

SCIENCE

10

MINIMUM LEARNING GUIDE

GOVERNMENT HIGH SCHOOL
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1. LAWS OF MOTION

Choose the correct answer

1. Inertia of a body depends on
 a) weight of the object
c) mass of the object
 b) acceleration due to gravity of the planet
 d) Both a & b
2. Impulse is equal to
 a) rate of change of momentum
c) change of momentum
 b) rate of force and time
 d) rate of change of mass
3. Newton's III law is applicable
 a) for a body at a rest
c) both a & b
 b) for a body in motion
 d) only for bodies with equal mass
4. Plotting a graph for momentum on the X-axis and time Y-axis, slope of momentum – time graph gives
 Impulsive force
 a) Acceleration
c) Force
 d) rate of force
5. In which of the following sport the turning of effect of force used
 a) swimming
 b) tennis
c) cycling
 d) hockey
6. The unit of 'g' is ms^{-2} . It can be also expressed as
 a) cm s^{-1}
b) N kg^{-1}
 c) $\text{N m}^2 \text{kg}^{-1}$
 d) $\text{cm}^2 \text{s}^{-2}$
7. One-kilogram force is equal to
 a) 9.8 dyne
 b) $9.8 \times 10^4 \text{ N}$
c) $98 \times 10^4 \text{ dyne}$
 d) 980 dyne
8. The mass of the body is measured on planet Earth as M kg, when it is taken to a planet of radius half that of the Earth then its value will be _____ kg
 a) 4M
 b) 2M
 c) M/4
d) M
9. If the Earth shrinks to 50% of its real radius its mass remaining the same, the weight of the body on the Earth will
 a) decrease by 50%
 b) increase by 50%
 c) decrease by 25%
d) increase by 300%
10. To project the rockets which of the following principle(s) is/(are) required?
 a) Newton's third law of motion
 b) Newton's law of gravitation
 c) law of conservation and linear momentum
d) both a & c

Short Answers

1. Define inertia. Give its classification.

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

Types of inertia: i) Inertia of rest ii) Inertia of motion iii) Inertia of direction

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

- Like parallel force
- 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

Solution:

$$F_1 = 5 \text{ N}$$

$$F_2 = 15 \text{ N}$$

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

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

$$\text{Resultant Force} = 10 \text{ N}$$

The direction of F_{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

$$❖ \text{Moment of force} = F \times d$$

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 sideways.

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.

$$F_A = - F_B$$

3. Deduce the equation of a force using Newton's second law of motion

The force acting on a body is directly proportional to the rate of change of linear momentum of the body.

$$\text{Initial momentum of the body } P_i = mu$$

$$\text{Final momentum of the body } P_f = mv$$

$$\text{Change in momentum} = P_f - P_i$$

$$= mv - mu$$

By Newton's second law of motion,

$$F \propto \frac{\text{Change in momentum}}{\text{Time}}$$

$$F \propto \frac{mv - mu}{t}$$

$$F = \frac{km(v-u)}{t}$$

k is constant,

$$k = 1$$

$$F = \frac{m(v-u)}{t}$$

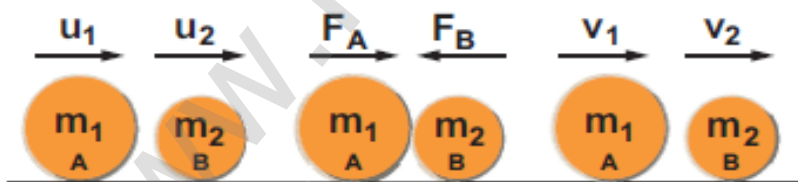
$$a = \frac{(v-u)}{t}$$

Therefore,

$$F = ma$$

4. State and prove the law of conservation of linear momentum

"There is no change in the linear momentum of a system of a body as long as no net external force acts on them"



Let two bodies A and B having masses m_1 and m_2 move with an initial velocity u_1 and u_2 in a straight line.

During an interval of time t second, they tend to have a collision

After the impact, both of the body's velocity v_1 and v_2 respectively

Force on a body B due to A,

$$F_B = \frac{m_2 (v_2 - u_2)}{t}$$

Force on a body A due to B,

$$F_A = \frac{m_1 (v_1 - u_1)}{t}$$

By Newton's III law,

$$F_A = - F_B$$

$$\frac{m_1 (v_1 - u_1)}{t} = - \frac{m_2 (v_2 - u_2)}{t}$$

$$m_1 v_1 - m_1 u_1 = - m_2 v_2 + m_2 u_2$$

$$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2$$

Momentum after collision = Momentum before collision

5. 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

6. 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.

2. OPTICS

Choose the correct answer

1. The refractive index of four substances A, B, C and D are 1.31, 1.43, 1.33, 2.4 respectively. The speed of light is maximum in

- a) A b) B c) C d) D

2. Where should an object be placed so that a real and inverted image of same size is obtained by a convex lens

- a) f **b) 2f** c) infinity d) between f and 2f

3. A small bulb is placed at the principal focus of a convex lens. When the bulb is switched on, the lens will produce

- a) a convergent beam of light b) a divergent beam of light
c) a parallel beam of light d) a coloured beam of light

4. Magnification of a convex lens is

- a) positive b) negative **c) either positive or negative** d) zero

5. A convex lens forms a real, diminished point sized image at focus. Then the position of the object is at

- a) focus **b) infinity** c) at 2f d) between f and 2f

6. Power of a lens is -4D, then its focal length

- a) 4m b) -40m **c) -0.25m** d) -2.5m

7. In myopic eye, the image of the object is formed

- a) behind the retina **b) in front of the retina**
 c) on the retina d) on the blind spot

8. The eye defect 'presbyopia' can be corrected by

- a) convex lens b) concave lens c) convex mirror **d) bi focal lens**

9. Which of the following lens would you prefer to use while reading small letters found in a dictionary?

- a) A convex lens of focal length 5 cm** b) A concave lens of focal length 5 cm
c) A convex lens of focal length 10 cm d) A concave lens of focal length 10 cm

10. If V_B , V_G , V_R be the velocity of blue, green and red light respectively in a glass prism, then which of the following statement gives the correct relation.

- a) $V_B = V_G = V_R$ b) $V_B > V_G > V_R$ **c) $V_B < V_G < V_R$** d) $V_B < V_G > V_R$

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.

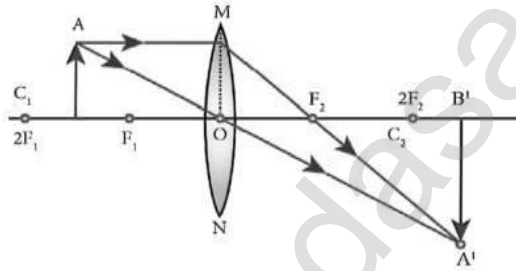
$$\mu = \frac{c}{v}$$

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 is 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 object is 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.

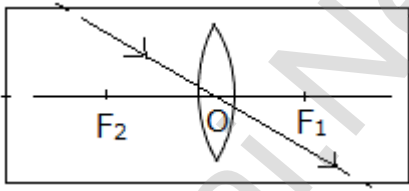
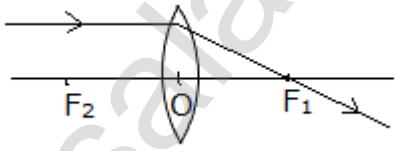
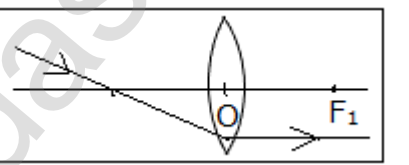
10. Why are traffic signals red in colour?

- 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.**

- 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
- 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>Rule 1 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>Rule 2 When rays parallel to the principal axis strikes a convex lens, the refracted rays are converged to the principal focus.</p>	
<p>Rule 3 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 is formed before retina	The image of nearby objects is 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

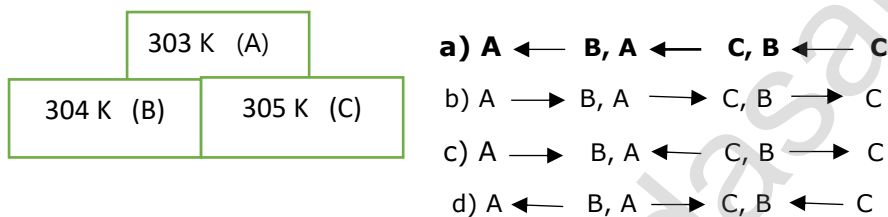
- ❖ The object AB is placed at a distance slightly greater than the focal length of objective lens

- ❖ 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.

3. THERMAL PHYSICS

Choose the correct answer

- The value of universal gas constant
a) $3.81 \text{ J mol}^{-1} \text{ K}^{-1}$ b) $8.03 \text{ J mol}^{-1} \text{ K}^{-1}$ c) $1.38 \text{ J mol}^{-1} \text{ K}^{-1}$ **d) $8.31 \text{ J mol}^{-1} \text{ K}^{-1}$**
- If the substance is heated or cooled, the change in mass of the substance is
a) positive b) negative **c) zero** d) none of the above
- If the substance is heated or cooled, the linear expansion occurs along the axis of
a) X or -X b) Y or -Y c) both a and b **d) a or b**
- Temperature is the average _____ of the molecules of a substance
a) difference in K.E and P. E b) sum of P.E and K. E
c) difference in T.E and P. E d) difference in K.E and T.E
- In the given diagram, the possible direction of heat energy transformation is



- The value of Avogadro number.
a) 6023×10^{23} **b) 6.023×10^{23}** c) 6.023×10^{24} d) 6023×10^{24}

Short Answers

1. Define one calorie.

One calorie 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, areal and superficial expansion.

Linear Expansion	Areal / 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 $\alpha_L = \frac{\Delta L}{\Delta T L_0}$	Coefficient of Areal expansion $\alpha_A = \frac{\Delta A}{\Delta T A_0}$

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. $\alpha_V = \frac{\Delta V}{\Delta T V_0}$

The SI unit is K^{-1}

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. (Charles law)

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?

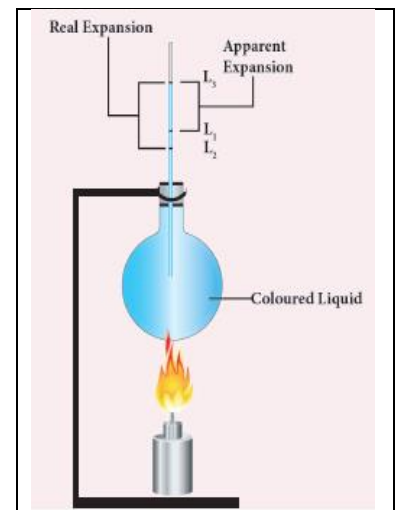
At constant pressure and temperature, the volume of a gas is directly proportional to number of atoms or molecules present in it. $V \propto n$

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

- The liquid is poured in a container up to a level. Mark this level as L_1
- Now, heat the container.
- Initially, the container expands. As a result the volume of the liquid appears to have reduced. Mark this level as L_2
- On the further heating, the level of liquid rises L_3
- Apparent expansion = $L_3 - L_1$
- Real expansion = $L_3 - L_2$.

**2. Derive the ideal gas equation.**

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

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

$$\frac{Pv}{nT} = R \quad (R - \text{Universal Gas Constant})$$

Therefore,

If $n = 1$,

$$PV = nRT$$

$$PV = RT$$

4. ELECTRICITY

Choose the correct answer

- Which of the following is correct?
 - Rate of change of charge is electrical power
 - Rate of change of energy is current
 - Rate of change of charge is electrical power
 - Rate of change of current is charge.
- SI unit of resistance is
 - mho
 - joule
 - ohm
 - ohm meter
- In a simple circuit, why does the bulb glow when you close the switch?
 - The switch produces electricity
 - Closing the switch breaks the circuit
 - Closing the switch completes the circuit
 - The bulb is getting charged
- Kilowatt hour is the unit of
 - resistivity
 - conductivity
 - electrical energy
 - electrical power

Short Answers

- Define the unit of current.
 - The SI unit of electric current is ampere (A).
 - When a charge of one coulomb flows across any cross section of a conductor, in one second is called 1 ampere
 - $1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}$
- What happens to the resistance, as the conductor is made thicker?
The resistance decreases, as the conductor is made thicker.
- 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.
- Name any two devices, which are working on the heating effect of the electric current.
 - Electric iron
 - Electric heater.
- 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.

- What is the role of the earth wire in domestic circuits?
 - It provides a low resistance path to the electric current.
 - It sends the current from the body of the appliance to the earth
 - It 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. $V \propto I$

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

Resistivity	Conductivity
The resistance of a conductor of unit length and unit area of cross section.	The reciprocal of electrical resistivity
Its unit is ohm meter	Its unit is mho meter ⁻¹ .

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 not 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.

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. 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

Choose the correct answer

1. When a sound wave travels through air, the air particles

a) vibrate along the direction of the wave motion

b) vibrate but not in any fixed direction

c) vibrate perpendicular to the direction of the wave motion

d) do not vibrate

2. Velocity of sound in a gaseous medium is 330 ms^{-1} . If the pressure is increased by 4 times without causing a change in the temperature, the velocity of sound in the gas is

a) 330 ms^{-1}

b) 660 ms^{-1}

c) 156 ms^{-1}

d) 990 ms^{-1}

3. The frequency, which is audible to the human ear

a) 50 kHz

b) 20 kHz

c) 15000 kHz

d) 10000 kHz

4. The velocity of sound in air at the particular temperature is 330 ms^{-1} . What will be its value when temperature is doubled and pressure is halved?

a) 330 ms^{-1}

b) 165 ms^{-1}

c) $330 \times \sqrt{2} \text{ ms}^{-1}$

d) $320/\sqrt{2} \text{ ms}^{-1}$

5. If the sound wave travels with a frequency of $1.25 \times 10^4 \text{ Hz}$ at 344 ms^{-1} , the wave length will be

a) 27.52 m

b) 275.2 m

c) 0.02752 m

d) 2.752 m

6. The sound waves are reflected from an obstacle into the same medium from which they were incident. Which of the following changes?

a) speed

b) frequency

c) wave length

d) none of these

7. Velocity of sound in the atmosphere of a planet is 500 ms^{-1} . The minimum distance between the sources of sound and the obstacle to hear the echo, should be

a) 17 m

b) 20 m

c) 25 m

d) 50 m

8. Speed of sound in Aluminium is

a) 5010 ms^{-1}

b) 5950 ms^{-1}

c) 6420 ms^{-1}

d) 331 ms^{-1}

Short Answers

1. What is a longitudinal wave?

As sound travels through a medium the particles vibrate along the direction of wave motion

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.

(i) Mosquito

(ii) Dogs

(iii) Bats

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

During rainy day the humidity increases, the speed of sound increases

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 is 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 listener (L) are moving in mutually perpendicular direction.

9. Difference between the Sound and Light waves.

Sound	Light
Medium is required for the propagation	Medium is not required for the propagation
Longitudinal waves	Transverse waves
Speed - 340 ms^{-1} at NTP	Speed - $3 \times 10^8 \text{ ms}^{-1}$ in Air

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 increase 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.

- (i) Mosquito (ii) Dogs (iii) 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:

- (i) The minimum time gap between the original sound and an echo must be 0.1 s
- (ii) The minimum distance required to hear an echo is 17.2 m

b) The medical applications of echo:

Echo is used in obstetric ultrasonography.

c) Calculation speed of sound:

$$\text{Speed of Sound } V = \frac{2d}{t}$$

6. NUCLEAR PHYSICS

Choose the correct answer

- Man-made radioactivity is also known as _____.
a) Induced radioactivity b) Spontaneous radioactivity c) Artificial radioactivity **d) a & c**
- Unit of radioactivity is _____.
a) roentgen b) curie c) becquerel **d) all the above**
- Artificial radioactivity was discovered by _____.
a) Becquerel **b) Irene Curie** c) Roentgen d) Neil's Bohr
- In which of the following, no change in mass number of the daughter nuclei takes place
i) α decay ii) β decay iii) γ decay iv) neutron decay
a) (i) is correct **b) (ii) & (iii) are correct**
c) (i) & (iv) are correct d) (ii) & (iv) are correct
- _____ isotope is used for the treatment of cancer.
a) Radio Iodine **b) Radio Cobalt** c) Radio Carbon d) Radio Nickel
- Gamma radiations are dangerous because
a) it affects eyes & bones b) it affects tissues
c) it produces genetic disorder d) it produces enormous amount of heat
- _____ aprons are used to protect us from gamma radiations
a) Lead oxide b) Iron **c) Lead** d) Aluminium
- Which of the following statement is/are correct?
i. α particles are photons ii. Penetrating power of γ radiation is very low
iii. Ionization power is maximum for α rays iv. Penetrating power of γ radiation is very high
a) i & ii are correct b) ii & iii are correct c) iv only correct **d) iii & iv are correct**
- Proton – Proton chain reactions is an example of _____.
a) nuclear fission b) α – decay **c) nuclear fusion** d) β decay
- In the nuclear reaction ${}_6X^{12} \xrightarrow{\alpha \text{ decay}} {}_Z Y^A$, the value of A & Z.
a) 8,6 **b) 8,4** c) 4,8 d) cannot be determined with the given data
- Kamini reactor is located at _____.
a) Kalpakkam b) Koodankulam c) Mumbai d) Rajasthan
- Which of the following statement is/are correct?
i. Chain reaction takes place in a nuclear reactor and an atomic bomb
ii. The chain reaction in a nuclear reactor is controlled
iii. The chain reaction in a nuclear reactor is not controlled
iv. No chain reaction takes place in an atom bomb
a) i only correct **b) i & ii are correct** c) iv only correct d) iii & iv are correct

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 and Aluminium
4. Write the name of the electromagnetic radiation, which is emitted during a natural radioactivity.
 γ rays
5. If A is a radioactive element which emits an α - 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) 3.2×10^{-11} J
7. Which hazardous radiation is the cause for the genetic disease?
Gamma radiation
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
It cannot be controlled.	It 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 2.58×10^{-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 absorb the neutrons

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.

Properties	α rays	β rays	γ rays
Definition	Helium nucleus	Electrons	Photons
Charge	Positive	Negative	No charge
Ionising power	Very high	Comparatively low	Very low
Penetrating power	Very low	Greater than α rays	Very high
Effect of electric and magnetic field	Deflected	Deflected	Not deflected
Speed	Very low speed compared with speed of light	Nearly equal to the speed of light	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.
- Water, air and helium are some of the coolants.

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.

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 ' nuclear fission '.	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 (Na^{24}) is used for the effective functioning of heart.
- Radio - Iodine (I^{131}) is used to cure goitre.
- Radio - iron is (Fe^{59}) is used to diagnose anaemia and also to provide treatment for the same.
- Radio phosphorous (P^{32}) is used in the treatment of skin diseases.
- Radio cobalt (Co^{60}) and radio - gold (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**Choose the correct answer**

1. Which of the following has the smallest mass?

- a) 6.023×10^{23} atoms of He **b) 1 atom of He** c) 2 g of He d) 1 mole atoms of He

2. Which of the is a triatomic molecule?

- a) Glucose b) Helium **c) Carbon dioxide** d) Hydrogen

3. The volume occupied by 4.4 g of CO_2 at S.T.P

- a) 22.4 litre **b) 2.24 litre** c) 0.24 litre d) 0.1 litre

4. Mass of 1 mole of Nitrogen atom is

- a) 28 amu b) 14 amu c) 28 g **d) 14 g**

5. Which of the following represents 1 amu?
 a) Mass of a C-12 atom
c) 1/12th of the mass of a C-12 atom
 b) Mass of a Hydrogen atom
 d) Mass of O-16 atom
6. Which of the following statement is incorrect?
 a) One gram of C-12 contains Avogadro's number of atoms
 b) One mole of oxygen gas contains Avogadro's number of molecules
c) One mole of hydrogen gas contains Avogadro's number of atoms.
 d) One mole of electrons stands for 6.023×10^{23} electrons.
7. The volume occupied by 1 mole of a diatomic gas at S.T.P is
 a) 11.2 litre b) 5.6 litre **c) 22.4 litre** d) 44.8 litre
8. In the nucleus of ${}_{20}\text{Ca}^{40}$, there are
 a) 20 protons and 40 neutrons **b) 20 protons and 20 neutrons**
 c) 20 protons and 40 electrons d) 40 protons and 20 electrons
9. The gram molecular mass of oxygen molecule is
 a) 16 g b) 18 g **c) 32 g** d) 17 g
10. 1 mole of any substance contains _____ molecules.
a) 6.023×10^{23} b) 6.023×10^{-23} c) 3.0115×10^{23} d) 12.046×10^{23}

Short Answers

1. Define: Relative atomic mass.

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

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

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

3. Define: Atomicity.

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

4. Give any two examples for hetero di atomic molecules.

- (i) HCl (ii) HF (iii) CO

5. What is 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)

$$\begin{aligned} \text{Molar mass of } \text{NH}_3 &= (1 \times 14) + (3 \times 1) \\ &= 14 + 3 \\ &= 17 \text{ g} \end{aligned}$$

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

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

$$\text{Number of molecules} = \frac{\text{Avogadro number} \times \text{given mass}}{\text{Gram molecular mass}}$$

$$\begin{aligned} \text{The number of molecules of one drop water} &= \frac{6.023 \times 10^{23} \times 0.18}{18} \\ &= 6.023 \times 10^{25} \end{aligned}$$



$$(\text{N} = 14, \text{H} = 1)$$

1 mole of nitrogen (___g) + 3 moles of hydrogen (___g) → 2 moles of ammonia (___g)

Solution:

1 mole of nitrogen (**28g**) + 3 moles of hydrogen (**6g**) → 2 moles of ammonia (**34 g**)

9. Calculate the number of moles in i) 27g of Al ii) 1.51×10^{23} molecules of NH_4Cl

i) **27g of Al:**

$$\begin{aligned} \text{Number of moles} &= \frac{\text{Mass of Al}}{\text{Atomic mass of Al}} \\ &= \frac{27}{27} = 1 \text{ mole} \end{aligned}$$

ii) **1.51×10^{23} molecules of NH_4Cl :**

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

$$\begin{aligned} \text{Number of moles} &= \frac{\text{Number of molecules of } \text{NH}_4\text{Cl}}{\text{Avogadro Number}} \\ &= \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}} \\ &= 0.25 \text{ mole.} \end{aligned}$$

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 transmuted into atoms of other elements. (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. Distinguish between atoms and molecules.

S.No.	Atom	Molecule
1	The smallest particle of an element	The smallest particle of an element or compound
2	Does not exist in free state (Except Noble gas)	Molecule exists in free state.
3	highly reactive. (Except Noble gas)	Molecules are less reactive
4	Atom does not have a chemical bond	Atoms in a molecule are held by chemical bonds

3. 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)

4. Derive the relationship between Relative molecular mass and Vapour density

$$\text{Vapour density} = \frac{\text{Mass of given volume of gas at STP}}{\text{Mass of same volume of Hydrogen}}$$

According to Avogadro's law

$$V = n, \text{ then}$$

$$\text{Vapour density} = \frac{\text{Mass of } n \text{ molecules of gas at STP}}{\text{Mass of } n \text{ molecules of Hydrogen}}$$

If, $n = 1$

$$\begin{aligned} \text{Vapour density} &= \frac{\text{Mass of 1 molecules of gas at STP}}{\text{Mass of 1 molecules of Hydrogen}} \\ &= \frac{\text{Mass of 1 molecules of gas at STP}}{2 \times \text{Mass of 1 atom of Hydrogen}} \end{aligned}$$

$$\text{Relative molecular mass} = \frac{\text{Mass of 1 molecule of gas at STP}}{\text{Mass 1 atom of Hydrogen}}$$

Therefore,

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

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

5. Calcium carbonate is decomposed on heating in the following reaction



a) How many moles of calcium carbonate are involved in this reaction?

1 mole

b) Calculate the gram molecular mass of calcium carbonate are involved in this reaction?

$$\begin{aligned} \text{Gram molecular mass of CaCO}_3 &= [(1 \times 40) + (1 \times 12) + (3 \times 16)] \\ &= [40 + 12 + 48] \\ &= 100 \text{ g} \end{aligned}$$

8. PERIODIC CLASSIFICATION OF ELEMENTS

Choose the correct answer

1. The number of periods and groups in the periodic table are ____.

- a) 6,16 b) 7,17 c) 8,18 **d) 7,18**

2. The basis of modern periodic law is ____.

- a) atomic number** b) atomic mass c) isotopic mass d) number of neutrons

3. ____ group contains the member of halogen family.

- a) 17th** b) 15th c) 18th d) 16th

4. ____ is the relative periodic property.

- a) atomic radii b) ionic radii c) electron affinity **d) electronegativity**

5. Chemical formula of rust is ____.

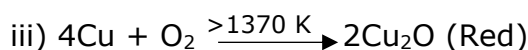
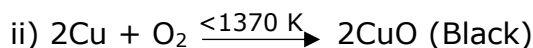
- a) $\text{FeO} \cdot x\text{H}_2\text{O}$ b) $\text{FeO}_4 \cdot x\text{H}_2\text{O}$ **c) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$** d) FeO

6. In the alumina thermic process the roll of Al is ____.
- a) oxidizing agent **b) reducing agent** c) hydrogenating agent d) sulphuring agent
7. The process of coating the surface of metal with a thin layer of zinc is called ____.
- a) painting b) thinning **c) galvanization** d) electroplating
8. Which of the following have inert gases 2 electron in the outermost shell.
- a) He** b) Ne c) Ar d) Kr
9. Neon shows zero electron affinity due to ____.
- a) stable arrangement of neutrons **b) stable configuration of electrons**
 c) reduced size d) increased density
10. ____ is an important metal to form amalgam.
- a) Ag **b) Hg** c) Mg d) Al

Short Answers

1. 'A' is reddish brown metal, which combines with O_2 at $<1370\text{ K}$ gives B, a black coloured compound. At temperature $>1370\text{ K}$, A gives C which is red colour. Find A, B and C with reaction.

i) A - reddish brown metal Copper



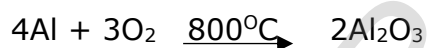
A - Copper

B - Copper II Oxide

C - Copper I Oxide

2. A is a silvery white metal. A combine with O_2 to form B at 800°C , the alloy of A is used in making the aircraft. Find A and B.

i) A - silvery white metal - Aluminium



ii) B - Aluminium oxized

3. What is rust? Give the equation for formation of rust.

Hydrated ferric oxide is known as rust.



4. State two conditions necessary for rusting of iron.

(i) Presence of moist air

(ii) Presence of water

(iii) Presence of oxygen

5. Define Alloys?

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

6. What is Amalgam? Give Example?

An alloy of mercury with another metal. Ex: Silver tin Amalgam

7. Name the acid renders aluminium passive. Why?

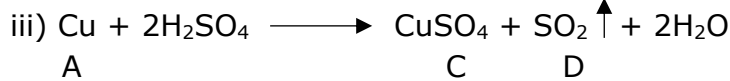
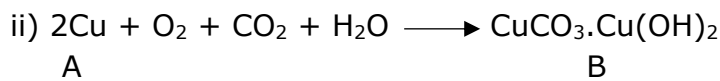
i) Dilute or concentrated **nitric acid**

ii) Nitric acid forms an oxide film on the surface of aluminium.

Answer in detail:

1. The electronic configuration of metal A is 2,8,18,1. A when exposed to air and moisture forms B a green layered compound. A with con. H₂SO₄ forms C and D along with water. D is a D is a Gaseous compound. Find A, B, C and D.

i) Metal A is Copper



A – Copper

B – Copper carbonate

C – Copper sulphate

D – Sulphur di oxide

2. 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:

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

9. SOLUTIONS**Choose the correct answer**

1. A solution is a _____ mixture.

a) homogenous

c) homogenous and heterogenous

b) heterogenous

d) non homogenous

2. The number of components in a binary solution is _____.

a) 2

b) 3

c) 4

d) 5

3. Which of the following is the universal solvent?

a) Acetone

b) Benzene

c) Water

d) Alcohol

4. A solution in which no more solute can be dissolved in a definite amount of solvent at the given temperature is called ____.

a) saturated solution

c) super saturated solution

b) unsaturated solution

d) dilute solution

5. Identify the non-aqueous solution

a) sodium chloride in water

c) copper sulphate in water

b) glucose in water

d) sulphur in carbon-di-sulphide

6. When pressure is increased at constant temperature the solubility of gases in liquid.

a) no change

b) increases

c) decreases

d) no reaction

7. solubility of NaCl in 100 ml water is 36 g If 25 g of salt is dissolved in 100 ml of water how much more salt is required for saturation.

- a) 12 g **b) 11 g** c) 16 g d) 20 g

8. A 25% alcohol solution means

- a) 25 ml alcohol in 100 ml water b) 25 ml alcohol in 25 ml water
c) 25 ml alcohol in 75 ml water d) 75 ml alcohol in 25 ml water

9. Deliquescence is due to _____.

- a) strong affinity to water** b) less affinity to water
 c) strong hatred to water d) inertness to water

10. Which of the following is hygroscopic in nature?

- a) ferric chloride b) copper sulphate Penta hydrate **c) silica gel** d) none of the above

Short Answers

1. Define solution

A solution is a homogeneous mixture of two or more substance. Ex. Sea water

(or)

Solution = Solvent + solute

2. What is mean by binary solution

Solution which are made of one solute and one solvent are called binary solution.

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

Aqueous solution

The solution in which water acts as a solvent. **E.g.:** salt in water

Non - Aqueous solution

The solution in which any liquid other than water acts as a solvent

E.g: Sulphur dissolved in carbon

4. Define Volume percentage

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

$$\text{Volume percentage} = \frac{\text{Volume of the solute}}{\text{Volume of solution}} \times 100$$

5. The aquatic animals live more in cold region Why?

More amount of dissolved oxygen is present in the water of cold regions.

6. Define Hydrated salt.

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

7. 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, Gypsum salt, Copper sulphate Penta hydrate	Con. Sulphuric acid, Silica gel

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 100 g of water at 25°C forms saturated solution.

ii) Unsaturated solution: Solution is one that contains less solute than that of the saturated solution at a given temperature.

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

2. Write notes on various factors affecting solubility.

There are three main factors that affect the solubility of a solute.

- 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 increase 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:

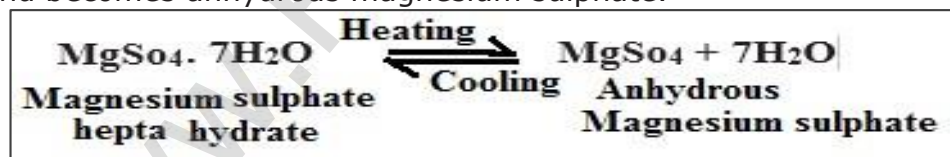
- ❖ The solubility of gas is more at lower temperature whereas it decreases with increasing temperature.

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 $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is heated? Write the appropriate equation

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



b) Define solubility

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.

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

Hygroscopic substances	Deliquescence substances
They absorb moisture and do not dissolve.	They absorb moisture and dissolve.
Do not change its physical state	Change its physical state
Amorphous solids or liquids.	Substance are crystalizing solids.

10. TYPES OF CHEMICAL REACTION

Choose the correct answer

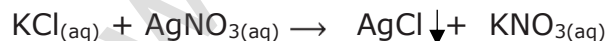
1. $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{HCl}(\text{g})$ is a

- a) decomposition reaction
- b) combination reaction
- c) single displacement reaction
- d) double displacement reaction

2. Photosynthesis is a decomposition reaction caused by _____.
 a) heat b) electricity **c) light** d) mechanical energy
3. A reaction between carbon and oxygen is represented by $C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} + \text{Heat}$. In which of the type(s), the above reaction can be classified?
 i) Combination Reaction ii) Combustion Reaction
 iii) Decomposition Reaction iv) Irreversible Reaction
 a) i and ii b) i and iv c) i, ii and iii **d) i, ii and iv**
4. The chemical equation $Na_2SO_{4(aq)} + BaCl_{2(aq)} \longrightarrow BaSO_{4(s)} + 2NaCl_{(aq)}$ represents which of the following types of reaction?
 a) Neutralisation b) Combustion **c) Precipitation** d) Single Displacement
5. Which of the following statements are correct above a chemical equilibrium?
 (i) It is adynamic in nature
 (ii) The rate of the forward and backward
 (iii) Irreversible reactions do not attain chemical equilibrium
 (iv) The concentration of reactants and products may be different
a) i, ii and iii b) i, ii and iv c) ii, iii and iv d) i, iii and iv
6. A single displacement reaction is represented by $X_{(s)} + 2HCl_{(aq)} \longrightarrow XCl_{2(aq)} + H_{2(g)}$. Which of the following(s) could be X.
 (i) Zn (ii) Ag (iii) Cu (iv) Mg. Choose the best pair.
 a) i and ii b) ii and iii c) iii and iv **d) i and iv**
7. Which of the following is not an "element + element compound" reaction.
 a) $C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ b) $2K_{(s)} + Br_{2(l)} \longrightarrow 2KBr_{(s)}$
c) $2CO_{2(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ d) $4Fe_{(s)} + 3O_2 \longrightarrow 2Fe_2O_{3(s)}$
8. Which of the following represents a precipitation reaction?
 a) $A_{(s)} + B_{(s)} \longrightarrow C_{(s)} + D_{(s)}$ b) $A_{(s)} + B_{(aq)} \longrightarrow C_{(aq)} + D_{(l)}$
c) $A_{(aq)} + B_{(aq)} \longrightarrow C_{(s)} + D_{(aq)}$ d) $A_{(aq)} + B_{(s)} \longrightarrow C_{(aq)} + D_{(l)}$
9. The pH of the solution is 3. Its $[OH^-]$ concentration is ____.
 a) 1×10^{-3} M b) 3 M **c) 1×10^{-11} M** d) 11 M
10. Powdered $CaCO_3$ reacts more rapidly than flaky $CaCO_3$ because of ____.
a) large surface area b) high pressure c) high concentration d) high temperature

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.



4. Differentiate reversible and irreversible reactions.

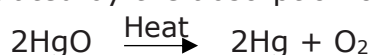
Reversible reaction	Irreversible reaction
It can be reversed under suitable condition.	It cannot be reversed
Both forward and backward reactions take place	It proceeds only in forward direction.
relatively slow	completely converted into products.
It attains equilibrium	Equilibrium is not attained.

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**

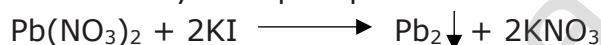
Calcium carbonate is heated, it breaks down into calcium oxide and carbon dioxide. It is a type of compound to compound / compound decomposition reaction.

**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.****i) Nature of reactant:**

Stronger acid more reactive than weaker acid.

ii) Concentration of the reactants:

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

iii) Temperature:

Adding heat to the reactants provides energy to break more bonds and thus speed up the reaction

iv) Pressure:

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

v) Catalyst:

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

vi) Surface area of the reactants:

Powered 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) decrease 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 gets 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 remains constant.

11. CARBON AND ITS COMPOUNDS

Choose the correct answer

1. The molecular formula of an open chain organic compound is C_3H_6 . The class of the compound is

- a) alkane **b) alkene** c) alkyne d) alcohol

2. The IUPAC name of an organic compound is 3- Methyl butane 1- ol. What type compound it is?

- a) Aldehyde b) Carboic acid c) Ketone **d) Alcohol**

3. The secondary suffix used in IUPAC nomenclature of an aldehyde is _____.

- a) - ol b) - oic acid **c) - al** d) - one

4. Which of the following pairs can be the successive members of a homologous series?

- a) C_3H_8 and C_4H_{10}** b) C_2H_2 and C_2H_4 c) CH_4 and C_3H_6 d) C_2H_5OH and C_4H_6OH

5. $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$ is a

- a) reduction of ethanol **b) combustion of ethanol**
c) oxidation of ethanoic acid d) oxidation of ethanol

6. Rectified spirit is an aqueous solution which contains about _____ of ethanol.

- a) 95.5 %** b) 75.5 % c) 55.5 % d) 45.5 %

7. Which of the following are used as anaesthetics?

- a) Carboxylic acids **b) Ethers** c) Esters d) Aldehydes

8. TFM in soaps represents _____ content in soap

- a) mineral b) vitamin **c) fatty acid** d) carbohydrate

9. Which of the following statements is wrong about detergents?

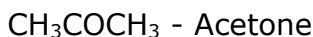
- a) It is a sodium salt of long chain fatty acids** b) It is sodium salts of sulphonic acids
c) The ionic part in a detergent is $-SO_3^-Na^+$ d) It is effective even in hard water

10. 100 % pure ethanol is called

- a) rectified spirit b) methylated spirit **c) absolute alcohol** d) power alcohol

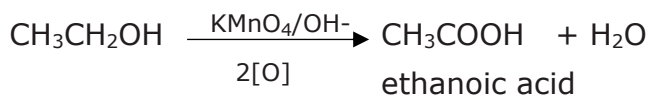
Short Answers

1. Name the simplest ketone and give its structural formula.



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

Ethanol is oxidized to ethanoic acid with alkaline KMnO_4 or acidified $\text{K}_2\text{Cr}_2\text{O}_7$



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 microorganisms 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.

4. 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 forms 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 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: $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{OH}$.

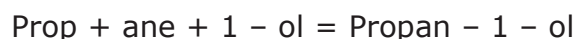
Step1: The parent chain consists of 3 carbon atoms. The root word is "prop"

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



3. How is ethanol manufactured from sugarcane?

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

i) Dilution of molasses

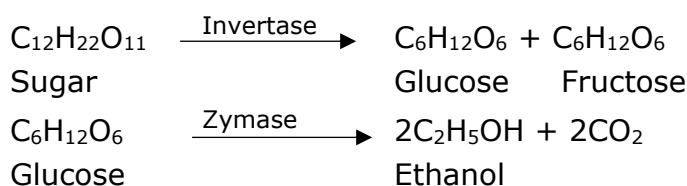
Molasses is first diluted with water to bring down the concentration of sugar to about 8 to 10 percent.

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**

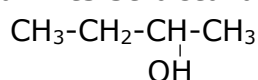
- The fermented liquid containing 15 to 18 percent alcohol, is now subjected to fractional distillation.
- The main fraction drawn is an aqueous solution of ethanol which contains 95.5 % ethanol and 4.5 % of water. This is called rectified spirit.
- This mixture is then refluxed over quick lime for about 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.

4. Explain the mechanism of cleansing action of soap.

- Soap molecule contains two distinct parts
- Polar end is attracted to water.
- Non-polar end is attracted to dirt on the cloth.
- The non polar end of the soap molecule traps the dirt
- The polar end makes the entire molecule soluble in water.
- When a soap is dissolved in water, the molecules join together as clusters called micelles.
- The polar end of the soap molecules makes the micelles soluble in water.
- Thus, the dirt is washed away with the soap.

5. The molecular formula of an alcohol is C₄H₁₀O. The locant number of its -OH group is 2

- i) Draw its structural formula
- ii) Give its IUPAC name
- iii) Is it saturated or unsaturated.

i) Draw its structural formula**ii) Give its IUPAC name**

2 - Butanol

iii) Is it saturated or unsaturated

Saturated

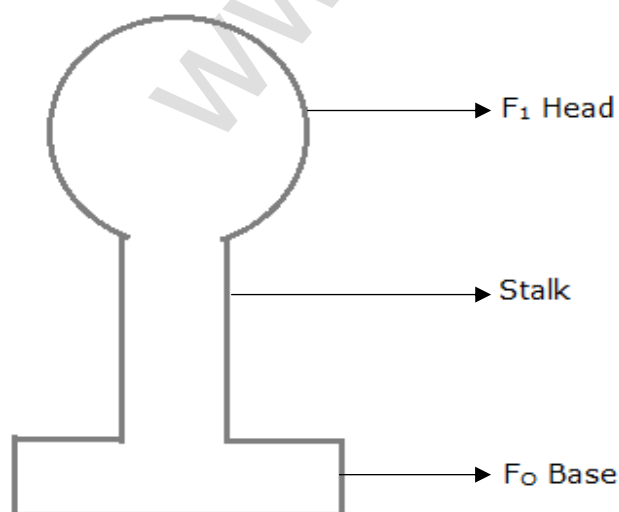
12. PLANT ANATOMY AND PLANT PHYSIOLOGY

Choose the correct answer

- Casparian strips are present in the ____ of the root
a) cortex b) pith c) pericycle **d) endodermis**
- The endarch condition is the characteristic feature of ____.
a) root **b) stem** c) leaves d) flower
- The xylem and phloem arranged side by side on the same radius is called ____.
a) radial b) amphivasal **c) conjoint** d) None of these
- Which is formed during anaerobic respiration.
a) carbohydrate **b) Ethyl alcohol** c) Acetyl Co. A d) Pyruvate
- Kreb's cycle takes place in
a) chloroplast **b) mitochondrial matrix**
c) stomata d) inner mitochondrial membrane
- Oxygen is produced at what point during photosynthesis
a) when ATP is converted to ADP b) when CO₂ is fixed
c) when H₂O is splitted d) All of these

Short Answers

- What is collateral vascular bundle?
Xylem lies towards the centre and phloem lies towards the periphery.
- Where does the carbon that is used in photosynthesis come from?
Carbon dioxide taken from atmosphere
- What is the common step is aerobic and anaerobic path way?
Glycolysis
- Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.
Anaerobic respiration.
- 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.
- 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.
- Draw and label the structure of oxosomes.



8. Name the three basic tissue system in flowering plants.

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

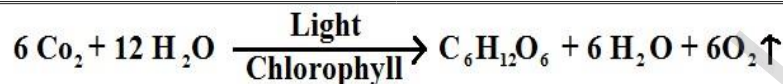
9. What is photosynthesis and where in a cell does it occur?

- 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 occurs in the chloroplast.

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

- During light independent reactions, CO_2 is reduced into carbohydrates with the help of ATP and NADPH_2 .
- So light dependent reaction occurs 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_2 , 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

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

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 enters into CO_2 and water

Electron Transport chain:

- NADH_2 and FADH_2 molecules formed during glycolysis and Krebs's cycle are oxidised to NAD^+ and FAD^+ 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_2 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 need sunlight
The end products are ATP and NADPH_2 and O_2	End product is carbohydrate, ADP and NADP
The reactants are 3 chlorophyll, sunlight and water	The reactants are CO_2 , ATP and NADPH_2 .
It occurs in thylakoid membrane of the chloroplast.	It occurs in the stroma of the chloroplast.

13. STRUCTURAL ORGANISATION OF ANIMALS

Choose the correct answer

1. In leech locomotion is performed by
 - a) Anterior sucker
 - b) Parapodia
 - c) Setae
 - d) contraction and relaxation of muscles**
2. The segments of leech are known as
 - a) Metameres (somite's)**
 - b) Proglottids
 - c) Strobila
 - d) All of the above
3. Pharyngeal ganglion in leech is a part of
 - a) Excretory system
 - b) Nervous system**
 - c) Reproductive system
 - d) Respiratory system
4. The brain of leech lies above the
 - a) Mouth
 - b) Buccal Cavity
 - c) Pharynx**
 - d) Crop
5. The body of leech has
 - a) 23 segments
 - b) 33 segments**
 - c) 38 segments
 - d) 30 segments
6. Mammals are _____ animals.
 - a) cold blooded
 - b) warm blooded**
 - c) poikilothermic
 - d) All the above

7. The animals which give birth to young ones are
 a) Oviparous **b) Viviparous** c) Ovoviviparous d) All the above
8. _____ spinal nerves are present in rabbit
 a) 12 pairs b) 10 pairs **c) 37 pairs** d) 47 pairs

Short Answers

1. Give the common name of the *Hirudinaria granulosa*.

The Indian Leech

2. How does leech respire?

Respiration takes place through the skin in leech.

3. Write the dental formula of rabbit.

Dental formula is $I \frac{2}{1}, C \frac{0}{0}, PM \frac{3}{2}, M \frac{3}{3}$. It is written as $\frac{2033}{3023}$

4. How many pairs of testes are present in leech?

11 pairs

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 triradiate 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.

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.
 - ❖ First channel lies above (dorsal) the alimentary canal.
 - ❖ Second channel 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 26th segment.

2. How does locomotion take place in leech?

Locomotion in leech take place by Looping (or) crawling movement and Swimming movement.

Looping or crawling movement:

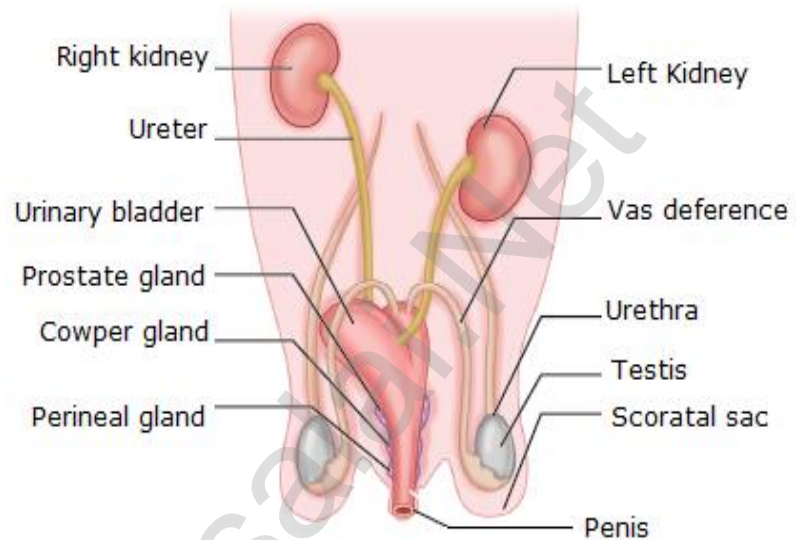
- This type of movement is brought about by the contraction and relaxation of muscles.
- The two suckers serve for attached during movement.

Swimming movement:

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

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

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



14. TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

Choose the correct answer

1. Active transports involves
 - a) movement of molecules from lower to higher concentration
 - b) expenditure of energy
 - c) it is an uphill task
 - d) all of the above**
2. Water which is absorbed by roots is transported to aerial parts of the plant through
 - a) cortex
 - b) epidermis
 - c) phloem
 - d) xylem**
3. During transpiration there is loss of
 - a) carbon di oxide
 - b) oxygen
 - c) water**
 - d) none of the above
4. Root hairs are
 - a) cortical cell
 - b) projection of epidermal cell
 - c) unicellular
 - d) both b and c**
5. Which of the following process requires energy
 - a) active transport**
 - b) diffusion
 - c) osmosis
 - d) all of them
6. The wall of human heart is made of
 - a) Endocardium
 - b) Epicardium
 - c) Myocardium
 - d) All of the above**
7. Which is sequence of correct blood below
 - a) ventricle – atrium – vein – arteries
 - b) atrium – ventricle – veins – arteries
 - c) atrium – ventricle – arteries – vein**
 - d) ventricles – vein – atrium – arteries

8. A patient with blood group O was injured in accident and has blood loss. Which blood group the doctor should effectively use for transfusion in this condition?

- a) **O group** b) AB group c) A or B group d) all blood group

9. 'Heart of heart' is called

- a) **SA node** b) AV node c) Purkinje fibres d) Bundle of His

10. Which one of the following regarding blood composition is correct

- a) Plasma - Blood + Lymphocyte b) Serum - Blood + Fibrinogen
c) Lymph - Plasma + RBC + WBC **d) Blood - Plasma + RBC + WBC + Platelets**

Short Answers

- Name two layered protective covering of human heart.
Pericardium
- What is the shape of RBC in human blood?
Biconcave and disc shaped.
- Why is the colour of the blood red?
Presence of haemoglobin in RBC
- Which kind of cells are found in the lymph?
Lymphocytes
- Name the heart valve associated with the major arteries leaving the ventricles.
Semi - lunar valves
- Mention the artery which supplies blood to the heart muscle.
Coronary artery
- What causes the opening and closing of guard cells of stomata during transpiration?
 - The opening and closing of the stomata are due to the change in turgidity of the guard 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.
- What is cohesion?
The force of attraction between molecules of water is called cohesion.
- 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
- What would happen to the leaves of a plant that transpires more water than its absorption in the roots?
 - When the leaves of a plant transpire more water than its absorption, it results in excessive transpiration.
 - The plant will get dehydrated and it affects plant growth, photosynthesis and transpiration
- Describe the structure and working of the human heart.

The structure of the human heart

- The human heart is made up of cardiac muscle and is enclosed by the pericardium
- 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 atriums pump blood into the right and left ventricles respectively
- The right and left pulmonary arteries supply deoxygenated blood to the lungs
- 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?

- When the blood circulates twice through the heart in one complete cycle
- The Oxygenated blood do not 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 except 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 are due to the change in turgidity of the guard 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.

- 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 move 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 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:

They are containing granules in their cytoplasm

i) Neutrophils: increased during infection and inflammation

ii) Eosinophils: It brings about detoxification of toxins.

iii) Basophils: They release chemicals during the process of inflammation.

Agranulocytes

They are not containing granules in their cytoplasm

i) Lymphocytes: They produce antibodies during bacterial and viral infections

ii) Monocytes: They are phagocytic and can energy bacteria

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

Systole	Diastole
Contraction phase of the heart	Relaxation phase of the heart
Normal systolic pressure is 120 mm Hg	Normal diastolic pressure is 80 mm Hg
Duration of ventricular systole is 0.3 s	Duration of ventricular diastole is 0.3 s

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.

15. NERVOUS SYSTEM

Choose the correct answer

1. Bipolar neurons are found in

- a) retina of eye** b) cerebral cortex c) embryo d) respiratory epithelium

2. Site for processing of vision, hearing, memory, speech, intelligence and thought is

- a) kidney b) ear **c) brain** d) lungs

3. In reflex action, the reflex arc is formed by

- a) brain, spinal cord, muscle b) receptor, muscle, spinal cord
c) muscle, receptor, brain **d) receptor, spinal cord, muscle**

4. Dendrites transmit impulse _____ cell body and axon transmit impulse _____ cell body.

- a) away from, away from **b) towards, away from**
c) towards, towards d) away from, towards

5. The outer most of the three cranial meninges is
 a) arachnoid membrane b) piamater **c) duramater** d) myelin sheath
6. There are ____ pairs of cranial nerves and ____ pairs of spinal nerves.
a) 12,31 b) 31, 12 c) 12, 13 d) 12, 21
7. The neurons which carries impulse from the central nervous system to the muscle fibre.
 a) afferent neurons b) association neuron **c) efferent neuron** d) unipolar neuron
8. Which nervous band connects the two cerebral hemispheres of brain?
 a) thalamus b) hypothalamus **c) corpus callosum** d) pons
9. Node of Ranvier is found in
 a) muscles **b) axons** c) dendrites d) cyton
10. Vomiting centre is located in
a) medulla oblongata b) stomach c) cerebrum d) hypothalamus
11. Nerve cells do not possess
 a) neurilemma **b) sarcolemma** c) axon d) dendrites
12. A person who met with an accident lost control of body temperature, water balance and hunger. Which of the part of following part of brain is supposed to be damaged?
 a) Medulla oblongata b) cerebrum c) pons **d) hypothalamus**

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. Differentiate between voluntary and involuntary actions.

Voluntary action	Involuntary action
Controlled by the brain	Controlled by the spinal cord
Initiates by our own conscious	Without our own conscious
Under the control of the will	Not under the control of the will
For example- Breathing, eating	For example-heartbeat, sneezing

2. Differentiate between medullated and non – medullated fibres

Medullated Nerve Fibres	Non-medullated Nerve Fibres
Myelin sheath is present	Myelin sheath is absent
White matter of brain	Grey matter of brain
Nodes of Ranvier are present	Nodes of Ranvier are absent
They carry impulses faster	They carry impulses slower

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. With a neat diagram explain the structure of a neuron.

A neuron consists of three basic parts, Cyton,

Dendrites and Axon

Cyton:

It helps in transmission of nerve impulses to and from the cell body.

Dendrites:

These are the numerous branched cytoplasmic processes that project from the surface of the cell body.

They conduct nerve impulses towards the cyton.

Axon:

The axon is a single, elongated, slender projection.

The axons may be covered by a protective sheath called

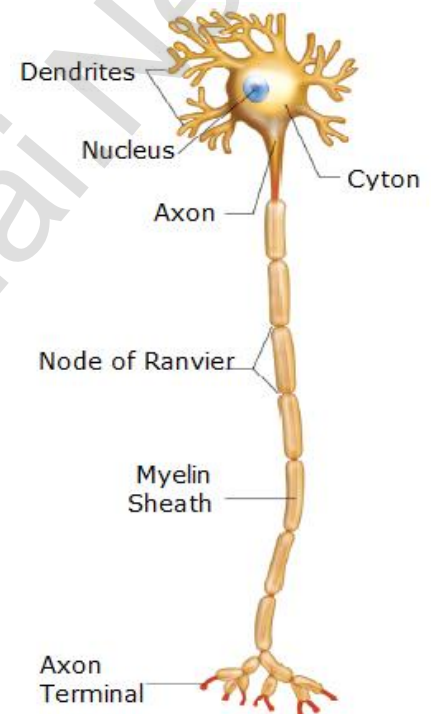
myelin sheath

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**.



16. PLANT AND ANIMAL HORMONES

1. Gibberellins cause

- a) Shortening of genetically tall plants b) **Elongation of dwarf plants**
c) Promotion of rooting d) Yellowing of young flowers

2. The hormone which has positive effect on apical dominance is

- a) Cytokinin b) **Auxin** c) Gibberellin d) Ethylene

3. Which one of the following hormones is naturally not found in plants

- a) **2, 4-D** b) GA3 c) Gibberellin d) IAA

4. Avena coleoptile test was conducted by

- a) Darwin b) N. Smith c) Paal d) **F.W. Went**

5. To increase the sugar production in sugarcane they are sprayed with

- a) Auxin b) Cytokinin c) **Gibberellins** d) Ethylene

6. LH is secreted by
 a) Adrenal gland b) Thyroid gland **c) Anterior gland** d) Hypothalamus
7. Identify the exocrine gland
 a) Pituitary gland b) Adrenal gland **c) Salivary gland** d) Thyroid gland
8. Which organ acts as both exocrine gland as well as endocrine gland
a) Pancreas b) Kidney c) Liver d) Lungs
9. Which one is referred as "Master Gland".
 a) Pineal gland **b) Pituitary gland** c) Thyroid gland d) Adrenal gland

Short Answers

- Which hormone promotes the production of male flowers in Cucurbits?
Gibberellins
- Write the name of a synthetic auxin.
2,4 D
- Which hormone induces parthenocarp in tomatoes?
Gibberellins
- What is the hormone responsible for the secretion of milk in female after child birth?
Prolactin hormone
- Name the hormones, which regulates water and mineral metabolism in man.
Mineralocorticoids - Aldosterone
- Which hormone is secreted during emergency situation in man?
Epinephrine, Norepinephrine,
- Which gland secretes digestive enzymes and hormones?
Pancrease
- Name the endocrine glands associated with kidneys.
Adrenal gland
- What are synthetic auxins? Give examples.
Artificially synthesized auxins that have properties like auxins are called as synthetic auxins. **Example:** 2, 4D
- 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
- Bring out any two physiological activities of abscisic acid.
 - ABA promotes - Abscission
 - During water stress and drought conditions ABA causes stomatal closure.
- 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**.
- What are chemical messengers?
Hormones
- 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?

It is essential for normal physical, mental and personality development. Hence, it is referred 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 children's

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, Warmolt 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.

- 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.

Lack of ADH - Diabetes insipidus

Lack of insulin - Diabetes mellitus

Diabetes insipidus	Diabetes mellitus
It reduces reabsorption of water	It reduces the conversion of glucose into glycogen
It causes an increase in urine output	It causes an increase in blood sugar level

17. REPRODUCTION IN PLANTS AND ANIMALS

Choose the correct answer

- The plant which propagates with the help of its leaves is ____.
a) Onion b) Neem c) Ginger **d) Bryophyllum**
- Asexual reproduction takes place through budding in ____.
a) Amoeba **b) Yeast** c) Plasmodium d) Bacteria
- Syngamy results in the formation of ____.
a) Zoospores b) Conidia **c) Zygote** d) Chlamydo spores
- The essential parts of a flower are
a) Calyx and Corolla b) Calyx and Androecium
c) Corolla and Gynoecium **d) Androecium and Gynoecium**
- Anemophilous flowers have ____.
a) Sessile stigma b) Small smooth stigma c) Coloured flower **d) Large feathery stigma**
- Male gametes in angiosperms are formed by the division of ____.
a) Generative cell b) Vegetative cell c) Microspore mother cell d) Microspore
- What is true gametes?
a) They are diploid b) They give rise to gonads
c) They produce hormones **d) They are formed from gonads**
- A single highly coiled tube where sperms are stored, get concentrated and mature is known as
a) Epididymis b) Vasa efferentia c) Vas deferens d) Seminiferous tubules
- The large elongated cell that provide nutrition to developing sperms are
a) Primary germ cells **b) Sertoli cells** c) Leydig cells d) Spermatogonia
- Oestrogen is secreted by
a) Anterior pituitary b) Primary follicle **c) Graafian follicle** d) Corpus luteum
- Which one of the following is an IUCD?
a) Copper - T b) Oral pills c) Diaphragm d) Tubectomy

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 28th
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 fragment 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.
Favorable environmental conditions.	Unfavorable environmental conditions.
Amoeba, Paramecium, etc.	Plasmodium.

13. Define triple fusion.
Among the two male gametes produced by generative cells one fuses with egg. The other sperm fuses with the secondary nucleus are 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.

Discuss the first event and write the types.

Pollination. 1. Self-pollination 2. Cross pollination

Mention the advantages and the disadvantages of that event.

self-pollination	cross-pollination
<p>Advantages: Flowers do not depend on agents for pollination. There is no wastage of pollen grains.</p>	<p>Advantages: It leads to the production of new varieties. More viable seeds are produced.</p>
<p>Disadvantages: The seeds are less in numbers. The endosperm is minute. Therefore, the seeds produce weak plants. New varieties of plants cannot be produced</p>	<p>Disadvantages of cross-pollination Pollination may fail due to distance barrier. More wastage of pollen grains It may introduce some unwanted characters Flowers depend on the external agencies for pollination</p>

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

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

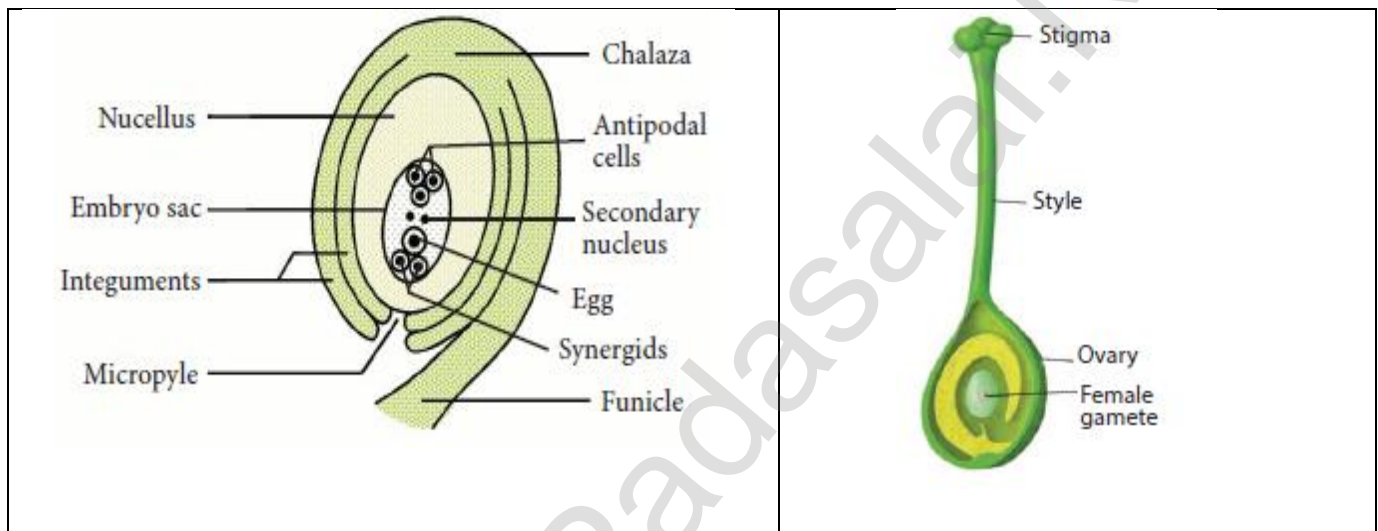
- Before puberty there is no sex hormone production.
- The corpus luteum persists, continues to secrete progesterone maintains the thickened state of uterine wall and prevents maturation of another follicle till the end of pregnancy.

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 **nucleus**.
- 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.

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

18. GENETICS

Choose the correct answer

1. According to Mendel alleles have the following character
 a) pair of genes **b) responsible for character**
 c) production of gametes d) recessive factors
2. 9: 3: 3: 1 ratio is due to
 a) Segregation b) Crossing over **c) Independent assortment** d) Recessiveness
3. The region of chromosome where the spindle fibres get attached during cell division
 a) Chromosome b) Centrosome **c) Centromere** d) Chromonema
4. The centromere is found at the centre of the ___ chromosome
 a) Telocentric **b) metacentric** c) Sub-metacentric d) Acrocentric
5. The ___ units from the backbone of the DNA
 a) 5 carbon sugar b) Phosphate c) Nitrogenous bases **d) Sugar phosphate**
6. Okasaki fragments are joined together by _____.
 a) Helicase b) DNA polymers c) RNA primer **d) DNA ligase**
7. The number of chromosomes found in human beings are _____.
a) 22 pairs of autosomes and 1 pair of allosomes b) 22 autosomes and 1 allosom
 c) 46 autosomes d) 46 pairs autosomes and 1 pair of allosomes
8. The loss of one or more chromosome in a ploidy is called _____.
 a) Tetra ploidy **b) Aneuploidy** c) Euploidy d) Polyploidy

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?
 Dominant - Axial white flower
 Recessive - Terminal white flower
4. What is the name given to the segments of DNA, which are responsible for the inheritance of a particular character?
 Genes
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?

Euploidy considered to be advantageous to both plants and animals, as they often result in increased fruit and flower size.

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 colour 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

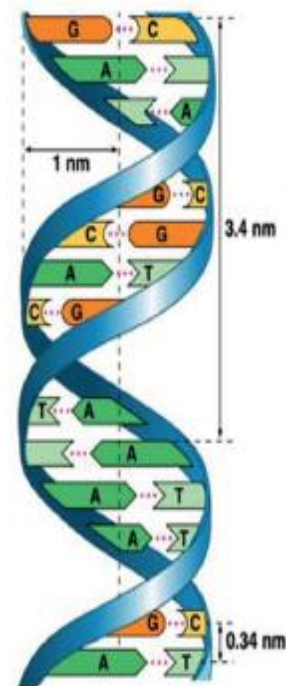
Monohybrid cross	Dihybrid cross
Crosses involving inheritance of only one pair of contrasting characters	Cross involving inheritance of two pairs of contrasting characters
Example: Tall Plant × Dwarf plant	Example: yellow × Wrinkled green
The phenotypic ratio is 3:1	Phenotypic ratio is 9:3:3:1

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

- DNA molecule consists of two polynucleotide chains
- These chains form a double helix structure
- Nitrogenous bases in the centre are linked to sugar phosphate units
- Hydrogen bonds between the nitrogenous bases make the DNA molecule stable
- Each turn of the double helix is 34 Å (3.4 nm)
- The nucleotides in a helix are joined together by phosphodiester bonds

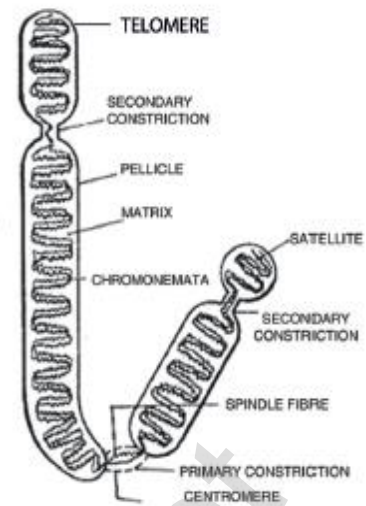
Significance of DNA:

- 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. 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.



4. 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.

19. ORIGIN AND EVOLUTION OF LIFE

Choose the correct answer

1. Biogenetic law states that _____.

a) Ontogeny and phylogeny go together

b) Ontogeny recapitulates phylogeny

c) Phylogeny recapitulates ontogeny

d) There is no relationship between phylogeny and ontogeny

2. The 'use and disuse theory' was proposed by ____.

a) Charles Darwin b) Ernst Haeckel **c) Jean Baptiste Lamarck** d) Gregor Mendel

3. Palaeontologists deal with

a) Embryological evidences

b) Fossil evidences

c) Vestigial organ evidences

d) All the above

4. The best way of direct dating fossils of recent origin is by

a) Radio-carbon method

b) Uranium lead method

c) Potassium-argon method

d) both (a) and (b)

5. The term Ethnobotany was coined by

a) Khorana

b) J. W. Herzberger

c) Ronald Ross

d) Hugo de Vries

6. The theory of natural selection for evolution was proposed by _____.

a) Charles Darwin

b) Ernst Haeckel

c) Jean Baptiste Lamarck

d) Gregor Mendel

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.
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. 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. 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 ethnomedicinal plant parts for the treatment of diseases
2. **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.

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

Variations

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

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.

Origin of species

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

3. How do you differentiate homologous organs from analogous organs?

Homologous organs	Analogous organs
Inherited from common ancestors	Inherited from different ancestors
Dissimilar and adapted for different function	Similar and perform similar function
Development patterns are similar	Development patterns are different
E.g. Human hand	E.g. Bat wings

20. BREEDING AND BIOTECHNOLOGY

Choose the correct answer

- Which method of crop improvement can be practised by a farmer if he is inexperienced
a) clonal selection **b) mass selection** c) pure line selection d) hybridisation
- Pusa komal is a disease resistant variety of ____.
a) sugarcane b) rice **c) cow pea** d) maize
- Himgiri developed by hybridisation and selection for disease resistance against rust pathogens is a variety of ____.
a) chilli b) maize c) sugarcane **d) wheat**
- The miracle rice which saved millions of lives and celebrated its 50th birthday is ____.
a) IR 8 b) IR 24 c) Atomita d) Ponni
- Which of the following is used to produce products useful to human by biotechnology techniques.
a) enzyme from organism b) live organism c) vitamins **d) both (a) and (b)**
- We can cut the DNA with the help of
a) scissors **b) restriction endonucleases** c) knife d) RNAase
- rDNA is a
a) vector DNA b) circular DNA
c) recombinant of vector DNA and desired DNA d) satellite DNA
- DNA fingerprinting is based on the principle of identifying ____ sequences of DNA
a) single stranded b) mutated c) polymorphic **d) repetitive**
- Organisms with modified endogenous gene or a foreign gene are also known as
a) transgenic organism b) genetically modified c) mutated **d) both (a) and (b)**
- In a hexaploidy wheat ($2n = 6x = 42$) the haploid (n) and the basic (x) number of chromosomes respectively are
a) $n = 7$ and $x = 21$ b) $n = 21$ and $x = 21$ c) $n = 7$ and $x = 7$ **d) $n = 21$ and $x = 7$**

Short Answers

- Give the name of wheat variety having higher dietary fibre and protein
Triticale.
- 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).
- 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).
- 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 is also known as transgenic organisms.

6. State the importance of biofertilizer?

- 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.

Selection – Selecting the best plants with desired characters

Hybridization - To combine the characters of two plants that are disease resistant

8. Name three improved characteristics of wheat that helped India to achieve high productivity.

- **Atlas 66** - Protein rich wheat variety
- **Himgiri** - Disease resistant variety of wheat is produced.
- **Sonalika** - High yielding, semi - dwarf varieties of wheat.

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.**

Somatic gene therapy	Germ line gene therapy
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.

Undifferentiated cells	Differentiated cells
Unspecialized cells	Specialized cells
Eg : Stem cells.	Eg : 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.
- In such situations stem cells are used for the treatment of disease which is called stem-cell therapy

13. Differentiate between outbreeding and inbreeding.

Outbreeding	Inbreeding
It is the breeding of unrelated animals.	Mating of closely related animals within the same breed for about 4 - 6 generations.
The hybrids are stronger and vigorous than their parents.	It helps in the accumulation of superior genes.
E.g. Mule	E.g. Sheep Hissardale

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.
- 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.

4. Discuss the importance of biotechnology in the field of medicine?

- Insulin used in the treatment of diabetes
- Human growth hormone used for treating children with growth deficiencies
- Blood clotting factors are developed to treat haemophilia
- Tissue plasminogen activator is used to dissolve blood clots and prevent heart attack
- Development of vaccines against various diseases like Hepatitis B and rabies

21. HEALTH AND DISEASES**Choose the correct answer**

1. Tobacco consumption is known to stimulate secretion of adrenalin. The component causing this could be

- a) **Nicotine** b) Tannic acid c) Curcumin d) Leptin

2. World 'No Tobacco Day' is observed on

- a) **May 31** b) June 6 c) April 22 d) October 2

3. Cancer cells are more easily damaged by radiations than normal cells because they are

- a) different in structure b) non-dividing
c) mutated cells **d) undergoing rapid division**

4. Which types of cancer affects lymph nodes and spleen.

- a) Carcinoma b) Sarcoma c) Leukaemia **d) Lymphoma**

5. Excessive consumption of alcohol leads to

- a) loss of memory **b) cirrhosis of liver**
c) state of hallucination d) suppression of brain function

6. Coronary heart disease is due to

- a) Streptococci bacteria b) Inflammation of pericardium
c) Weakening of heart valves **d) Insufficient blood supply to heart muscles**

7. Cancer of epithelial cells is called
 a) Leukaemia b) Sarcoma **c) Carcinoma** d) Lymphoma
8. Metastasis is associated with
a) malignant tumour b) benign tumour c) both (a) and (b) d) crown gall tumour
9. Polyphagia is a condition seen in
 a) Obesity **b) Diabetes mellitus** c) Diabetes insipidus d) AIDS
10. Where does alcohol effect immediately after drinking?
 a) Eyes b) Auditory region c) Liver **d) Central Nervous System**

Short Answers

1. What are psychotropic drugs?

Psychotropic drugs act 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, overeating 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 new tissues. This process is called metastasis.

6. How does insulin deficiency occur?

Destruction of β cells of the pancreas.

7. What are the various routes by which transmission of human immunodeficiency 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?

Normal cell	Cancer cell
They have controlled cell division	They have uncontrolled cell division
Normal growth	Abnormal growth
They respond to normal cell division	They are not responding to normal cell division

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 β -cells	Target cells do not 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.

22. ENVIRONMENTAL MANAGEMENT**Choose the correct answer**

1. Which of the following is/are a fossil fuel?

- (i) Tar (ii) Coal (iii) Petroleum
 a) i only b) i and ii **c) ii and iii** d) i, ii and iii

2. What are steps will you adopt for better waste management?

- a) reduce the amount of waste formed b) reuse the waste
 c) recycle the waste **d) all of the above**

3. The gas released from vehicles exhaust are

- i) Carbon monoxide ii) Sulphur dioxide iii) Oxides of nitrogen
 a) i and ii b) i and iii c) ii and iii **d) i, ii and iii**

4. Soil erosion can be prevented by

- a) deforestation **b) afforestation** c) over growing d) removal of vegetation

5. A renewable source of energy is

- a) petroleum b) coal c) nuclear fuel **d) trees**

6. Soil erosion is more where there is

- a) no rainfall b) low rainfall **c) rainfall is high** d) none of these

7. An inexhaustible resource is
a) wind power b) soil fertility c) wild life d) all of the above
8. Common energy source in village is
 a) electricity b) coal c) biogas **d) wood and animal dung**
9. Greenhouse effect refers to
 a) cooling of earth b) trapping of u-v rays
 c) cultivation of plants **d) warming of earth**
10. A cheap, conventional, commercial and inexhaustible source of energy is
a) hydropower b) solar energy c) wind energy d) thermal energy
11. Global warming will cause
 a) raise in level of oceans b) melting of glaciers
 c) sinking of islands **d) all of these**
12. Which of the following statement is wrong with respect to wind energy
 a) wind energy is renewable energy
b) the blades of wind mill are operated with the help of electric motor
 c) production of wind energy is pollution free
 d) usage of wind energy can consumption of fossil fuels

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?

The formation of the fossil fuel is a very slow process and take very long period of time period

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 greenhouse gases emitted.

9. What are the consequences of deforestation?

- Floods
- Drought
- Soil erosion
- Loss of wild life

10. What are the environmental effects 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**.

Digging of tanks or lakes (Eris):

Eris are constructed in such a way 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.

Ooranis:

- These are **small ponds** to collect rainwater.
- The water is used for various domestic purposes (drinking, washing and bathing).
- These ponds cater the nearby 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. Enumerate the importance of forest.

- Forests are vital for human life
- Forests also contribute to the economic development of our country.
- It is a source for a wide range of renewable natural resource.
- They provide wood, food, fodder, fibre and medicine.
- Forests are major factor of environmental concern. regulate climatic conditions, increase rainfall, reduce global warming, protect wild life.
- They also play a vital role in maintaining the ecological balance.

4. What are the consequence of soil erosion?

- Soil erosion causes a significant loss of humus, nutrients and decrease the fertility of soil
- It leads to desertification
- Soil loss and nutrient leaching which reduces land productivity.
- Annual floods damages crops, property and lives

23. VISUAL COMMUNICATION

Choose the correct answer

1. Which software is used to create animation?

- a) Paint b) PDF c) MS Word **d) Scratch**

2. All files are stored in

- a) Folder** b) Box c) Pai d) Scanner

3. Which is used to build scripts?

- a) **Script area** b) Block palette c) stage d) sprite

4. Which is used to edit programs

- a) Inkscape **b) script editor** c) stage d) sprite

5. Where you will create category of blocks?

- a) Block palette **b) Block menu** c) Script area d) sprite

Short Answers

1. What is Scratch?

'Scratch' is a software used to create animations, cartoons and games easily. It is a visual programming language.

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

Script area	Where you build scripts.
Block menu	Where you choose the category of blocks (programming statements) to use.
Block palette	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, cat appears as a sprite when the Scratch window is opened.
- The software provides facilities to make alternations in sprite.

-----X-----

“முயற்சி திருவினை ஆக்கும் முயற்றின்மை
இன்மை புகுத்தி விடும்”

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