short note on mesophyll.**

- ❖ In a leaf, the tissue present between the upper and lower epidermis is called mesophyll.
- ❖ It is differentiated into palisade parenchyma and Spongy parenchyma.

**7. Draw and label the structure of oxysomes.****8. Name the three basic tissue system in flowering plants.**

- ❖ Dermal (or) Epidermal tissue system
- ❖ Ground tissue system
- ❖ Vascular tissue system

**9. What is photosynthesis and where in a cell does it occur?**

- ❖ Photosynthesis is a process by which autotrophic organisms like green plants, algae and chlorophyll containing bacteria utilize the energy from sunlight to synthesize their own food.
- ❖ Photosynthesis occur in the chloroplast.

**10. Why should the light dependent reaction occur before the light independent reaction?**

- ❖ During light independent reactions, CO<sub>2</sub> is reduced into carbohydrates with the help of ATP and NADPH<sub>2</sub>.
- ❖ So light dependent reaction occur before the light independent reaction.

**11. Write the reaction for photosynthesis.****12. What is R.Q?**

It is the ratio of volume of carbon dioxide liberates and the volume of oxygen consumed during respiration

$$RQ = \frac{\text{volume of CO}_2 \text{ liberated}}{\text{volume of O}_2 \text{ consumed}}$$

**13. Write down the functions of chloroplast**

- ❖ Photosynthesis
- ❖ Storage of starch
- ❖ Synthesis of fatty acids.
- ❖ Storage of lipids.

**14. What are the factors affecting photosynthesis**

- ❖ External factors → Light, CO<sub>2</sub>, temperature, water and mineral elements.
- ❖ Internal factors → Pigments, leaf age, accumulation of carbohydrates and hormones.

**Answer in detail:****1. Differentiate the following.**

a) Monocot root and Dicot root

b) Aerobic and Anaerobic respiration

a) **Monocot root and Dicot root:**

Dicot Root	Monocot Root
Tetrarch Xylem	Polyarch Xylem
Cambium Present	Cambium absent
Secondary Growth Present	Secondary Growth absent
Pith absent	Pith present

### b) Aerobic and Anaerobic respiration:

Aerobic respiration	Anaerobic respiration
Presence of oxygen.	Absence of oxygen.
It occurs in most plants and animals	It occurs in some bacteria
Glucose is converted into carbon dioxide.	Glucose is converted into ethanol
carbon dioxide, water and energy	Ethanol and energy

## 2. Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.

### Glycolysis:

- It is the breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon).
- Glycolysis takes place in cytoplasm of the cell.

### Krebs cycle:

- This cycle occurs in mitochondria matrix.
- At the end of glycolysis, the oxidation of two molecules of pyruvic acid enter into into CO<sub>2</sub> and water

### Electron Transport chain:

- NADH<sub>2</sub> and FADH<sub>2</sub> molecules formed during glycolysis and Kreb's cycle are oxidised to NAD<sup>+</sup> and FAD<sup>+</sup> to release the energy via electrons.
- The electrons as they move through the system, release energy which is trapped by ADP to synthesize ATP.
- This process O<sub>2</sub> the ultimate acceptor of electrons gets reduced to water.

## 3. How does the light dependent reaction differ from the light independent reaction? What are the end product and reactants in each? Where does each reaction occur within the chloroplast?

Light dependent Reaction	Light independent Reaction
It needs sunlight	It does not needs sunlight
The end products are ATP and NADPH <sub>2</sub> and O <sub>2</sub>	End product is carbohydrate, ADP and NADP
The reactants are 3 chlorophyll, sunlight and water	The reactants are CO <sub>2</sub> , ATP and NADPH <sub>2</sub> .
It occurs in thylakoid membrane of the chloroplast.	It occurs in the stroma of the chloroplast.

## 13. STRUCTURAL ORGANISATION OF ANIMALS

### Short Answers

- Give the common name of the *Hirudinaria granulosa*. The Indian Leech
- How does leech respire? Respiration takes place through the skin in leech.
- Write the dental formula of rabbit. Dental formula is  $I \frac{2}{1}, C \frac{0}{0}, PM \frac{3}{2}, M \frac{3}{3} \frac{2033}{1023}$
- How many pairs of testes are present in leech? 11 pairs of testes.

5. **How is diastema formed in rabbit?** The gap between the incisors and premolar is called diastema
6. **What organs are attached to the two bronchi?** Lungs
7. **Which organ acts as suction pump in leech?** Muscular pharynx
8. **What does CNS stand for?** CNS → Central Nervous System.
9. **Why is the teeth of rabbit called heterodont?** In Rabbit teeth are of different types
10. **How does leech suck blood from the host?**
- ♣ Leech make a triadate or Y shaped incision in the skin of the host and the blood is sucked by Muscular pharynx.
11. **Why are the rings of cartilages found in trachea of rabbit?**
- ♣ Tracheal walls are supported by rings of cartilage, which helps in the free passage of air.
12. **List out the parasitic adaptations in leech.**
- ♣ Blood is sucked by pharynx.
  - ♣ The three jaws inside the mouth, caused a painless y shaped wound in the skin of the host.
  - ♣ The salivary glands produced hirudin which does not allow the blood to coagulate.
  - ♣ Parapodia and setae are completely absent.

### Answer in detail:

#### 1. How is the circulatory system designed in leech to compensate the heart structure?

- ♣ In leech, circulation is brought about by haemocoelic system.
- ♣ There are no true blood vessels.
- ♣ The blood vessels are replaced by channels called haemocoelic channels (or) canal filled with blood like fluid.
- ♣ The coelomic fluid contain haemoglobin.
- ♣ There are four longitudinal channels.
  - ✚ One channel lies above (dorsal) the alimentary canal.
  - ✚ One below (ventral) the alimentary canal.
  - ✚ The other two channels lie on either (lateral) side of the alimentary canal, which serve as heart and have inner valves.
- ♣ All the four channels are connected together posteriorly in the 26<sup>th</sup> segment.

#### 2. How does locomotion take place in leech?

Locomotion in leech take place by

- ♣ Looping (or) crawling movement.
- ♣ Swimming movement.

#### Looping or crawling movement:

- ♣ This type of movement is brought about by the contraction and relaxation of muscles.
- ♣ The two suckers serve for attached during movement.

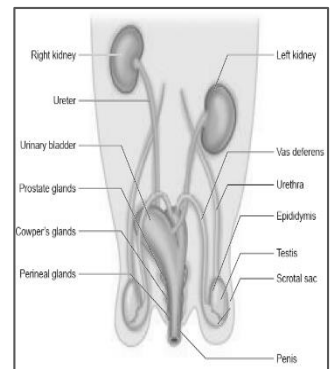
#### Swimming movement:

- ♣ Leech swim very actively and perform
- ♣ undulating movements in water.

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3. Explain the male reproductive system of rabbit with a labelled diagram.

- ❖ The male reproductive system of rabbit consists of a pair of testes, which are ovoid in shape.
- ❖ Testes are enclosed by scrotal sacs in the abdominal cavity.
- ❖ Each testis consists of numerous fine tubules called seminiferous tubules.
- ❖ This network of tubules lead into a coiled tubule called epididymis, which leads into the sperm duct called vas deferens.
- ❖ The vas deferens joins in the urethra just the penis.
- ❖ The urethra runs backward and passes into the penis.



## 14. TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

### Short Answers

1. Name two layered protective covering of human heart. Pericardium
2. What is the shape of RBC in human blood? Biconcave and disc shaped.
3. Why is the colour of the blood red ? Presence of haemoglobin in RBC
4. Which kind of cells are found in the lymph? Lymphocytes
5. Name the heart valve associated with the major arteries leaving the ventricles.
  - ❖ Semi - lunar valves
6. Mention the artery which supplies blood to the heart muscle. The coronary artery
7. What causes the opening and closing of guard cells of stomata during transpiration?
  - ❖ The opening and closing of the stomata is due to the change in turgidity of the guards cells.
  - ❖ When water enters into guard cells, they become turgid and the stoma open.
  - ❖ When the guard cells lose water, it become flaccid and the stoma closes.
8. What is cohesion?
  - ❖ The force of attraction between molecules of water is called cohesion.
9. Trace the pathway followed by water molecules from the time it enters a plant root to the time it escapes into the atmosphere from a leaf.  
Root hair → Root → Xylem → Stem → Leaf → Stomata → Water is evaporated
10. What would happen to the leaves of a plant that transpires more water than its absorption in the roots?
  - ❖ If the leaves of a plant transpires more than its absorption in the roots,
  - ❖ The plant will get dehydrated and it affects plant growth, photosynthesis and transpiration
11. Describe the structure and working of the human heart.  
**The structure of the human heart**
  - ❖ The human heart is four chambered. There are two atrium and two ventricles.**Working of the human heart**
  - ❖ The right atrium receives deoxygenated blood from different parts of the body
  - ❖ The right and left articles pump blood into the right and left ventricles respectively.
  - ❖ From the right ventricle arises the pulmonary trunk, which bifurcates to form right and left pulmonary arteries.
  - ❖ The right and left pulmonary arteries supply deoxygenated blood to the lungs of the respective side.

- ❖ The left ventricle gives rise to aorta. The oxygenated blood is supplied by the aorta to various organs of the body.

## 12. Why is the circulation in man referred to as double circulation?

- ❖ For Human it is double circulation because the heart contains completely separated four chambers
- ❖ The Oxygenated blood donot mix with the deoxygenated blood

## 13. What are heart sounds? How are they produced?

- ❖ The rhythmic closure and opening of the valves cause the sound of the heart.
- ❖ The first sound LUBB is longer duration and produced by the closure of the tricuspid
- ❖ The second sound DUPP is of a shorter duration and produced by the closure of semilunar valves

## 14. What is the importance of valves in the heart?

- ❖ Regulate the flow of blood in a single direction
- ❖ Prevent back flow of blood.

## 15. Who discovered Rh factor? Why was it named so?

- ❖ Rh factor was discovered by Landsteiner and Wiener in Rhesus Monkey.
- ❖ So it is named as Rh factor.

## 16. How are arteries and veins structurally different from one another?

Artery	Vein
Distributing vessel	Collecting vessel
Pink in colour	Red in colour
Deep location	Superficial in location
Blood flow with high pressure	Blood flow with low pressure
Wall of artery is strong thick and elastic	Wall of vein is weak, thin and non-elastic
All arteries carry oxygenated blood except pulmonary arteries	All veins carry deoxygenated blood expect pulmonary veins
Internal valves are absent	Internal valves are present

## 17. Why is the Sinoatrial node called the pacemaker of heart?

- ❖ SA node acts as the pace maker of the heart
- ❖ It is capable of initiating impulse which can simulate the heart muscles to contract.

## 18. Guard cells are responsible for opening and closing of stomata.

- ❖ The opening and closing of the stomata is due to the change in turgidity of the guards cells.
- ❖ When water enters into guard cells, they become turgid and the stoma open.
- ❖ When the guard cells lose water, it become flaccid and the stoma closes.

## 19. The walls of the right ventricle are thicker than the right auricles.

- ❖ **Reason:** The walls of the right ventricles are thicker than the right auricles.
  - ❖ From the right ventricle arises the pulmonary trunk, which bifurcates to, from right and left pulmonary arteries.

## Answer in detail:

### 1. How do plants absorb water? Explain.

- ❖ There are millions of root hairs on the tip of the root, which absorb water and minerals by diffusion.
- ❖ Root hairs are thin walled, slender extension of epidermal cell that increase the surface area of absorption.
- ❖ Once the water enters the root hairs, the concentration of water molecules in the root hairs cells become more than that of the cortex.
- ❖ Thus water from the root hair more to the cortical cells by osmosis and then reaches the xylem.
- ❖ From there the water is transported to the stem and leaves.



2. What is transpiration? Give the importance of transpiration.  
 Transpiration → Transpiration is the evaporation of water in plants through stomata in the leaves.

**Importance of transpiration:**

- ❖ Creates transpirational pull for transport of water.
- ❖ Supplies water for photosynthesis.
- ❖ Transports minerals from soil to all parts of the plants.
- ❖ Cools the surface of the leaves by evaporation.
- ❖ Keeps the cells turgid, hence maintains their shape.

3. Why are leucocytes classified as granulocytes and agranulocytes? Name each cell and mention its functions.

- Granulocytes :**
1. **Neutrophils :** increased during infection and inflammation
  2. **Eosinophils :** detoxification of toxins.
  3. **Basophils :** They release chemicals during the process of inflammation.
- Agranulocytes**
1. **Lymphocytes :** They produce antibodies during bacterial and viral infections
  2. **Monocytes :** They are phagocytic and can energy bacteria

4. Differentiate between systole and diastole. Explain the conduction of heart beat.

Systole	Diastole
One complete contraction of the atrium and ventricles of the heart constitute heart beat.	One complete relaxation of the atrium and ventricles of the heart constitute heart beat.

**Conduction of heart beat:**

- ❖ The human heart is myogenic in nature.
- ❖ It is situated in the wall of the right atrium
- ❖ The wave of contraction from SA node reaches the atrioventricular (AV) node
- ❖ An impulse of contraction spreading to the ventricular bundle and the Purkinje fibres.

5. Enumerate the functions of blood.

**Functions of blood**

- ❖ Transport of respiratory gases
- ❖ Transport of digested food materials to the different body cells.
- ❖ It is involved in protection of the body and defense against diseases.
- ❖ It acts as buffer and helps in regulation of pH and body temperature.
- ❖ It maintains proper water balance in the body.

6. Tabulate different types of blood groups.

Blood Group	Antigens on RBC	Antibodies in Plasma	Can donate to	Can receives from
A	Antigen A	Anti – B	A and AB	A and O
B	Antigen B	Anti – A	B and AB	B and O
AB	Antigen A and B	No antibody	AB	A, B, AB and O recipient
O	No Antigen	Both anti A and B	A, B, AB and O (Universal Donor)	O

## 15. NERVOUS SYSTEM

**Short Answers**

1. **Define stimulus.** It refers to the changes in the environmental condition.
2. **Name the parts of the hind brain.** (i) cerebellum (ii) pons (iii) medulla oblongata.

3. What are the structures involved in the protection of brain?
- (i) Duramater (ii) Arachnoid (iii) Piamater
4. Give an example for conditioned reflexes.
- ♣ Playing harmonium by striking a particular key on seeing a music note is an example of conditioned reflexes.
5. Which acts as a link between the nervous system and endocrine system?
- Hypothalamus
6. Define reflex arc.
- ♣ The pathway taken by nerve impulse to accomplish reflex action is called reflex arc.

**Answer in detail:**

**1. Voluntary and involuntary actions.**

Voluntary action	Involuntary action
Controlled by the brain	Controlled by the spinal cord.
initiates by our own conscious.	without your own conscious.
under the control of the will.	not under the control of the will.
For example- Breathing, eating	For example-heartbeat, sneezing

**Medullated and non-medullated nerve fibre.**

Medullated (Myelinated) Nerve Fibres	Non-medullated (Nonmyelinated) Nerve Fibres
Myelin sheath is present.	Myelin sheath is absent.
white matter of brain.	the grey matter of brain.
Nodes of Ranvier are present	Nodes of Ranvier are absent.
They carry impulses faster.	They carry impulses slower.

**2. With a neat labelled diagram explain the structure of a neuron.**

A neuron typically consists of three basic parts: Cyton, Dendrites and Axon.

**(i) Cyton:** (cell body or perikaryon)

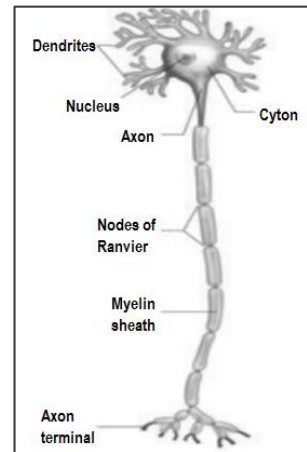
- ❖ It help in transmission of nerve impulses to and from the cell body.

**(ii) Dendrites:**

- ❖ These are the numerous branched cytoplasmic processes that project from the surface of the cell body.
- ❖ They conduct nerve impulses towards the cyton.

**(iii) Axon:**

- ❖ The axon is a single, elongated, slender projection.
- ❖ The axons may be covered by a protective sheath called **myelin sheath**
- ❖ **myelin sheath** is further covered by a layer of **Schwann cells** called **neurilemma**.
- ❖ Myelin sheath breaks at intervals by depressions called **Nodes of Ranvier**. The region between the nodes is called as **internode**.



**3. Illustrate the structure and functions of brain.**

Structure	Functions
Cerebral cortex	Sensory perception, control of voluntary functions, language, thinking, memory, decision making, creativity
Thalamus	Acts as relay station.

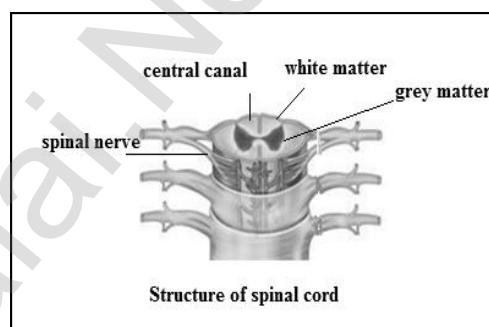
Hypothalamus	Temperature control, thirst, hunger, urination, important link between nervous system and endocrine glands.
Cerebellum	Maintenance of posture and balance, coordinate voluntary muscle activity.
Pons and medulla	Role in sleep-awake cycle, cardiovascular, respiratory and digestive control centers.

**4. What will you do if someone pricks your hand with a needle? Elucidate the pathway of response with a neat-labelled diagram.**

- When someone pricks your hand with a needle, the stimulus is the pain, which is sensed by receptor called as **pain receptors** in our hand.
- The **sensory neuron** transmits the message to the spinal cord.
- Spinal cord** interprets the stimulus and the impulse is passed on to the relay neuron, which in turn transmits it to a motor neuron.
- Motor neurons** carry command from spinal cord to our arm.
- Muscle in our arm contracts and we withdraw our hand immediately from the needle.

**5. Describe the structure of spinal cord.**

- ♣ Spinal cord is a cylindrical structure lying in the neural canal of the vertebral column
- ♣ It extends from the lower end of medulla oblongata to the first lumbar vertebra.
- ♣ The posterior most region of spinal cord tapers into a thin fibrous thread like structure called **filum terminale**.
- ♣ Internally, the spinal cord contains a cerebrospinal fluid filled cavity known as the **central canal**.
- ♣ The grey matter of spinal cord is 'H' shaped.
- ♣ The upper end of letter 'H' forms **posterior horns** and lower end forms **anterior horns**.
- ♣ A bundle of fibres passes into the posterior horn forming **dorsal** or **afferent root**.
- ♣ Fibres pass outward from the anterior horn forming **ventral** or **efferent root**.



## 16. PLANT AND ANIMAL HORMONES

### Short Answers

- Which hormone promotes the production of male flowers in Cucurbits? Gibberellin
- Write the name of a synthetic auxin. 2,4 D
- Which hormone induces parthenocarpy in tomatoes? Gibberellin
- What is the hormone responsible for the secretion of milk in female after child birth? Prolactin or lactogenic hormone
- Name the hormones, which regulates water and mineral metabolism in man. Mineralocorticoids - Aldosterone
- Which hormone is secreted during emergency situation in man? Adrenaline or Epinephrine
- Which gland secretes digestive enzymes and hormones? Pancreas
- Name the endocrine glands associated with kidneys. Adrenal

9. What are synthetic auxins? Give examples. *Example:* 2, 4 D (2,4 Dichlorophenoxy Acetic Acid)
- Artificially synthesized auxins that have properties like auxins are called as synthetic auxins.
10. What is bolting? How can it be induced artificially?
- Sudden shoot elongation followed by flowering is known as **bolting**.
  - It can be artificially induced on rosette plants by the treatment of Gibberellin
11. Bring out any two physiological activities of abscisic acid.
- ABA promotes – Abscission
  - During water stress and drought conditions ABA causes stomatal closure.
12. What will you do to prevent leaf fall and fruit drop in plants? Support your answer with reason.
- Auxins **prevent** the formation of **abscission layer**.
13. What are chemical messengers?
- Hormone.
14. Write the differences between endocrine and exocrine gland.

Endocrine glands	Exocrine glands
Without ducts	With ducts
Secrete hormones	Produce enzymes
Ex. Pituitary, Thyroid	Salivary glands, Gastric glands

15. What is the role of parathormone?
- It regulates calcium and phosphorus metabolism in the body.
  - They act on bone, kidney and intestine to maintain blood calcium levels.
16. What are the hormones secreted by posterior lobe of the pituitary gland? Mention the tissues on which they exert their effect.
- Vasopressin or Antidiuretic hormone (ADH)
  - Oxytocin: They exert their effect on uterus and mammary gland.
17. Why are thyroid hormones referred as personality hormone?
- Essential for normal physical, mental and personality development. It is also known as **personality hormone**.
18. Which hormone requires iodine for its formation? What will happen if intake of iodine in our diet is low?
- Thyroid hormone requires iodine for its formation.
  - If it is low Goitre and Cretinism for childrens. Myxoedema for adults.

### Answer in detail:

1. (a) Name the gaseous plant hormone. Describe its three different actions in plants.

Ethylene.

**Its three different actions in plants.**

- Ethylene promotes the ripening of fruits.
- Ethylene inhibits the elongation of stem and root in dicots.
- Ethylene hastens the senescence of leaves and flowers.

- (b) Which hormone is known as stress hormone in plants ? Why?

Abscisic acid. Because it increases tolerance of plants to various kinds of stress. So, it is also called as stress hormone.

2. Describe an experiment which demonstrates that growth stimulating hormone is produced at the tip of coleoptile.

- ❖ In First experiment, Waemolt went removed the tips of Avena coleoptiles.
- ❖ The cut tips did not grow indicating that the tips produced something essential for growth.
- ❖ In his second experiment, he placed the agar blocks on the decapitated coleoptile tips.
- ❖ The coleoptile tips did not show any response.
- ❖ In his next experiment, he placed the detached coleoptile tips on agar blocks.
- ❖ After an hour, it grew straight up indicating that some chemical had diffused from the cut coleoptile tips into the agar block, which stimulated the growth.

3. Write the physiological effects of gibberellins.

**Physiological effects of Gibberellins:**

- ❖ Treatment of rosette plants with gibberellin induces sudden shoot elongation followed by flowering. This is called bolting.
- ❖ Gibberellins promote the production of male flowers in monoecious plants (Cucurbits).
- ❖ Gibberellins break dormancy of potato tubers.
- ❖ Gibberellins are efficient than auxins in inducing the formation of seedless fruit - Parthenocarpic fruits e.g. Tomato.

4. Where are estrogens produced? What is the role of estrogens in the human body?

- ❖ **Estrogen** is produced by the **Graafian follicles** of the ovary.

**Functions of estrogens:**

- ❖ It brings about the changes that occur during puberty.
- ❖ It initiates the process of oogenesis.
- ❖ It stimulates the maturation of ovarian follicles in the ovary.
- ❖ It promotes the development of secondary sexual characters

5. What are the conditions which occur due to lack of ADH and insulin? How are the conditions different from one another?

- ❖ It Reduces reabsorption of water
- ❖ It causes an increase in urine output (polyuria)

Diabetes insipidus	Diabetes mellitus
Increase in urine output	Increase in blood suger level

## 17. REPRODUCTION IN PLANTS AND ANIMALS

### Short Answers

1. If one pollen grain produces two male gametes, how many pollen grains are needed to fertilize 10 ovules?  
10 pollen grains needed.
2. In which part of the flower germination of pollen grains takes place?   Stigma
3. Name two organisms which reproduces through budding.   Yeast, Hydra
4. Mention the function of endosperm.   Provides food to the developing embryos.
5. Name the hormone responsible for the vigorous contractions of the uterine muscles.   Oxytocin
6. What is the enzyme present in acrosome of sperm?   Hyaluronidase
7. When is World Menstrual Hygiene Day observed?   May 28<sup>th</sup>
8. What is the need for contraception? It is the best birth control measure.



**9. Name the part of the human female reproductive system where the following occurs.**

- Fertilization : Fallopian tube or ampulla
- Implantation : Uterine wall

**10. What will happen if you cut planaria into small fragments?**

- Each fragments of the organism to give rise an individual new organism.

**11. Why is vegetative propagation practiced for growing some type of plants?**

- It has only mitotic division, no gametic fusion and daughter plants are genetically similar to the parent plant.

**12. How does binary fission differ from multiple fission?**

Binary Fission	Multiple Fission
The parent organism splits to form two new organisms.	The parents organism splits to form many new organisms at the same time.
favourable environmental conditions.	unfavourable environmental conditions.
Amoeba, Paramecium, etc.	Plasmodium.

**13. Define triple fusion.**

- Among the two male gamete produced by generative cells one fuses with egg.
- The other sperm fuses with the secondary nucleus is called triple fusion.

**14. Write the characteristics of insect pollinated flowers.**

- To attract insects these flowers are brightly coloured, have smell and nectar.

**15. Name the secondary sex organs in male**

- Vas deferens, epididymis, seminal vesicle, prostate gland and penis.

**16. What is colostrum? How is milk production hormonally regulated?**

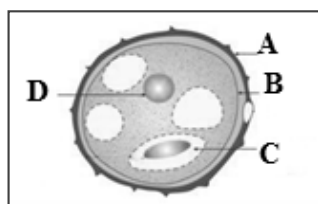
- The milk produced from the breast during the first 2 to 3 days after child birth is called colostrum.
- Milk production is stimulated by prolactin hormone
- The ejection of milk is stimulated by oxytocin hormone

**17. How can menstrual hygiene be maintained during menstrual days?**

- Sanitary pads should be changed regularly,
- Use of warm water to clean genitals helps to get rid of menstrual cramps
- Wearing loose clothing rather than tight fitting clothes

**18. How does developing embryo gets its nourishment inside the mother's body?**

- Placenta allows the exchange of food materials, diffusion of oxygen, excretion of nitrogenous wastes and elimination of carbon dioxide.

**19. Identify the parts A, B, C and D**

- A – Exine
- B – Intine
- C – Generative cell
- D – Vegetative cell



20. Write the events involved in the sexual reproduction of a flowering plant.

a. Discuss the first event and write the types.

Pollination. 1. Self-pollination 2. Cross pollination

b. Mention the advantages and the disadvantages of that event.

self-pollination	cross-pollination
<p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>♣ Flowers do not depend on agents for pollination.</li> <li>♣ There is no wastage of pollen grains.</li> </ul>	<p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>♣ It leads to the production of new varieties.</li> <li>♣ More viable seeds are produced.</li> </ul>
<p><b>Disadvantages:</b></p> <ul style="list-style-type: none"> <li>♣ The seeds are less in numbers.</li> <li>♣ The endosperm is minute. Therefore, the seeds produce weak plants.</li> <li>♣ New varieties of plants cannot be produced</li> </ul>	<p><b>Disadvantages of cross-pollination</b></p> <ul style="list-style-type: none"> <li>♣ Pollination may fail due to distance barrier.</li> <li>♣ More wastage of pollen grains</li> <li>♣ It may introduce some unwanted characters</li> <li>♣ Flowers depend on the external agencies for pollination</li> </ul>

21. Why are the human testes located outside the abdominal cavity? Name the pouch in which they are present.

- ♣ Because sperm formation requires a lower temperature than the normal body temperature.
- ♣ Name of the pouch is Scrotum.

22. Luteal phase of the menstrual cycle is also called the secretory phase. Give reason.

- ♣ The hormone progesterone is produced by the ovaries.
- ♣ Progesterone is secreted by the corpus luteum, which develops from the Graafian follicle. ...
- ♣ For this reason, this phase of the menstrual cycle is called the secretory phase.

23. Why are family planning methods not adopted by all the people of our country?

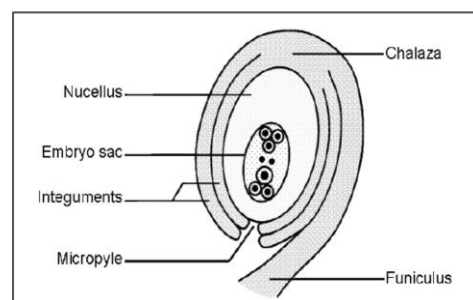
- ♣ Poverty, illiteracy, Fatalist. Most of the people in India are fatalist, Religious Opposition, Lack of Finance, Lack of Cheap and Effective Methods, Shortage of Trained Staff

**Answer in detail:**

1. With a neat labelled diagram describe the parts of a typical angiospermic ovule.

**Structure of the Ovule :**

- ♣ **Nucleus** is enclosed by two integuments leaving an opening called as **micropyle**.
- ♣ The ovule is attached to the ovary wall by a stalk known as **funiculus**.
- ♣ **Chalaza** is the basal part.
- ♣ The embryo sac contains seven cells and the eighth nuclei located within the **nucellus**.
- ♣ Three cells at the **micropylar** end form the egg apparatus
- ♣ The three cells at the **chalaza** end are the antipodal cells.



2. What are the phases of menstrual cycle? Indicate the changes in the ovary and uterus.

The menstrual cycle consists of 4 phases

- 1) Menstrual or Destructive Phase
- 2) Follicular or Proliferative Phase
- 3) Ovulatory Phase
- 4) Luteal or Secretory Phase

Phase	Changes in Ovary	Changes in Uterus
Menstrual phase	Development of primary follicles.	Breakdown of uterine endometrial lining leads to bleeding
Follicular phase	Primary follicles grow to become a fully mature Graafian follicle	Endometrium regenerates through proliferation
Ovulatory phase	The Graafian follicle ruptures, and releases the ovum(egg)	Increase in endometrial thickness
Luteal phase	Emptied Graafian follicle develops into corpus luteum	Endometrium is prepared for implantation if fertilization of egg takes place, if fertilization does not occur corpus luteum degenerates, uterine wall ruptures, bleeding starts and unfertilized egg is expelled

3. In angiosperms the pollen germinates to produce pollen tube that carries two gametes. What is the purpose of carrying two gametes when single gamete can fertilize the egg?

- ❖ One sperm fuses with the egg (syngamy) and forms a diploid zygote.
- ❖ Since two types of fusion syngamy and triple fusion take place in an embryo sac, the process is termed as **double fertilization**.
- ❖ After triple fusion, primary endosperm nucleus develops into an endosperm.
- ❖ Endosperm provides food to the developing embryo.

4. Why menstrual cycle does not take place before puberty and during pregnancy ?

- ❖ Before puberty there is no sex hormone production.
- ❖ The corpus luteum persists, continues to secrete progesterone maintains the thickened state of uterine wall and prevents maturation of another follicle till the end of pregnancy.

5. Read the following passage and answer the questions that follow.

Rahini and her parents were watching a television programme. An advertisement flashed on the screen, which was promoting use of sanitary napkins. Rahini's parents suddenly changed the channel, but she objected to her parents and explained the need and importance of such advertisement.

a) What is first menstruation called? When does it occur ?

- ❖ The first menstruation is called 'puberty'. It occur between 11 to 13 years.

b) List out the napkin hygiene measures taken during menstruation ?

- ❖ The sanitary pad and tampons should be wrapped properly and discarded because they can spread infections.
- ❖ Sanitary pad or tampon should not be flushed down the toilet.
- ❖ Napkin incinerators are to be used properly for disposal of used napkins.

c) Do you think that Rahini's objection towards her parents was correct? If so, Why?

- ❖ Yes, it was correct. Because maintaining menstrual hygiene is important for the overall health of women.

## 18. GENETICS

### Short Answers

1. What is a cross in which inheritance of two pairs of contrasting characters are studied?

Dihybrid cross

2. Name the conditions when both the alleles are identical? Homozygous condition.

3. A garden pea plant produces axial white flowers. Another of the same species produced terminal violet flowers. Identify the dominant trait? The dominant trait is Axial white flowers.

www.Padasalai.Net www.Trh.Tnpsc.com35  
4. What is the name given to the segments of DNA, which are responsible for the inheritance of a particular character?

Genes are the segments of DNA which are responsible for the inheritance of a particular character.

5. Name the bond which binds the nucleotides in a DNA. Phosphodiester bonds

6. Why did Mendel select pea plant for his experiments?

- ♣ Pea plant is naturally self pollinating and so is very easy to raise pure breeding individuals.
- ♣ It is easy to cross pollinate.
- ♣ The flowers are bisexual.

7. What do you understand by the term phenotype and genotype?

- ♣ Phenotype - External expression of a particular trait is known as phenotype.
- ♣ Genotype - The genetic expression of an organisms.

8. What are allosomes?

- ♣ Allosomes are chromosomes, which are responsible for determining the sex of an individual. They are also called sex chromosomes (or) hetero chromosome.

9. What are Okazaki fragments?

- ♣ The short segments of DNA are called Okazaki fragments.
- ♣ The fragments are joined together by the enzyme DNA ligase.

10. Why is euploidy considered to be advantageous to both plants and animals?

- ♣ Euploid considered to be advantageous to both plants and animals, as they often result in increase fruit and flower size.

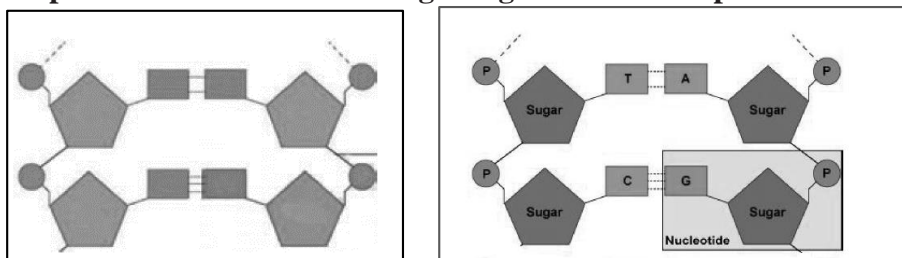
11. A pure tall plant (TT) is crossed with pure dwarf plant (tt), what would be the F<sub>1</sub> and F<sub>2</sub> generations? Explain.

- ♣ F<sub>1</sub> plants are Hybrid tall (Tt)
- ♣ In the F<sub>2</sub> generation 3 different type were obtained.
  - Tall Homozygous - TT - pure - 1
  - Tall Heterozygous - Tt - 2
  - Dwarf Homozygous - tt - 1

12. Explain the structure of a chromosome.

- ♣ The chromosomes are thin, long and thread like structures consisting of two identical strands called sister chromatids.
- ♣ They are held together by the centromere.
- ♣ The chromosomes are made up of DNA, RNA chromosomal proteins C histones and non - histones and certain metallic ions.
- ♣ These proteins provide structural support to the chromosome.

13. Label the parts of the DNA in the diagram given below. Explain the structure briefly.



- DNA is a large molecule consisting of millions of nucleotides. Hence, it is also called a polynucleotide.
- Each nucleotide consists of three components.
  - a) A sugar molecule - Deoxyribose sugar
  - b) A nitrogenous base - There are two types of nitrogenous base in DNA. They are,
    - Purines (Adenine and Thymine)
    - Pyrimidines ( Cytosine and Thymine)
  - c) A Phosphate group
- Adenine links thymine with two hydrogen bonds, cytosine links guanine with three hydrogen bonds.

### Answer in detail:

#### 1. Explain with an example the inheritance of dihybrid cross. How is it different from monohybrid cross?

- Dihybrid cross involves the inheritance of two pairs contrasting traits at the same time.
- Mendel crossed pea plants having round yellow seed with pea plants having wrinkled green seeds. In F1 round yellow seeds were produced.
- When the hybrids of F1 generation pea plants having round yellow seeds were cross- bred by self-pollination then four types of seeds having different combinations of shape and color were obtained in F2.
  - They were, Round Yellow -9 Round green – 3 Wrinkled yellow - 3 Wrinkled green – 1 The phenotypic ratio is 9:3:3:1

Monohybrid cross	Dihybrid cross
Crosses involving inheritance of only one pair of contrasting characters	Cross involving inheritance of two pairs of contrasting characters
Example : Tall Plant × Dwarf plant	Example: yellow × Wrinkled green
The phenotypic ratio is 3:1	Phenotypic ratio is 9:3:3:1

#### 2. How is the structure of DNA organised? What is the biological significance of DNA?

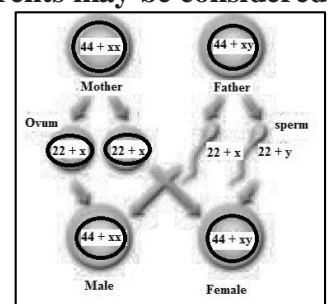
- DNA is the hereditary material as it contain the genetic information.
- The most widely accepted model of DNA is the double helical structure of **James Watsib** and **Frabcis Crick**.
- They proposed the three-dimensional model of DNA on the basis of X - ray diffraction studies of DNA obtained by **Rosalind Franklin** and **Manrice Wilkies**.

#### Significance of DNA:

- DNA is responsible for the transmission hereditary information from one generation to next generations.
- It contains information required for the formation of proteins.
- It controls the developmental process and life activities of an organism.

#### 3. The sex of the newborn child is a matter of chance and neither of the parents may be considered responsible for it. What would be the possible fusion of gametes to determine the sex of the child?

- Human beings have 23 pairs of chromosomes out of which 22 pairs are autosomes and one pair (23rd pair) is the sex chromosomes.
- The female gametes (or) the eggs formed are similar in their chromosome type (22+xx). So, human females are homogametic.
- The male gametes produced are of two types. They are produced in equal proportions.
  - The sperm bearing 22 + x chromosomes. The sperm bearing 22 + y chromosomes. So human males are called heterogametic.



**Short Answers**

- 1. A human hand, a front leg of a cat, a front flipper of a whale and a bat's wing look dissimilar and adapted for different functions. What is the name given to these organs?**  
Homologous organs
- 2. Which organism is considered to be the fossil bird?** Archaeopteryx
- 3. What is the study of fossils called?** Palaeontology
- 4. The degenerated wing of a kiwi is an acquired character. Why is it an acquired character?**
  - ♣ According to Lamarck, the acquired characters are transmitted to the offspring by the process of inheritance. **E.g** : degenerated wing of kiwi.
- 5. Why is Archaeopteryx considered to be a connecting link?**
  - ♣ Archaeopteryx is considered to be a connecting link between reptiles and birds.
  - ♣ It had wings with feathers, like a bird.
  - ♣ It had a long tail clawed digits and conical teeth, like a reptile.
- 6. Define Ethnobotany and write its importance.**
  - ♣ Ethnobotany is the study of a region's plants and their practical uses through the traditional knowledge of the local culture of people.

**Importance of Ethnobotany:**

  - ♣ It proves traditional uses of plant.
  - ♣ It gives information about certain unknown and known useful plants.
  - ♣ Tribal communities utilize ethno medicinal plant parts for the treatment of diseases.
- 7. How can you determine the age of the fossils?**
  - ♣ The age of fossils is determined by radioactive elements present in it.
  - ♣ They may be carbon, uranium, lead or potassium.
  - ♣ It is used in determining the age of human fossils and manuscripts

**Answer in detail:****1. Natural selection is a driving force for evolution - How?**

- ♣ Organisms which are unable to face the challenge are unfit to survive and disappears. The process of selection of organisms with favourable variation is called as natural selection.

**Principles of Darwinism****i. Overproduction**

- ♣ Living beings have the ability to reproduce more individuals and form their own progeny.
- ♣ This will increase reproductive potential leading to overproduction.

**ii. Struggle for existence**

- Intraspecific struggle:** Competition among the individuals of same species.
- Interspecific struggle:** Competition between the organisms of different species living together.
- Environmental struggle:** Natural conditions like extreme heat or cold, drought and floods can affect the existence of organisms

**iii. Variations**

According to Darwin **favourable variations** are useful to the organism and **unfavourable variations** are harmful or useless to the organism.

**iv. Survival of the fittest or Natural selection**

Organisms which are unable to face the challenges, are unfit to survive and disappear. The process of selection of organisms with favourable variation is called as natural selection.



## v. Origin of species

According to Darwin, new species originates by the gradual accumulation of favourable variations for a number of generations.

## 20. BREEDING AND BIOTECHNOLOGY

### Short Answers

1. Give the name of wheat variety having higher dietary fibre and protein     Triticale.
2. Semi - dwarf varieties were introduced in rice. This was made possible by the presence of dwarfing gene in rice. Name this dwarfing gene.     Dee-geo-woo-gene (DGWG).
3. Define genetic engineering?  
Genetic engineering is the manipulation and transfer of genes from one organism to another organism to create a new DNA called as recombinant DNA (rDNA).
4. Name the types of stem cells.
  - ♣ Embryonic stem cell.
  - ♣ Adult stem cell (or) Somatic stem cell.
5. What are transgenic organisms?
  - ♣ Plants or animals expressing a modified endogenous gene (or) a foreign gene are also known as transgenic organisms.
6. State the importance of biofertiliser?
  - ♣ High yield without pest
  - ♣ Reduce soil pollution problem
  - ♣ Conserve microbial population in soil
  - ♣ They are cheaper and ecofriendly.
7. Discuss the method of breeding for disease resistance.
  - ❖ Plant diseases are caused by pathogens like viruses, bacteria and fungi. This affects crop yield.

Crop	Variety	Resistance to diseases
Wheat	Himgiri	Leaf and stipe rust, hill bund
Cauliflower	Pusa Shubhra, Push snowball K-1	Black rot
Cowpea	Pusa Komal	Bacterial blight

8. Name three improved characteristics of wheat that helped India to achieve high productivity.
  - ♣ Atlas 66, a protein rich wheat variety is produced through Biofortification.
  - ♣ Disease resistant Himgiri variety of wheat is produced. It resists Leaf and stiffs rust and hill burnt.
  - ♣ Sonalika, kalyan sona are semi - dwarf varieties of wheat developed from high yielding, semi-5.
9. Name two maize hybrids rich in amino acid lysine.
  - ♣ Protina
  - ♣ Shakti
  - ♣ Rathna



**10. Distinguish between****a. somatic gene therapy and germ line gene therapy.**

<b>somatic gene therapy</b>	<b>germ line gene therapy</b>
Replacement of defective gene in Somatic cells.	Replacement of defective gene in germ cell
It is not carried out to next generation.	The gene can be carried out to next generation.

**b. undifferentiated cells and differentiated cells.**

<b>undifferentiated cells</b>	<b>differentiated cells</b>
Unspecialised mass of cells that have variable potency.	The cell types that can carry out any specific function is called differentiated cells.
<i>Eg</i> : Stem cells.	<i>Eg</i> : Nerve cell, Heart cell, etc.

**11. State the applications of DNA finger printing technique.**

- ❖ DNA finger printing technique is widely used in forensic applications like crime investigation such as identifying the culprit.
- ❖ It is also used for paternity testing in case of disputes.
- ❖ It also helps in the study of genetic diversity of population, evolution and speciation.

**12. How are stem cells useful in regenerative process?**

- ❖ Its ability to divide and give rise to more stem cells by self renewal.
- ❖ Its ability to give rise to specialised cells with specific functions by the process of differentiation.

**13. Differentiate between outbreeding and inbreeding.**

<b>Outbreeding</b>	<b>Inbreeding</b>
1. It is the breeding of unrelated animals.	Inbreeding refers to the mating of closely related animals within the same breed for about 4 - 6 generations.
2. The hybrids are stronger and vigorous than their parents.	Superior males and superior females of the same breed are identified and mated in pairs. It helps in the accumulation of superior genes.

**Answer in detail:****1. What are the effects of hybrid vigour in animals?**

- ❖ Increased production of milk by cattle.
- ❖ Increased production of egg by poultry.
- ❖ High quality of meat is produced.
- ❖ Increased growth rate in domesticated animal.

**2. Describe mutation breeding with an example.**

Mutation Breeding is defined as the sudden heritable change in the nucleotide sequence of DNA in an organism.

**Achievements of Mutation breeding**

- ❖ Sharbati Sonora wheat produced from Sonora 64 by using gamma rays.
- ❖ Atomita 2 rice with saline tolerance and pest resistance.
- ❖ Groundnut with thick shells.

**3. Biofortification may help in removing hidden hunger. How?**

- ❖ Hidden Hunger means Undernutrition and protein malnutrition.
- ❖ Hidden Hunger among human population is a major health problem which has been receiving much focus throughout the world.
- ❖ Apart, from humans it also affects the health of farm animals.

- ❖ To combat these conditions, human and animal health are to be determined by the nutritional quality of the feed crops.
- ❖ The nutritional quality of crops depends on quality and quantity of nutrients. The nutritional quality may be improved with respect to its
  - Protein content and quality of protein
  - Oil content
  - Mineral content
- ❖ Biofortification is the scientific process of developing crop plants enriched with high levels of desirable nutrients like vitamins, proteins and minerals.

**Example:**

- ❖ Protina, Shakti and Rathna are lysine rich maize hybrids (developed in India).
- ❖ Atlas 66, a protein rich wheat variety.
- ❖ Iron rich fortified rice variety.
- ❖ Vitamin A enriched carrots, pumpkin and spinach.

## 21. HEALTH AND DISEASES

### Short Answers

**1. What are psychotropic drugs?**

- ♣ There are certain drugs called psychotropic drugs, which acts on the brain and alter the behaviour, consciousness, power of thinking and perception.

**2. Mention the diseases caused by tobacco smoke.**

- ♣ Lung cancer, Bronchitis, Pulmonary tuberculosis, Emphysema, Hypoxia, Increased blood pressure, Ulcer, Oral cancer

**3. What are the contributing factors for Obesity?**

Obesity is due to genetic factors physical inactivity, eating habits and endocrine factors.

**4. What is adult onset diabetes?**

Type – 2 Non – Insulin Dependent Diabetes Mellitus

**5. What is metastasis?**

The cancerous cells migrate to distant parts of the body and affect metastasis. The frequent sites if metastasis.

**6. How does insulin deficiency occur?**

**Type I - Insulin Dependent Diabetes Mellitus :**

- ❖ This is caused by the destruction of B cells of the pancreas. It is characterized by abnormally elevated blood glucose levels, resulting from inadequate insulin secretion.

**Type II – Non Insulin Dependent Diabetes Mellitus :**

- ❖ In this case insulin production by the pancreas is normal but its action is impaired. The target cells do not respond to insulin. It does not allow the movement of glucose into cells.

**7. What are the various routes by which transmission of human immuno deficiency virus takes place?**

- ♣ Sexual contact with infected person.
- ♣ Use of contaminated syringes especially in case of intravenous drug abusers.
- ♣ By transfusion of contaminated / infected blood or blood products.
- ♣ From infected mother to her child through placenta.

8. How is a cancer cell different from a normal cell?

Cancer cell	Normal cell
The size of the nucleus is large.	Normal, small size of nucleus is present.
multiply indefinitely.	The cells are normally divide.
They are less differentiated.	They are will differentiated.
Nucleoli is very prominent.	Nucleoli is prominent.

9. Differentiate between Type-1 and Type-2 diabetes mellitus

Factors	Type -1 Diabetes Mellitus(IDDM)	Type-2 Diabetes Mellitus (NIDDM)
Prevalence	10-20%	80-90%
Age of onset	Juvenile onset (< 20 years)	Maturity onset (>30 years)
Body weight	Normal or Underweight	Obese
Defect	Insulin deficiency due to destruction of $\beta$ -cells	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine

Answer in detail:

1. Suggest measures to overcome the problems of an alcoholic.

**Education and counselling:**

Education and proper counselling will help the alcoholics to overcome their problems and stress, to accept failures in their life.

**Physical activity:**

Individuals undergoing rehabilitation should be channelized into healthy activities like reading, music, sports, yoga and meditation.

**Seeking help from parents and peer groups:**

- ❖ When a problematic situation occurs, the affected individuals should seek help and guidance from parents and peers.
- ❖ This would help them to share their feeling of anxiety, wrong doing and get rid of the habit.

**Medical assistance:**

- ❖ Individual should seek help from psychologists and psychiatrists to get relieved from this condition and to lead a relaxed and peaceful life.
- ❖ Alcohol de-addiction and rehabilitation programmes are helpful to the individual so that they could get rid of the problem completely and can lead a normal and healthy life.

2. Changes in lifestyle is a risk factor for occurrence of cardiovascular diseases. Can it be modified?

If yes, suggest measures for prevention.

**Prevention and Control of Heart Disease.**

**Diet Management:**

- ❖ Reduction in the intake of calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt are some of the dietary modifications.
- ❖ Diet rich in polyunsaturated fatty acids (PUFA) is essential.

**Physical activity:**

Regular exercise, walking and yoga are essential for body weight maintenance.

**Addictive substance avoidance:**

Alcohol consumption and smoking are to be avoided.

**Short Answers****1. What will happen if trees are cut down?**

- ❖ It gives rise to ecological problems like floods, drought, soil erosion, loss of wild life, extinction of species, imbalance of bio geochemical cycles, alteration of climatic conditions and desertification.

**2. What would happen if the habitat of wild animals is disturbed?**

- ❖ Animal will not be able to find food
- ❖ In recent years, increase in human encroachment has posed a threat to India's wildlife.

**3. What are the agents of soil erosion?**

- ❖ Agents of soil erosion are high velocity of wind, air currents, flowing water, land slide, human activities and overgrazing by cattle.

**4. Why fossil fuels are to be conserved?**

- ❖ It is necessary to conserve or save coal and petroleum resources for the future use, which can be done by reducing their consumption.

**5. Solar energy is a renewable energy. How?**

- ❖ Solar energy is the energy obtained from the sun.

**6. How are e-wastes generated?**

- ❖ It includes the spoiled, outdated, non-repairable electrical and electronic devices.

**7. What is the importance of rain water harvesting?**

- ❖ To improve ground water level
- ❖ To reduce flood and soil erosion
- ❖ To meet the increase demand of water

**8. What are the advantages of using biogas?**

- ❖ It burns without smoke and therefore causes less pollution.
- ❖ An excellent way to get rid of organic wastes like bio-waste and sewage material.
- ❖ Left over slurry is a good manure rich in nitrogen and phosphorus
- ❖ It is safe and convenient to use
- ❖ It can reduce the amount of green house gases emitted.

**9. What are the environmental effect caused by sewage?**

- ❖ Sewage water results in agricultural contamination and environmental degradation.

**Answer in detail:****1. How does rain water harvesting structures recharge ground water?****(i) Roof top rainwater harvesting:**

- ❖ The rain water that falls on the roof of the houses, apartments, commercial buildings etc. is collected and stored in the surface tank and can be used for domestic purpose.

**(ii) Recharge pit:**

- ❖ In this method, the rain water is first collected from the roof tops or open spaces and is directed into the **percolation pits** through pipes for filtration.
- ❖ After filtration the rainwater enters the **recharge pits** or **ground wells**.

**(i) Digging of tanks or lakes (Eris):**

- ❖ Eris are constructed in such away that if the water in one eri overflows, it automatically gets diverted to the eri of the next village, as these eris are inter connected.

**(ii) Ooranis:**

- ❖ These are **small ponds** to collect rainwater.
- ❖ The water is used for various domestic purposes (drinking, washing and bathing). These ponds cater the near by villages.

## 2. How will you prevent soil erosion?

- ❖ Retain vegetation cover, so that soil is not exposed.
- ❖ Cattle grazing should be controlled.
- ❖ Crop rotation and soil management improve soil organic matter.
- ❖ Runoff water should be stored in the catchment.
- ❖ Reforestation, terracing and contour ploughing.
- ❖ Wind speed can be controlled by planting trees in form of a shelter belt.

## 3. What are the sources of solid wastes? How are solid wastes managed?

- ❖ Solid wastes mainly include municipal wastes, hospital wastes, industrial wastes and e - wastes etc.

### Methods of solid wastes disposal

#### a) Segregation:

It is the separation of different type of waste materials like biodegradable and non-bio degradable wastes.

#### b) Sanitary landfill:

- ❖ Solid wastes are dumped into low-lying areas. The layers are compacted by trucks to allow settlement.
- ❖ The waste materials get stabilized in about 2-12 months. The organic matter under goes decomposition.

#### c) Incineration:

It is the burning of non-biodegradable solid wastes (medical wastes) in properly constructed furnace at high temperature.

#### d) Composting:

Biodegradable matter of solid wastes is digested by microbial action or earth worms and converted into humus.

## 4. Enumerate the importance of forest.

- ❖ Forests are an important component of our environment and are dominated by micro organisms, flowering plants, shrubs, climbers, dense trees and provide a vast habitat for wild animals.
- ❖ Forests also contribute to the economic development of our country.
- ❖ Forests are vital for human life; it is a source for a wide range of renewable natural resource.
- ❖ They provide wood, food, fodder, fiber and medicine.
- ❖ Forests are major factor of environmental concern.
- ❖ They act as carbon sink, regulate climatic conditions, increase rainfall, reduce global warming, prevent natural hazards like flood and landslides, protect wild life and also act as catchments for water conservation.
- ❖ They also play a vital role in maintaining the ecological balance.

## 5. What are the consequences of soil erosion?

- ❖ Deforestation is the destruction of large area of forests.
- ❖ This happens for many reasons like intensive agriculture, urbanization, construction of dams, roads, buildings and industries, hydroelectric projects, forest fires, construction of mountain and forest roads.
- ❖ It is a threat to the economy, quality of life and future of the environment. India is losing about 1.5 million hectares of forest cover every year.
- ❖ Deforestation gives rise to ecological problems like floods, drought, soil erosion, loss of wild life, extinction of species, imbalance of bio geochemical cycles, alteration of climatic conditions and desertification.

**Short Answers****1. What is Scratch?**

'Scratch' is a software used to create animations, cartoons and games easily. Scratch, on the other hand, is a visual programming language.

**2. Write a short note on editor and its types?**

The script editor has three main parts:

<b>Script area</b>	Where you build scripts.
<b>Block menu</b>	Where you choose the category of blocks (programming statements) to use.
<b>Block palette</b>	Where you choose the blocks to use. When the Costumes tab is chosen, the costume editor.

**3. What is Stage?**

- ❖ Stage is the background appearing when we open the scratch window.
- ❖ The background will most often be white. You can change the background colour as you like.

**4. What is Sprite?**

- ❖ The characters on the background of a Scratch window are known as Sprite.
- ❖ Usually a cat appears as a sprite when the Scratch window is opened.
- ❖ The software provides facilities to make alternations in sprite.