1 MARK

1. LAWS OF MOTION

1. Inertia of a body depends on

   a) weight of the object
   b) acceleration due to gravity of the planet
   c) mass of the object
   d) Both a & b

2. Impulse is equals to

   a) rate of change of momentum
   b) rate of force and time
   c) change of momentum
   d) rate of change of mass

3. Newton's III law is applicable

   a) for a body is at rest
   b) for a body in motion
   c) both a & b
   d) only for bodies with equal masses

4. Plotting a graph for momentum on the X-axis and time on Y-axis. Slope of momentum-time graph gives

   a) Impulsive force
   b) Acceleration
   c) Force
   d) Rate of force

5. In which of the following sport the turning 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) $N\ m^2\ kg^{-1}$
   d) $cm^2\ s^{-2}$

7. One kilogram force equals to

   a) 9.8 dyne
   b) 9.8×10^4 N
   c) 98×10^4 dyne
   d) 980 dyne

8. The mass of a 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) 4 M
   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 a 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 of linear momentum
    d) both a and c

11. A heavy truck and bike are moving with the same kinetic energy. If the mass of the truck is four times that of the bike, then calculate the ratio of their momenta

    a) 1 : 4
    b) **1: 2**
    c) 2 : 1
    d) 4 : 1

12. A planet has mass of 20% more than that of earth and radius is 20% less than that of earth. Then find the acceleration due to gravity of the planet.

    a) $17.375\,ms^{-2}$
    b) $18.375\,ms^{-2}$
    c) $16.375\,ms^{-2}$
    d) $11.375\,ms^{-2}$

13. Two planets are spiralling around sun in circular orbits of ratio $m:n$ and the density ratio $p:q$, the acceleration due to gravity g is in the ratio of

a) $mq:np$ b) $np:mq$ c) $nq:mp$ d) $mp:nq$

14. Two asteroids of equal masses revolve diametrically opposite to each other in circle of radius $1000\,\text{km}$ with equal velocity. If mass of one of them is $10^8\,kg$, then find their velocity $(G=6.6\times10^{-11}Nm^2kg^{-2})(0.66)^{1/2}=0.8124.$

a) $0.816\times10^{-2}ms^{-2}$ b) $0.816\times10^{-3}ms^{-2}$
c) $0.716\times10^{-3}ms^{-2}$ d) $0.716\times10^{-2}ms^{-2}$

15. A bomb of mass $10\,\text{kg}$ is initially at rest explodes into two parts. Mass of 4 kg is moving with kinetic energy of $200\,J$. Velocity of other mass is_____ m/s.

a) 2.54 b) 6.6 c) 5.6 d) -6.6

16. Average force necessary to stop a hammer with $25Ns$ momentum in $0.04\,\text{s}$ is _____ N.

a) $625\,\text{N}$ b) $225\,\text{N}$ c) $50\,\text{N}$ d) $25\,\text{N}$

17. A person jumps into a swimming pool from a height of 1 m and comes to rest by 0.2 second. If the same person increases his height by 8 m from its old position and jumps, comes to rest by 2 second. Compare the ratio of forces exerted by him in both the cases.

a) $10:3$ b) $3:10$ c) $1:1$ d) None of the above

18. Same force acts on two bodies of different masses 2kg and 4kg initially at rest. The ratio of time required to acquire same final velocity is _____.

a) $2:1$ b) $1:2$ c) $1:1$ d) $4:16$

19. The lift is going up with the passengers. Total mass of 1 ton. The variation in velocity of life in 2 sec is $3.6\,\text{m/s}$. Then the tension in the rope pulling the lift is ____.

a) $1000\,N$ b) $80000N$ c) $800N$ d) $8000N$

20. A person is standing on a spring balance. Reading of the balance is 65 kgf. If the man jumps off from the balance, then the momentary reading in the balance will

a) **first increases and decreases** b) first decreases and increases
c) Decreases d) No change

21. A satellite in its orbit around the earth is weight less on account of its ……

a) Velocity b) Momentum **c) Angular Momentum** d) Acceleration

22. At Sea level, the value of 'g' is maximum at……..

a) The poles b) the equator c) 45 south latitude d) 45 north longitude

23. Two or more forces of equal or unequal magnitude acting along the same direction, parallel to each other are called ……

a) Like parallel forces b) unlike parallel forces
c) resultant force d) balanced force

24. The value of variation of acceleration due to gravity (g) is …… at the centre of the earth

a) One **b) zero** c) $\frac{1}{\infty}$ d) ∞

25. The weight of a body is …… at the poles than at the equatorial region

a) More b) less c) zero d) infinity

26. The mass of the earth is ……

a) 5.972 x 10^{24} kg b. 4.294 x 10^{22} kg c) 9.8 ms^{-2} d) 6.673 x 10^{-5} kg

27. What will be apparent weight of a person if the lift is moving upwards ……

a) R>W b) R<W c) R=W d) R=0

Fill in the Blanks:

1. To produce a displacement _____ is required. **(force)**
2. Passengers lean forward when sudden brake is applied in a moving vehicle. This can be explained by _____. **(inertia of motion)**
3. By convention, the clockwise moments are taken as _____ and the anticlockwise moments are taken as_____ . **(negative, positive)**
4. _____ is used to change the speed of car. **(Gear)**
5. A man of mass 100 kg has a weight of _____ at the surface of the Earth. **(980 N)**

Assertion & Reasoning:

1. Mark the correct choice as

(a) If both the assertion and the reason are true and the reason is the correct explanation of assertion.
(b) If both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
(c) Assertion is true, but the reason is false.
(d) Assertion is false, but the reason is true.

1. Assertion: The sum of the clockwise moments is equal to the sum of the anticlockwise moments.

Reason: The principle of conservation of momentum is valid if the external force on the system is zero. **Ans: (b)**

2. Assertion: The value of 'g' decreases as height and depth increases from the surface of the Earth.

Reason: 'g' depends on the mass of the object and the Earth. **Ans: (c)**

2. OPTICS

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 is

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

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

   a) behind the retina b) on the retina c) **in front of 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 lenses**

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 VB, VG, VR 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) VB = VG = VR b) VB > VG >VR c) **VB < VG < VR** d) VB < VG > VR

11. The refractive index of water with respect to air is 1.33 and the refractive index of glass with respect of air is 1.52. The refractive index of glass with respect to water is

    a) 1.33 b) 1.52 c) 1.142 d) 0.875

12. The time taken by a light ray to travel through a glass slab of thickness 8 mm is $(\text{Take } \mu \text{ glass} = 1.5)$

    a) $4\times10^{-11}s$ b) $4\times10^{+11}s$ c) $2.5\times10^{-11}s$ d) $2.5\times10^{+11}s$

13. A lens of focal length 12 cm magnifies the object by three times and produced an erect image. Then the distance between the object and the lens is

    a) $8\,cm$ b) $16\,cm$ c) $24\,cm$ d) $32\,cm$

14. A convex lens has a focal length of 12 cm. An object is placed at some distance from the lens so that an image is formed at a distance of 24 cm in front of the lens. Then the distance between the object and the lens is

a) $8\,cm$ b) $12\,cm$ c) $\underline{24\,cm}$ d) $32\,cm$

15. A lens forms a real image of height 6 cm of an object 2 cm. If the distance between the object and the image is 16 cm, then the focal length of the lens is

a) $2\,cm$ b) $3\,cm$ c) $\underline{6\,cm}$ d) $12\,cm$

16. The refractive index of medium 2 with respect to medium 1 is 'x' and refractive index of medium 2 with respect to medium 3 is 'y'. Then the refractive index of medium 3 with respect to medium 1 is.

a) xy b) $\underline{\frac{x}{y}}$ c) $\frac{y}{x}$ d) $\frac{1}{xy}$

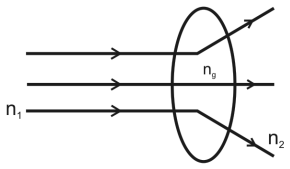
17. A convex lens of focal length f is placed somewhere in between an object and screen. The distance between the object and the screen is x. If the numerical value of the magnification produced by the lens is m, then the focal length of the lens is

a) $\underline{\frac{mx}{(m+1)^2}}$ b) $\frac{mx}{(m-1)^2}$ c) $\frac{(m+1)^2}{mx}$ d) $\frac{(m-1)^2}{mx}$

18. A converging lens is used to form an image on a screen when upper half of the lens is covered by an opaque screen

a) Half the image will disappear
b) Complete image will be formed of same intensity.
c) Half image will be formed of same intensity
d) Complete image will be formed of decreased intensity

19. The ray diagram could be correct (Here n_1, n_2 be the refractive index of medium 1 and medium 2, n_g – refractive index of the glass)



a) $\text{If } n_1 = n_2 = n_g$ b) $\text{If } n_1 = n_2 \text{ and } n_1 < n_g$

c) $\underline{\text{If } n_1 = n_2 \text{ and } n_1 > n_g}$ d) Under no circumstances.

20. An object is placed at distance of $f/2$ from a convex lens. The image will be

a) At one of the foci, virtual and double its size. b) At $3f/2$, real and inverted
c) At $2f$, virtual and erect d) None

21. The least distance of distinct vision for normal human eye is

a) 30 cm **b) 25 cm** c) 35 cm d) infinity

22. ……..is the centre part of the iris.

a) Cornea b) retina **c) pupil** d) eye lens

FILL IN THE BLANKS:

1. The path of the light is called as _____. **(ray)**
2. The refractive index of a transparent medium is always greater than _____. **(one)**
3. If the energy of incident beam and the scattered beam are same, then the scattering of light is called as _____ scattering. **(elastic)**
4. According to Rayleigh's scattering law, the amount of scattering of light is inversely proportional to the fourth power of its _____. **(wavelength)**
5. Amount of light entering into the eye is controlled by _____. **(Iris)**

Assertion and reasoning type

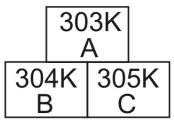
Mark the correct choice as

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) Assertion is true but reason is false.
d) Assertion is false but reason is true.

1. **Assertion :** If the refractive index of the medium is high (denser medium) the velocity of the light in that medium will be small
   Reason : Refractive index of the medium is inversely proportional to the velocity of the light
   Ans (a)
2. **Assertion :** Myopia is due to the increase in the converging power of eye lens.
   Reason : Myopia can be corrected with the help of concave lens.
   Ans (b)

3. THERMAL PHYSICS

1. The value of universal gas constant
   a) $3.81\ mol^{-1}\ K^{-1}$ b) $8.03\ mol^{-1}\ K^{-1}$
   c) $1.38\ mol^{-1}\ K^{-1}$ d) $\underline{8.31\ mol^{-1}\ K^{-1}}$
2. If a substance is heated or cooled, the change in mass of that substance is
   a) positive b) negative
   c) **zero** d) none of the above
3. If a 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)
4. 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
5. In the Given diagram, the possible direction of heat energy transformation is



   a) $A \leftarrow B, A \leftarrow C, B \leftarrow C$ b) $A \rightarrow B, A \rightarrow C, B \rightarrow C$
   c) $A \rightarrow B, A \leftarrow C, B \rightarrow C$ d) $A \leftarrow B, A \rightarrow C, B \leftarrow C$

6. A piece of ice can

a) not radiate heat
b) **radiate and absorb heat**
c) radiate heat but not absorb heat
d) absorb heat but not radiate heat

7. The bottom of a lake does not freeze in severe winter even when the surface is all frozen. Why?

a) The water has large specific heat
b) The water has large latent heat of fusion.
c) The conductivity of ice is low.
d) The temperature of the earth at the bottom of the lake is high.

8. Why does the cooking pot coated with black?

a) black surfaces reflect more heat
b) black surfaces are easier to clean.
c) black surfaces absorbs more heat
d) none of the above

9. Which of the following thermometers is used for measuring temperature around $1200^{\circ}C$?

a) optical pyrometer.
b) Mercury thermometer
c) constant volume gas thermometer
d) platinum resistance thermometer.

10. At what temperature are the Celsius value and Fahrenheit value equal?

a) $+40^{\circ}$ b) -40° c) -0° d) $+100^{\circ}$

11. What could happen to a hole is a metal sheet when the sheet is heated?

a) The size of hole decreases
b) The size of hole increases
c) No change in size
d) None of these

12. The surface which radiates more heat energy at a given particular temperature is

a) Black and Rough
b) Black and polished
c) White and polished
d) White and Rough

13. Which of the below is used for measurement of high temperature?

a) Vapor thermometer
b) energy meter
c) Pyrometer
d) resistance thermometer

14. If boiling water is taken to the dark side of the moon it will

a) vapourized
b) continue to boil
c) stop boiling but remain hot
d) freeze

15. Order the substance iron, glass and water in descending order of thermal conductivity

a) iron, glass, water
b) iron, water, glass
c) water, iron, glass
d) water glass, iron

16. If a heater coil is cut into four equal parts and only one part is used in the heater, the heat generated

a) increases b) decreases c) no change d) may increase of decrease

17. Which of the following denotes highest temperature?

a) $1^{\circ}C$ b) $1K$ c) $1^{\circ}F$ d) All are equal

Fill in the Blanks

1. The value of Avogadro number _____ . (6.023×10^{23})
2. The temperature and heat are _____ quantities. **(scalar)**

3. One calorie is the amount of heat energy required to raise the temperature of _____ of water through_____. **(1 gram, 1^0 C)**

4. According to Boyle's law, the shape of the graph between pressure and reciprocal of volume is _____ . **(straight line)**

Assertion and reason type questions

a. Both the assertion and the reason are true and the reason is the correct explanation of the assertion.

b. Both the assertion and the reason are true but the reason is not the correct explanation of the assertion.

c. Assertion is true but the reason is false.

d. Assertion is false but the reason is true.

1. **Assertion:** Gas is highly compressible than solid and liquid
Reason: Interatomic or intermolecular distance in the gas is comparably high.
Ans (a)

4. ELECTRICITY

1. Which of the following is correct?

a) Rate of change of charge is electrical power b) **Rate of change of charge is current.**
c) Rate of change of energy is current. d) Rate of change of current is charge.

2. SI unit of resistance is

a) mho b) joule c) **ohm** d) ohm meter

3. In a simple circuit, why does the bulb glow when you close the switch?

a) The switch produces electricity. b) **Closing the switch completes the circuit.**
c) Closing the switch breaks the circuit. d) The bulb is getting charged)

4. Kilowatt hour is the unit of

a) resistivity b) conductivity c) **electrical energy** d) electrical power

5. Two charged bodies having equal potential are connected through a wire, in this case

a) current will flow **b) current will not flow**
c) cannot say d) current will flow if a resistor is connected

6. The relation between potential difference (V) and current (I) is

a) $V \& I$ b) $V \& I^2$ c) $V^2 \& I$ d) $V \& I^3$

7. If a 12 V battery is connected in series with resistors 3 ohm, 4 ohm, 5 ohm, then the current flows through the 3 ohm resistor is

a) $1\,\mathrm{A}$ b) $2\,\mathrm{A}$ c) $3\,\mathrm{A}$ d) $4\,\mathrm{A}$

8. The rheostat is used in the circuit to

a) increase the magnitude of current only
b) decrease the magnitude of current only
c) increase or decrease the magnitude of current
d) none of these

9. There are 'n' resistor each of resistance R. First they all are connected in series and equivalent resistance is X. Now they are connected in parallel and equivalent resistance is Y. What is the ratio of X and Y?

a) $X:Y=1:n$ b) $X:Y=1:n^2$ c) $X:Y=n:1$ d) $X:Y=n^2:1$

10. The heat generated while transferring 50 coulomb of charge in one hour through a potential difference of 50 v is

a) $50\,J$ b) $250\,J$ c) $500\,J$ d) $2500\,J$

11. The amount of heat produced by a conductor of resistance 20Ω, while 5A current flows for 30 seconds.

a) $150\,J$ b) $1500\,J$ c) $15000\,J$ d) $1000\,J$

12. A 12 V battery is connected across a resistor if the current through the resistors is 2A, then the resistance of the resistor

a) 20Ω b) 4Ω c) 6Ω d) 12Ω

13. If 'n' resistors are connected in parallel then the effective resistance is

a) nR b) n/R c) R/n d) $R/2n$

14. One kilowatt hour is equal to

a) $3.6\times10^5\,J$ b) $3.6\times10^6\,J$ c) $3.6\times10^{-5}\,J$ d) $3.6\times10^{-6}\,J$

15. To protect the house hold electrical appliances from overloading due to excess current ……. is used.

a) Fuse wire b) MCB **c) Both a & b** d) None

16. The current in the electric bulb of 100W and 200 V electric circuit is ……

a) 5 A **b) 0.5A** c) 50 A d) 500 A

17. One horse power is equal to ……

a) 640 watts **b) 746 watts** c) 220 watts d) 330 watts

Fill in the Blanks:

1. When a circuit is open, _____ cannot pass through it. **(Current)**
2. The ratio of the potential difference to the current is known as _____. **(Resistance)**
3. The wiring in a house consists of _____ circuits. **(parallel)**
4. The power of an electric device is a product of _____ and _____.

   (Potential Difference, current)
5. LED stands for _____. **(Light Emitting Diode)**

Assertion and reason type questions:

Mark the correct choice as

a. if both the assertion and the reason are true and the reason is the correct explanation of the assertion.
b. if both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
c. if the assertion is true, but the reason is false.
d. if the assertion is false, but the reason is true.

1. **Assertion:** Electric appliances with a metallic body have three wire connections.
   Reason: Three pin connections reduce heating of the connecting wires
   Ans: (c)

2. **Assertion:** In a simple battery circuit the point of highest potential is the positive terminal of the battery.
   Reason: The current flows towards the point of the highest potential
   Ans: (c)

3. **Assertion:** LED bulbs are far better than incandescent bulbs.
   Reason: LED bulbs consume less power than incandescent bulbs.
   Ans: (a)

5. ACOUSTICS

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 $330\ \text{m s}^{-1}$. If the pressure is increased by 4 times without causing a change in the temperature, the velocity of sound in the gas is
   a) $330\ \text{m s}^{-1}$ b) $660\ \text{m s}^{-1}$ c) $156\ \text{m s}^{-1}$ d) $990\ \text{m s}^{-1}$

3. The frequency, which is audible to the human ear is
   a) 50 kHz b) 20 kHz c) 15000 kHz d) 10000 kHz

4. The velocity of sound in air at a particular temperature is 330 m s–1. What will be its value when temperature is doubled and the pressure is halved?
   a) $330\ \text{m s}^{-1}$ b) $165\ \text{m s}^{-1}$ c) $330 \times \sqrt{2}\ \text{m s}^{-1}$ d) $320\ /\ \sqrt{2}\ \text{m s}^{-1}$

5. If a sound wave travels with a frequency of $1.25 \times 10^4\ \text{Hz}$ at $344\ \text{m s}^{-1}$, the wavelength 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) wavelength d) none of these

7. Velocity of sound in the atmosphere of a planet is $500\ \text{m s}^{-1}$. 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. The waves that required a material medium for their propagation is called
   a) Matter waves b) Electromagnetic waves
   c) Carrier waves **d) Mechanical waves**

9. Doppler effect depends on
   a) Velocity of listener b) Distance between the source and listener
   c) Velocity of the source **d) All the above**

10. If wind blows in a direction opposite to the sound propagation, then the velocity of sound

a) increases **b) Decreases**
c) Remains constant d) Cannot be determined

11. A longitudinal wave of wavelength 1 cm travels with a speed of 300 m/s. Can this wave be heard by a normal human being?

a) no b) yes c) Only in day time d) Only in night time

12. An observer stands at a distance of 850 m from the mountain and fires the gun. If the sound travels at speed of 350 m/s. After what time gap he will hear the echo.

a) 2 S b) 2.2 S c) 2.4 S **d) 4.86 S**

13. The waves produced by a motorboat sailing in water are

a) Transverse b) longitudinal
c) longitudinal and transverse d) Stationary

14. A wave of frequency 500 Hz travels between X and Y, distance of 600 m in 2 S. How many wave lengths are there in distance XY?

a) 1000 b) 300 c) 180 d) 2600

15. Sound waves of wave length λ travelling in a medium with a speed of V m/s enter into another medium where its speed is 2 V m/s wavelength of sound waves in the second medium is

a) λ b) $\lambda/2$ c) 2λ d) 4λ

16. Which of the following is not a characteristic of musical sound?

a) pitch **b) wavelength** c) quality d) loudness

17. The speed of sound in Iron is_____

a) 1493 ms^{-1} b) 6420 ms^{-1} c) 5950 ms^{-1} d) 1533 ms^{-1}

18. The whispering Gallery is designed on the principle of _____

a) Total internal reflection b) Reflection c) Multiple reflection d) vibration.

19. The distance required for echo is _____

a) d=17.2 m b) d=13.5 m c) d=15 m d) d=20 m

20. What does it mean when a waves amplitude increases

a) its frequency also increasing b) its moving in denser medium
c) its wavelength gets longer **d) its carrying more energy**

Fill in the Blanks:

1. Rapid back and forth motion of a particle about its mean position is called ____.

(vibrational motion)

2. If the energy in a longitudinal wave travels from south to north, the particles of the medium would be vibrating in _____ . **(north to south)**

3. A whistle giving out a sound of frequency 450 Hz, approaches a stationary observer at a speed of 33 m s^{-1}. The frequency heard by the observer is (speed of sound = 330 m s^{-1}) __. **(500 Hz)**

4. A source of sound is travelling with a velocity 40 km/h towards an observer and emits a sound of frequency 2000 Hz. If the velocity of sound is 1220 km/h, then the apparent frequency heard by the observer is _____. **(2068 Hz)**

Assertion and Reason Questions

Mark the correct choice as

a. If both the assertion and the reason are true and the reason is the correct explanation of the assertion.
b. If both the assertion and the reason are true but the reason is not the correct explanation of the assertion.
c. Assertion is true, but the reason is false.
d. Assertion is false, but the reason is true.

1) Assertion: The change in air pressure affects the speed of sound.
Reason: The speed of sound in a gas is proportional to the square of the pressure
Ans: (d)

2) Assertion: Sound travels faster in solids than in gases.
Reason: Solid posses a greater density than that of gases.
Ans: (a)

3). Assertion: The velocity of sound in air increases due to the presence of moisture in it.
Reason: The presence of moisture in air lowers the density of air.
Ans (a)

6. NUCLEAR PHYSICS

1. Man-made radioactivity is also known as _____

a) Induced radioactivity b) Spontaneous radioactivity
c) Artificial radioactivity d) **a & c**

2. Unit of radioactivity is _____

a) roentgen b) curie c) becquerel d) **all the above**

3. Artificial radioactivity was discovered by _____

a) Bequerel b) **Irene Curie** c) Roentgen d) Neils Bohr

4. 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) and (iii) are correct**
c) (i) & (iv) are correct d) (ii) & (iv) are correct

5. _____ isotope is used for the treatment of cancer.

a) Radio Iodine b) **Radio Cobalt** c) Radio Carbon d) Radio Nickel

6. 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

7. _____ aprons are used to protect us from gamma radiations

a) Lead oxide b) Iron c) **Lead** d) Aluminium

8. Which of the following statements 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**

9. Proton - Proton chain reaction is an example of _____

a) Nuclear fission b) α - decay c) **Nuclear fusion** d) β - decay

10. In the nuclear reaction ${}_6X^{12}$ α decay ${}_ZY^A$, the value of A & Z.

a) 8, 6 **b) 8, 4** c) 4, 8 d) cannot be determined with the given data

11. Kamini reactor is located at _____

a) **Kalpakkam** b) Koodankulam c) Mumbai d) Rajasthan

12. Which of the following 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

13. β rays are emitted from the _____

a) sun b) stars
c) atom whose atomic number less than 50 **d) radioactive nucleus of an atom**

14. Radio activity may be _____

a) natural b) artificial
c) natural and artificial d) none of the these

15. The natural source of a gamma radiations are _____

a) natural gas b) radio carbon c) radio ions d) all the above

16. The alpha particle carries two positive charges and its mass is nearly equal to ____

a) two protons b) two electrons
c) an atom of helium d) atom of hydrozen

17. In the nuclear reaction ${}_{90}Hg^{198} + X \rightarrow {}_{89}Au^{198} + {}_1H^1X$ stands for ____

a) Neutron b) proton c) electron d) deuteron

18. The radio Isotope used in agriculture is ____

a) ${}_{15}P^{32}$ b) ${}_{15}P^{31}$ c) ${}_{11}Na^{23}$ d) ${}_{11}Na^{23}$

19. The _____ is a natural radio active element, whose atomic number is less than 83

a) Aluminium b) silver **c) Technetium** d) calcium

20. The SI unit of radio activity is _____

a) Rutherford **b) Becquerel** c) Curie d) roentgen

21. _____ travel with the speed of light

a) Alpha rays b) Beta rays **c) Gamma rays** d) None of the above

22. _____ is an example for fertile material

a) uranium 235 **b) Thorium -232** c) plutonium 239 d) plutonium 241

FILL IN THE BLANKS:

1. One roentgen is equal to _____ disintegrations per second. **(3.7×10^{10})**
2. Positron is an_____. **(Antiparticle of electron)**
3. Anemia can be cured by _____ isotope. **(Fe^{59})**
4. Abbreviation of ICRP_____. **(International Commission on Radiological Protection)**
5. _____is used to measure exposure rate of radiation in humans. **(Dosimeter)**
6. _____ has the greatest penetration power. **(Gamma rays)**
7. ${}_{Z}Y^{A} \rightarrow {}_{Z+1}Y^{A} + X$; Then, X is _____. **(${}_{-1}e^{\circ}$)**
8. ${}_{Z}X^{A} \rightarrow {}_{Z}Y^{A}$ This reaction is possible in _____ decay. **(Gamma)**
9. The average energy released in each fusion reaction is about _____ J. **(3.84×10^{-12})**
10. Nuclear fusion is possible only at an extremely high temperature of the order of ___ K. **(10^{7} to 10^{9})**
11. The radio isotope of _____ helps to increase the productivity of crops. **(P-32)**
12. If the radiation exposure is 100 R, it may cause _____. **(fatal diseases)**

Assertion and reason type questions:

Mark the correct choice as

a. If both the assertion and the reason are true and the reason is the correct explanation of the assertion.
b. If both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
c. Assertion is true, but the reason is false.
d. Assertion is false, but the reason is true.

1. **Assertion:** A neutron impinging on U^{235}, splits it to produce Barium and Krypton.
   Reason: U - 235 is a fissile material. **Ans (a)**
2. **Assertion**: In a β - decay, the neutron number decreases by one.
   Reason: In β - decay atomic number increases by one. **Ans (d)**
3. **Assertion**: Extreme temperature is necessary to execute nuclear fusion.
   Reason: In a nuclear fusion, the nuclei of the reactants combine releasing high energy. **Ans (a)**
4. **Assertion**: Control rods are known as 'neutron seeking rods'
   Reason: Control rods are used to perform sustained nuclear fission reaction **Ans (a)**

CHEMISTRY

7. ATOMS AND MOLECULES

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 following 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 b) Mass of a hydrogen atom
   c) **1/12th of the mass of a C – 12 atom** d) Mass of O – 16 atom

6. Which of the following statement is incorrect?

   a) 12 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 $_{20}Ca^{40}$, 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}

11. Which of the following has largest number of particles?

    a) 8g of CH_4 b) 4.4g of CO_2 c) 34.2g of $C_{12}H_{22}O_{11}$ d) 2g of H_2

12. Number of molecules in 16g of oxygen is -----

    a) 6.023×10^{23} b) 6.023×10^{-23} c) 3.011×10^{23} d) 3.011×10^{-23}

13. The mass of sodium in 11.7g of NaCl is ----

    a) 2.3g b) 4.6g c) 6.9g d) 7.1g

14. Which of the following contains the largest number of molecules?

    a) 0.2 moles of H_2 b) 8.0g of H_2 c) 17g of H_2O d) 6.0g of CO_2

15. One gram of which of the following contains largest number of oxygen atom.

    a) O b) O_2 c) O_3 d) All contains same

16. The mass of one carbon atom is _____.

a) 6.023×10^{23} b) 1.99×10^{23} c) 2.0g d) 12g

17. A group of atoms bonded together is _____.

a) a molecule b) an atom c) a salt d) an element.

18. How many molecules are present in 1g of Hydrogen?

a) 6.023×10^{23} b) 3.011×10^{23} c) 1.511×10^{23} d) 2.511×10^{23}

19. $_{17}Cl^{35}$ and $_{17}Cl^{37}$ are _____.

a) Isotopes b) Isobars c) Isotones d) None of these

20. Which one has no unit?

a) AAM b) GAM c) RAM d) GMM

21. Modern methods of determination of atomic mass is _____.

a) C-12 scale b) Mass spectroscopy
c) Hydrogen scale d) Average mass of isotopes

FILL IN THE BLANKS:

1. Atoms of different elements having _____ mass number, but _____ atomic numbers are called isobars. **(same, different)**
2. Atoms of different elements having same number of _____are called isotones. **(neutrons)**
3. Atoms of one element can be transmuted into atoms of other element by _____. **(Artificial transmutation)**
4. The sum of the numbers of protons and neutrons of an atom is called its ___. **(mass number)**
5. Relative atomic mass is otherwise known as _____. **(Standard atomic weight)**
6. The average atomic mass of hydrogen is _____ amu. **(1.008)**
7. If a molecule is made of similar kind of atoms, then it is called _____ atomic molecule. **(homo)**
8. The number of atoms present in a molecule is called its _____. **(atomicity)**
9. One mole of any gas occupies _____ ml at S.T.P. **(22,400)**
10. Atomicity of phosphorous is _____. **(4)**

Assertion and Reason:

Answer the following questions using the data given below:

i) A and R are correct, R explains the A.
ii) A is correct, R is wrong.
iii) A is wrong, R is correct.
iv) A and R are correct, R doesn't explains A.

1. Assertion: Atomic mass of aluminium is 27
Reason: An atom of aluminium is 27 times heavier than 1/12th of the mass of the C – 12 atom.
Ans (i)

2. Assertion: The Relative Molecular Mass of Chlorine is 35.5 a.m.u.
Reason: The natural abundance of Chlorine isotopes are not equal.
Ans (i)

8. PERIODIC CLASSIFICATION OF ELEMENTS

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 a relative periodic property

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

5. Chemical formula of rust is _____.

a) $FeO.xH_2O$ b) $FeO_4.xH_2O$ c) $Fe_2O_3.xH_2O$ d) FeO

6. In the alumino thermic process the role of Al is _____.

a) oxidizing agent b) **reducing agent**
c) hydrogenating agent d) sulphurising 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 electrons 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

11.Pure gold is _____.

a) 16 carat b) 22 carat c) 20 carat d) **24 carat**

12. Blue gold is _____.

a. **Alloy of 46% gold with 54% indium** b. Alloy of 36% gold with 64% indium
c. Alloy of 26% gold with 74% indium d. Alloy of 16% gold with 84% indium

13. Give an example for a metal which is a liquid at room temperature.

a) **Mercury** b) Sodium c) Silver d) Lead.

14. Ionic radii increases along a _____.

a) **Group** b) Period c) Both a and b d) None

15. Which of the following is highly electronegative?

a) **Fluorine** b) chlorine c) Bromine d) Iodine

16. Why sodium is kept immersed in kerosene oil?

a) **Sodium reacts both with air and water** b) Sodium reacts with kerosene.
c) Sodium does not react both with air or water.

17. The poorest conductor of heat is _____.

a) Aluminium b) Silver c) **Lead** d) Gold

18. The Electrical conductivity of a metal is due to _____.

a) Its high density b. Its high lustre
c) Its chemical inertness d. **Presence of free electrons.**

19. Which of the following metals form Amphoteric oxide?

a) Copper b) Silver c) **Aluminium** d) Iron

20. Non-metals generally act as _____.

a) Oxidising agents b. Reducing agents c) **both a and b** d. None of these.

21. The periodic function which clarified the defects in Mendeleov's Periodic Table is ___

a) Mass number **b) Atomic number** c) Mass the isotope d) Molecular weight

22. ____ is added to remove acidic impurities during extraction of metals from its ore.

a) Cao b) Sio_2 c) Co_2 d) So_2

23. What is the value of difference in electro nagativity between two bonded atoms H and F in a molecule of HF. What is the nature of bonding between the 2 atom.

a) 1.7 covalent bond b)1.5 covalent bond c) **1.9 ionic bond** d) 2.2 ionic bond

24. Brass is _____.

a) Zn, Cu b) Ag, Hg c) Fe, Cr d) Br, As

25. Which type of iron is used in making drain pipes, what is the percentage of its Carbon content ___

a) Steel < 0.25% b) wrought iron 0.25 – 2%
c**) Pig iron 2 – 4.5**% d) Nickel steel 1.5%

26. Sulphur matte is _____

a) Cu_2S+FeS b) Cu_2S+ZnS c) Cu_2S+PbS d) Cu_2S+Ag_2S

27. Which is the correct sequential order in arranging positive ions, according to the size of the ion.

a) $A^{+}<A^{++}<A^{+++}$ b) $A^{+++}<A^{++}<A^{+}$ c) $A^{++}<A^{+}<A^{+++}$ d) $A^{+++}<A^{+}<A^{++}$

28. Flexible metals other than water _____

a) Na, K b) Cr,Pb c) Au,Ag d) Cu,Au

29. Molecular formula of cryolite is _____

a) Al_2O_3 b) Na_3AlF_6 c) Cr_2O_3 d) $Al_2O_3ZH_2O$

30. Electrolyte present in HALL's process is ____

a) Pure Alumina + molten cryolite + Sodium floride
b) Pure alumina + molten haematite + fluorspar
c) Pure alumina + molten bauxite + hydrogen floride
d**) Pure alumina + molten cryolite + fluorspar**

Fill in the Blanks:

1. If the electronegativity difference between two bonded atoms in a molecule is greater than 1.7, the nature of bonding is _____. **(ionic)**
2. _____ are the longest periods in the periodical table. **(Sixth and Seventh)**
3. _____ forms the basis of modern periodic table. **(Atomic number)**
4. If the distance between two Cl atoms in Cl_2 molecule is 1.98Å, then the radius of Cl atom is _____. $\left(0.99\ \overset{0}{\text{A}}\right)$
5. Among the given species A^{-}, A^{+}, and A, the smallest one in size is _____. **(A^{+})**
6. The scientist who propounded the modern periodic law is _____. **(Henry Moseley)**
7. Across the period, ionic radii _____ (increases, decreases). **(decreases)**
8. _____ and _____ are called inner transition elements. **(Lanthanides, Actinides)**
9. The chief ore of Aluminium is _____. **(Bauxite)**
10. The chemical name of rust is _____. **(hydrated ferric oxide)**

Assertion and Reason

Answer the following questions using the data given below:

i) A and R are correct, R explains the A.
ii) A is correct, R is wrong.
iii) A is wrong, R is correct.
iv) A and R are correct, R doesn't explains A.

1. **Assertion :** The nature of bond in HF molecule is ionic
   Reason : The electronegativity difference between H and F is 1.9

   Ans (i)
2. **Assertion :** Magnesium is used to protect steel from rusting
   Reason : Magnesium is more reactive than iron

   Ans (i)
3. **Assertion :** An uncleaned copper vessel is covered with greenish layer.
   Reason : Copper is not attacked by alkali
   Ans (iv)

9. SOLUTIONS

1. A solution is a _____ mixture.

   a) **homogeneous** b) heterogeneous
   c) homogeneous and heterogeneous d) non homogeneous

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 a given temperature is called _____

   a) **Saturated solution** b) Un saturated solution
   c) Super saturated solution d) Dilute solution

5. Identify the non aqueous solution.

   a) sodium chloride in water b) glucose in water
   c) copper sulphate 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) 12g b) **11g** c) 16g d) 20g

8. A 25% alcohol solution means

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

11. Deep sea divers use (O_2 + H_2) mixture in preference to (O_2 + N_2) mixture. This is because---
    a) Helium is lighter than nitrogen
    b) Helium is less soluble in blood than nitrogen
    c) Helium is more soluble in blood
    d) Helium provides a better inert atmosphere than nitrogen.

12. Naphthalene dissolves in kerosene because naphthalene and kerosene are respectively---
    a) Polar and non-polar b) Polar and polar
    c) Non-polar and non-polar d) Non-polar and polar

13. Saturated solution of NaCl on heating ---
    a) Becomes supersaturated **b) Becomes unsaturated**
    c) Remains saturated d) vapourises

14. Nitrogen in soil is an example for ---- solution in nature.
    a) Unsaturated b) Saturated c) supersaturated d) dilute

15. A concentrated solution contains --- amount of the solute
    a) less **b) high** c) equal

16. The solubility of a substance is defined as the amount of solute present in ---- of the solvent.
    a) 5g b) 10g c) 100g d) 1000g

17. Anhydrous calcium chloride salt absorbs moisture from atmospheric air, so it is a ---------- substance.
    a) Hygroscopic b) deliquescent c) hydrated d) amorphous.

18. The solubility of ammonium chloride --------- as the temperature increases.
    a) decreases **b) increases** c) remains the same

19. Quicklime dissolved in water is a --- process
    a) exothermic b) endothermic c) reversible d) both a and b

Fill in the Blanks

1. The component present in lesser amount, in a solution is called _____. **(solute)**
2. Example for liquid in solid type solution is _____. **(amalgam)**
3. Solubility is the amount of solute dissolved in _____ g of solvent. **(100)**
4. Polar compounds are soluble in _____ solvents. **(polar)**
5. Volume percentage decreases with increases in temperature because _____.
   (of expansion of liquid)

10. TYPES OF CHEMICAL REACTIONS

1. $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ is a

   a) Decomposition Reaction b) **Combination Reaction**
   c) Single Displacement Reaction d) Double Displacement Reaction

2. Photolysis 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 $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)} + Heat$. 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 $Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)} \downarrow + 2NaCl_{(aq)}$ 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 about a chemical equilibrium?

   (i) It is dynamic in nature
   (ii) The rate of the forward and backward reactions are equal at equilibrium
   (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 $X_{(s)} + 2HCl_{(aq)} \rightarrow XCl_{2(aq)} + H_{2(g)}$. Which of the following(s) could be X. Choose the best pair.

   (i) Zn (ii) Ag (iii) Cu (iv) Mg.

   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" type reaction?

   a) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ b) $2K_{(s)} + Br_{2(l)} \rightarrow 2KBr_{(s)}$
   c) $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$ d) $4Fe_{(s)} + 3O_{2(g)} \rightarrow 2Fe_2O_{3(s)}$

8. Which of the following represents a precipitation reaction?

   a) $A_{(s)} + B_{(s)} \rightarrow C_{(s)} + D_{(s)}$ b) $A_{(s)} + B_{(aq)} \rightarrow C_{(aq)} + D_{(l)}$
   c) $A_{(aq)} + B_{(aq)} \rightarrow C_{(s)} + D_{(aq)}$ d) $A_{(aq)} + B_{(s)} \rightarrow C_{(aq)} + D_{(l)}$

9. The pH of a 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

11. Which of the following reactions involves the combination of two elements?

    a) $CaO + CO_2$ --------→ $CaCO_3$ b) $4Na + O_2$ --------→ $2Na_2O$
    c) $SO_2 + ½\ O_2$ --------→ SO_3 d) $NH_3 + HCl$ --------→ NH_4Cl

12. Zn + Dil. H_2SO_4 ----------→ $ZnSO_4$ + H_2. This reaction is _____.

a) Decomposition reaction **b) Single displacement reaction**
c) Combination reaction d) Synthesis reaction

13. Rate at which reaction proceeds is directly proportional to _____.

a) Product of the active masses of the products.
b) Product of the active masses of the reactants.
c) Both a and b
d) None of these.

14. Take about 1.0g of $CaCO_3$ in a test tube. Heat it over a flame until a colourless gas comes. This reaction is called _____.

a) Decomposition reaction b) Displacement reaction
c) Double decomposition reaction d) Double displacement reaction.

15. What type of chemical reaction releases energy in the form of heat?

a) geothermic b) endothermic c) subthermic **d) exothermic**

16. In which of the following, heat energy will be evolved?

a) Electrolysis of water b) Dissolution of NH_4Cl in water
c) Burning of L.P.G d) Decomposition of AgBr in the presence of sunlight

17. The reaction in which two compounds exchange their ions to form new compounds is called ---

a) displacement reaction b) Combination reaction
c) Double displacement reaction d) redox reaction.

18. Pure water is _____ substance.

a) strong **b) neutral** c) acidic d) basic

19. Hydrochloric acid is completely ionized in solution, hence it is a _____.

a) a weak monobase **b) strong monobasic acid**
c) weak monoacidic base d) strong monoacidic base

20. What is pH value of saliva after meal?

a) 4.8 **b) 5.8** c) 6.8 d) less than 4

Fill in the Blanks:

1. A reaction between an acid and a base is called _____. **(neutralization)**
2. When lithium metal is placed in hydrochloric acid, _____ gas is evolved. **(Hydrogen)**
3. The equilibrium attained during the melting of ice is known as ____. **(Physical equilibrium)**
4. The pH of a fruit juice is 5.6. If you add slaked lime to this juice, its p^H _____ (increase/decrease). **(increase)**
5. The value of ionic product of water at 250^0 C is _____. **(1×10^{-14} mol^2 dm^{-6})**
6. The normal p^H of human blood is _____. **(7.4)**
7. Electrolysis is type of _____reaction. **(decomposition)**
8. The number of products formed in a synthesis reaction is _____. **(one)**
9. Chemical volcano is an example for_____ type of reaction. **(decomposition)**
10. The ion formed by dissolution of H^+ in water is called _____. **(hydronium ion)**

11. CARBON AND ITS COMPOUNDS

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 butan-1-ol. What type compound it is?
   a) Aldehyde b) Carboxylic 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_8OH
5. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ is a
   a) Reduction of ethanol b) **Combustion of ethanol**
   c) Oxidation of ethanoic acid d) Oxidation of ethanal
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 an aesthetics?
   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 –SO3–Na+
   d) It is effective even in hard water.
10. Detergents pollute rivers and water bodies. Detergents can be made biodegradable and pollution free by taking _____.
    a) Cyclic hydrocarbon chain b) Shorter hydrocarbon chain
    c) Unbranched hydrocarbon chain d) Hydrocarbon with more branched chain
11. Which % of acetic acid in water can be used as a preservative _____.
    a) 5 - 8% b) 10 – 15% c) 15 – 20% d) 100%
12. A few drops of ethanoic acid were added to solid sodium carbonate. The possible result of the reactions were _____.
    a) A hissing sound was evolved b) brown fumes evolved
    c) Brisk effervescence occurred d) a pungent smelling gas evolved
13. Which of the four test tubes containing the following chemicals show brisk efferversence when dilute acetic acid is added to them?
    i) KOH ii) $NaHCO_3$ iii) K_2CO_3 d) NaCl
    a) I & ii **b) ii & iii** c) i & iv d) I & iii
14. A very dilute solution of ethanoic acid is _____.
    a) vinegar b) methanoic acid c) hydrochloric acid d) nitric acid
15. When sodium metal is dropped into ethanol _____ gas is released.
    a) Nitrogen **b) hydrogen** c) CO_2 d) Oxygen

16. This is not characteristic of member of homologous series

a) They possess varying chemical properties
b) The properties vary in regular predictable manner.
c) The formulae fit the general molecular formula.
d) Adjacent members differ by one carbon and two hydrogen atoms.

17. Consider the chemical formulae CH_3COOH and $HCOOCH_3$ and choose the incorrect statement.

a) Both have equal boiling point
b) Both have equal molecular weight
c) Both have equal number of covalent bonds.
d) Both have the same functional group.

18. When ethanol reacts with acidified $K_2Cr_2O_7$, the orange colour of $K_2Cr_2O_7$ changes to

a) yellow b) red c) purple **d. green**

19. The enzymes present in yeast are ----

a) invertase b) zymase **c) both a and b** d) neither a nor b

Fill in the Blanks:

1. An atom or a group of atoms which is responsible for chemical characteristics of an organic compound is called _____. **(functional group)**
2. The general molecular formula of alkynes is _____. (C_nH_{2n-2})
3. In IUPAC name, the carbon skeleton of a compound is represented by _____ (root word / prefix / suffix) **(root word)**
4. (Saturated / Unsaturated) _____ compounds decolourize bromine water. **(Unsaturated)**
5. Dehydration of ethanol by conc. Sulphuric acid forms _____ (ethene/ ethane) **(ethene)**
6. 100 % pure ethanol is called _____. **(Absolute alcohol)**
7. Ethanoic acid turns _____ litmus to _____. **(blue, red)**
8. The alkaline hydrolysis of fatty acids is termed as _____. **(Saponification)**
9. Biodegradable detergents are made of _____. (branched / straight) chain hydrocarbons **(straight)**

Assertion and Reason:

Answer the following questions using the data given below:

i) A and R are correct, R explains the A.
ii) A is correct, R is wrong.
iii) A is wrong, R is correct.
iv) A and R are correct, R doesn't explains A.

1. Assertion: Detergents are more effective cleansing agents than soaps in hard water.

Reason: Calcium and magnesium salts of detergents are water soluble.

Ans (i)

2. **Assertion**: Alkanes are saturated hydrocarbons.

Reason: Hydrocarbons consist of covalent bonds.

Ans (iv)

BIOLOGY

12. PLANT ANATOMY AND PLANT PHYSIOLOGY

1. Casparian strips are present in the _____ of the root.
   a) cortex b) pith c) pericycle d) **endodermis**
2. The endarch condition is the characteristic feature of
   a) root b) **stem** c) leaves d) flower
3. The xylem and phloem arranged side by side on same radius is called _____
   a) radial b) amphivasal c) **conjoint** d) None of these
4. Which is formed during anaerobic respiration
   a) Carbohydrate b) **Ethyl alcohol** c) Acetyl CoA d) Pyruvate
5. Kreb's cycle takes place in
   a) chloroplast b) **mitochondrial matrix**
   c) stomata d) inner mitochondrial membrane
6. Oxygen is produced at what point during photosynthesis ?
   a) when ATP is converted to ADP b) when CO_2 is fixed
   c) When H_2O is splitted d) All of these
7. During light reaction which of the following molecules are formed?
   a) ATP b) **ATP and NADPH + H** c) $NADPH_2$ d) None of these
8. In photosynthesis energy from light reaction to dark reaction is transferred in the form of
   a) RUDP b) ADP c) **ATP** d) both ATP and ADP
9. The first product of photosynthesis is sugar and it is converted into _____
   a) **starch** b) protein c) Glycogen d) None of these
10. The dark reaction in photo synthesis is called so because it is
    a) Light dependent b) **Light independent**
    c) cannot occur during day time d) All of these
11. Photosynthesis in green algae and bacteria is respectively
    a) **Oxygenic and anoxygenic** b) an oxygenic both
    c) oxygenic both d) an oxygenic and oxygenic
12. The first step in glucose breakdown in an cell is
    a) ETC b) Acetyl CoA c) Kreb cycle d) **Glycolysis**
13. Respiration is
    a) Anabolic process b) **Catabolic process**
    c) both a and b d) Endothermic process
14. Respiration occurs in the presence of oxygen is called
    a) Fermentation b) Anaerobic respiration
    c) Glycolysis d) **Aerobic respiration**

15. End product of Aerobic respiration in plants are

a) sugar and oxygen b) **Co_2 water, energy**
c) Co_2 and energy d) water and energy

16. Respiratory Quotient is

a) C / B b) N / C c) Co_2 / O_2 d) O_2 / Co_2

17. Which of the following is the key intermediate compound linking glycolysis to the kreb's cycle?

a) Pyruvic acid b) Malic acid c) **Acetyl CoA** d) None of these

18. Electron transport chain can produce a total of

a) 6 ATP b) 8 ATP c) 24 ATP d) **38 ATP**

19. Ground tissue system include

a) xylem and phloem b) stomata, epidermis, trichomes
c) **Cortex, endodermis, pericycle, pith** d) meristems

20. Which is not a function of epidermis?

a) Gaseous exchange b) **conduction of water**
c) transpiration d) protection

21. Conjoint, collateral, open and endarch vascular bundles found in

a) monocot stem b) monocot root c) **dicot stem** d) dicot root

22. The power house or ATP factory of the cell is _____.

a) plastids b) vacuoles c) Nucleus d) **Mitochondria**

23. This is the first step of both Aerobic and Anaerobic respiration is _____

a) Electron transport chain b) Respiratory Quotient
c) **Glycolysis** d) Kreb's cycle

Fill in the Blanks:

1. Cortex lies between _____. **(Epidermis and vascular tissues)**
2. Xylem and phloem occurring on the same radius constitute a vascular bundle called _____. **(Conjoint)**
3. Glycolysis takes place in _____. **(Cytoplasm)**
4. The source of O_2 liberated in photosynthesis is _____. **(Water)**
5. _____ is ATP factory of the cells. **(Mitochondria)**

13. STRUCTURAL ORGANISATION OF ANIMALS

1. In leech locomotion is performed by

a) Anterior sucker b) Posterior sucker c) Setae d) **Both a and b**

2. The segments of leech are known as

a) **Metameres (somites)** b) Proglottids c) Strobila d) All 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. Leech saliva contains ____ that prevents blood coagulation

a) **Hirudin** b) amylase c) lipase d) pepsin

9. How many pair of eyes are present on the dorsal side of leech?

a) 2 pairs b) 3 pairs c) 4 pairs d) **5 pairs**

10. What are the functions of suckers in leech?

a) Attachment and locomotion b) Attachment and respiration
c) Attachment and reproduction d) Attachment and circulation

11. How does a leech move on a substratum ?

a) By Looping or crawling b) By Pseudopodia
c) By contractions of the muscles d) Oscillatory movement

12. _____ is a hermaphrodite.

a) Frog b) Lizard c) **Leech** d) Dog

13. Rabbits are _____ animals, that means moving in groups.

a) Sanguivorous b) **Gregarious**

14. The existence of 2 sets of teeth in the life of any animals is called _____

a) heterodont b) monodont c) homodont d) **diphyodont**

15. Which is the largest gland present in the rabbits that secret bile?

a) pancreas b) **Liver** c) Pineal d) Adrenal

16. The younger ones of the hare and rabbit are _____ and _____ respectively.

a) **Leverets and kittens** b) Calf and Kitten
c) Calf and Leverets d) Cub and Hare

17. Where is the sublingual part of the salivary gland located ?

a) Above the tongue b) **Below the tongue**
c) Upper Jaw d) Lower Jaw

18. In which angle does the eyes of the rabbit rotate?

a) 320 b) **360** c) 260 d) 160

19. The abbreviation of CNS is _____.

a) Cerebral nervous system b) Contact nervous system
c) **Central Nervous System** d) Cranial nerve signals

20. The inner most layer of brain of the rabbit is _____

a) Duramater b) **Piamater** c) Arachanoidmater d) Meninges

21. Name the specialized cells that surrounds and nourishes egg cell of a rabbit?

a) **Graffian follicles** b) Theca externa
c) Theca Interna d) None of the above

22. The secretion of _____ glands neutralizes the acidity of urethra and Vagina.

a) **Cowpers gland** b) Pineal Gland c) Adrenal gland d) Thyroid gland

23. Which of the following statement is false?

a. Hare feeds on harder bark and twigs
b. Rabbit feeds on soft grasses and vegetables
c. **The external ears of Hare are shorter**
d. Rabbits makes their home in burrows

24. In leech, the blood vessels are replaced by channels called ____

a) Arteries b) **Haemocoelic channels**
c) Veins d) Hydrophilic channels

25. Leech is used to treat _____ and _____ in human beings.

a) Circulatory disorders and cardiovascular diseases
b) The nervous disorder and neural diseases
c) Respiratory disorders and lung diseases
d) None of the above

26. The gap between the incisors and premolar teeth of a rabbit is called _____

a) Diastema b. Maxilla c. Dentary d. Pre Maxilla

27. The largest portion of Alimentary canal in leech is

a) Mouth b) pharynx c) Oesophagus d) **Crop.**

Fill in the Blanks:

1. The posterior sucker is formed by the fusion of the _____ segments. **(last 7)**
2. The existence of two sets of teeth in the life of an animal is called _____ dentition. **(diphyodont)**
3. The anterior end of leech has a lobe-like structure called _____. **(anterior sucker)**
4. The blood sucking habit of leech is known as _____. **(sanguivorous)**
5. _____ separate nitrogenous waste from the blood in rabbit. **(Nephrons)**
6. _____ spinal nerves are present in rabbit. **(37 pairs)**

14. TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

1. Active transport 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 dioxide 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 the sequence of correct blood flow

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 an 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**

11. The only artery which carries deoxygenated blood is _____

a) Hepatic portal artery b) Hepatic artery
c) Renal artery d) **pulmonary artery**

12. Which type of blood cell will increased during the condition of allergy

a) **Eosinophils** b) Basophils c) Neutrophils d) Leucocytes

13. The longest time duration for one cardiac cycle occurs in _____

a) Auricular systole b) Ventricular systole
c) Auricular diastole d) **Ventricular diastole**

14. Which one of the following species contains the Haemocoel

a) Amphibian b) **Arthropods** c) Reptiles d) Mammals

15. In heart the Lubb sound is produced by the closing valve of _____

a) Bicuspid , Tricuspid, Semilunar valves
b) Tricuspid and bicuspid valves
c) Tricuspid and semilunar valves
d) Bicuspid and semilunar valves

16. Which one of the following is under the range of hypotension

a) 120 mm Hg/ 80 mm Hg b) **90 mm Hg/ 60 mm Hg**
b) 140 mm Hg/ 90 mm Hg d) 160 mm Hg/ 100 mm Hg

17. Sphygmomanometer is used to measure the _____

a) Blood pressure b) Heart beat c) Internal organ sound d) All of these

18. AB Blood group is universal recipient because of the following.

a) Antibody 'AB' is not present in plasma
b) Antibody present in plasma
c) Antibody 'A' is present in plasma
d) Antibody 'B' is present in plasma

19. Rh-factor was discovered by _____

a) Landsteiner and Wiener b) Decastello and Stenin
c) William Harvey d) Karl Landsteiner

20. Systemic circulation means

a) Lungs → Heart → Lungs
b) Heart → Body → Heart
c) Heart → Heart
d) Lungs → Heart → Body

Fill in the Blanks:

1. _____ involves evaporative loss of water from aerial parts. **(Transpiration)**
2. Water enters the root cell through a _____ plasma membrane. **(semipermeable)**
3. Structures in roots that help to absorb water are _____. **(Root hairs)**
4. Normal blood pressure is _____. **(120 / 80 mm Hg)**
5. The normal human heartbeat rate is about _____ time per minute. **(72 – 75)**

Assertion and Reasoning

a. If both A and R are true and R is correct explanation of A
b. If both A and R are true but R is not the correct explanation of A
c. A is true but R is false
d. Both A and R are false

1. **Assertion:** RBC plays an important role in the transport of respiratory gases.
   Reason: RBC do not have cell organelles and nucleus.
   Ans (b)
2. **Assertion:** Persons with AB blood group are called an universal recipients, because they can receive blood from all groups.
   Reason: Antibodies are absent in persons with AB blood group.
   Ans (a)

15. NERVOUS SYSTEM

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) arachanoid 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 following part of brain is supposed to be damaged?

(a) Medulla oblongata (b) cerebrum (c) pons (d) **hypothalamus**

13. The gap between neurons is called

a) dendrite b) **synapse** c) axon d) impulse

14. The patient is not able to balance his body, and is unable to walk properly. Name the part of the brain which is affected

a) **Hind brain** b) Mid brain c) Spinal cord d) Fore brain

15. Which part of the human brain is more developed in comparison to other parts?

a) **Cerebrum** b) Cerebellum c) Optic lobes d) Medulla oblongata

16. Which of the following protects the brain from shocks?

a) Pons b) **Cerebrospinal fluid** c) Pons d) Medulla

17. All the voluntary actions of the body are controlled by_____

a) **Cerebrum** b) Cerebellum c) Pons d) Medulla

18. Electrical impulse travel in neuron from?

a) dendrite → axon → axon → cell body
b)cell body → dendrite → axon → axon end
c) **dendrite → cell body → axon → axon end**
d) axon end → axon → cell body → dendrite

19. Which is the correct sequence of reflex arc?

a) Receptors -> muscle -> Sensory neuron -> Motor neuron ->Spinal Cord
b) Receptors -> Motor neuron -> Spinal Cord ->Sensory neuron -> Muscle
c) Receptors -> Spinal Cord -> Sensory neuron -> Motor neuron ->muscle
d) Receptors -> Sensory neuron -> Spinal Cord -> Motor neuron->muscle

20. The contraction of the pupil of the eye in the presence of bright light is an example of

a) Voluntary reflex b) **cerebral reflex** c) Spinal reflex d) Adrenal reflex

21. The number of pair of nerves which are from the spinal cord of man is _____

a) 21 b) **31** c) 41 d) 51

22. Which of the following helps in maintaining posture and balance of human body?

a) **Cerebellum** b) Cerebrum c) medulla d) pons

23. The human hindbrain comprises three parts. One of which is _____

a) Spinal cord b) Corpus callosum c) Hypothalamus d) **Cerebellum**

24. Unidirectional transmission of nerve impulse is maintained by

a) Interneurons b) **Myelin sheath** c) synapse d) Membrane polarity

25. In reflex action, reflex arc is formed by

a) **Receptor, spinal cord, Muscle** b) Spinal cord, Muscle, Receptor
c) Muscle, Receptors, Brain d) Brain, spinal cord, Muscle

26. Select the incorrect statement:-

a) Cerebral cortex, greyish in appearance thrown into prominent fold known as Sulci and gyri
b) Hypothalamus controls the body temperature and urge for eating
c) Right and left cerebral hemispheres are connected via corpus striatum
d) Dendrites transmit impulse away from the cell body

27. The correct sequenceof meninges of brain from outside to inside is :

a) Piamater , Duramater, Archanoid b) Duramater, Piamater, Archanoid
c) Duramater, Archanoid, Piamater d) Archanoid, Duramater, Piamater

28. One of the following actionsnot an example of autonomic system?

a) **knee – jerk reflex** b) peristalsis of intestine
c) swallowing of food d) pupillary reflex

29. Nerve cells do not divide because they do not have

a) Golgi body b) nucleus c) **centrosome** d) mitochondria

30. The spinal cord originates from

a) **Medulla** b) Cerebellum c) cerebrum d) Pons

31. In a neuron, conversion of electric signal to a chemical signal occurs in

a) **axon end** b) cell body c) dendrites d) myelin sheath

Fill in the Blanks

1. _____ is the longest cell in our body. **(Neurons)**
2. Impulses travels rapidly in _____ neurons. **(myelinated)**
3. A change in the environment that causes an animal to react is called ____. **(stimulus)**
4. _____ carries the impulse towards the cell body. **(Dendrite)**
5. The two antagonistic component of autonomic nervous system are _____ and _____. **(sympathetic, parasympathetic)**
6. A neuron contains all cell organelles except _____. **(Centriole)**
7. _____ maintains the constant pressure inside the cranium. **(cerebrospinal fluid)**
8. _____ and increases the surface area of cerebrum. **(Gyri, sulci)**
9. The part of human brain which acts as relay center is _____. **(Thalamus)**

Assertion and Reasoning

a. Assertion is correct and reason is wrong
b. Reason is correct and the assertion is wrong
c. Both assertion and reason are correct
d. Both assertion and reason are wrong

1. **Assertion:** Cerebrospinal fluid is present throughout the central nervous system.
Reason: Cerebrospinal fluid has no such functions.
Ans (a)

2. **Assertion:** Corpus callosum is present in space between the duramater and piamater.
Reason: It serves to maintain the constant intracranial pressure.
Ans (d)

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 leaves

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 sugarcanes 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 pituitary**
   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

10. A plant hormone is _____.

    a) an ion responsible for turgour pressure
    b) a pigment that gives colour
    c) **an organic compound**
    d) a secondary metabolite

11. The plant harmones which promote growth are

    a) gibberillins, and ethylene
    b) **auxins, gibberellins and cytokinin**
    c) an organic compound
    d) a secondary metabolite

12. Auxin synthesis occurs in _____

    a) **root / shoot tip**
    b) cortex
    c) xylem
    d) phloem

13. Parthenocarpy is induced by _____

    a) ethylene
    b) **spraying auxin on pistil**
    c) spraying auxin on fruit
    d) spraying auxin on leaf

14. _____ is not influence of auxins

    a) Apical dominance
    b) Tropic movements
    c) Cell elongation
    d) **Bolting**

15. Abcissic acid is primarily synthesized

    a) lysosome
    b) golgi complex
    c) **chloroplast**
    d) ribosome

16. Genetically dwarf plants can be induced to grow tall by using____

    a) **gibberellins**
    b) auxins
    c) cytokinins
    d) ethylene

17. Which one of the following pairs is not correctly matched?

a) Abscissic acid - Stomatal closure
b) **Gibberellins** **- leaf fall**
c) Cytokinin - cell division
d) IAA - cell wall elongation

18. _____ is a natural growth inhibitor

a) NAA b) **ABA** c) IAA d) GA

19. Removal of apical bud of a flowering plant or pruning of a flowering plant leads to_____

a) Formation of new apical buds
b) Formation of adventitious roots
c) Early flowering of stopping floral growth
d) Promotion of lateral branches

20. Endocrine glands put their secretions directly into _____

a) Ducts b) **Blood** c) Both d) None of the above

21. The secretion of the following pituitary hormones is controlled by hypothalamus

a) Thyrotropin(TSH) and cortisol
b) Follicle stimulating hormone(FSH) and progesterone
c) Corticotrophin (ACTH) growth harmone (GH) and vasopressin
d) Lutenising hormone(LH), corticotrophin(ACTH) and thyrotropin(TSH)

22. Pituitary gland is found in

a) Around trachea b) Gonad c) Pancreas d) **Brain**

23. Which one is not secreted by pituitary?

a) Thyroxine b) FSH c) GH d) ACTH

24. Anterior lobe of pituitary secretes

a) TSH, ADH and Prolactin b) **LH, FSH and a growth hormone**
c) ACTH, TSH and oxytocin d) TSH, GH and antidiuretic hormone

25. Gonadotropins are secreted from

a) hypothalamus b) posterior pituitary c) **Anterior pituitary** d) Gonads

26. Growth hormone is secreted by the

a) **Anterior lobe of the pituitary** b) posterior lobe of the pituitary
c) Adrenal gland d) Gonads

27. In an accident anterior pituitary a four year old boy was severely damaged but the boy survived. What is likely to happen?

a) High levels of thyroxin will be released.
b) Spermatogenesis will be stimulated
c) **The boy will not grow much in height**
d) The growth of mammary glands will be stimulated.

28. A gorilla is like man with huge hand and legs. This is due to the abnormal secretion of

a) pituitary FSH b) pituitary LH c) **pituitary GH** d) Thyroid

29. Hyper secretion of growth hormone by pituitary results in

a) Dwarfism b) **Gigantism** c) Cretinism d) Myxoedema

30. The synthesis and release of thyroxin from the thyroid gland is stimulated by

a) LH b) **TSH** c) ACTH d) FSH

31. LH and FSH are called

a) antistress hormones b) **gonadotrophic hormones**
c) emergency hormones d) neuroharmones

Fill in the Blanks:

1. _____ causes cell elongation, apical dominance and prevents abscission. **(Auxin)**
2. _____ is a gaseous hormone involved in abscission of organs and acceleration of fruit ripening. **(Ethylene)**
3. _____ causes stomatal closure. **(Abscissic acid)**
4. Gibberellins induce stem elongation in _____ plants. **(rosette)**
5. The hormone which has negative effect on apical dominance is _____. **(Cytokinin)**
6. Calcium metabolism of the body is controlled by _____. **(Parathormone)**
7. In the islets of Langerhans, beta cells secrete _____. **(Insulin)**
8. The growth and functions of thyroid gland is controlled by _____. **(Thyroid stimulating Hormone)**
9. Decreased secretion of thyroid hormones in the children leads to ____. **(Cretinism)**

Assertion and Reasoning

a. If both A and R are true and R is correct explanation of A
b. If both A and R are true but R is not the correct explanation of A
c. A is true but R is false
d. Both A and R are false

1. **Assertion:** Application of cytokinin to marketed vegetables can keep them fresh for several days.
   Reason: Cytokinins delay senescence of leaves and other organs by mobilisation of nutrients.
   Ans (a)
2. **Assertion (A):** Pituitary gland is referred as "Master gland".
   Reason (R): It controls the functioning of other endocrine glands.
   Ans (a)
3. **Assertion (A):** Diabetes mellitus increases the blood sugar levels.
   Reason (R): Insulin decreases the blood sugar levels.
   Ans (b)

17. REPRODUCTION IN PLANTS AND ANIMALS

1. The plant which propagates with the help of its leaves is _____ .

   a) Onion b) Neem c) Ginger d) **Bryophyllum**

2. Asexual reproduction takes place through budding in _____ .

   a) Amoeba b) **Yeast** c) Plasmodium d) Bacteria

3. Syngamy results in the formation of _____ .

   a) Zoospores b) Conidia c) **Zygote** d) Chlamydospores

4. The essential parts of a flower are _____ .

   a) Calyx and Corolla b) Calyx and Androecium
   c) Corolla and Gynoecium d) **Androecium and Gynoecium**

5. Anemophilous flowers have _____ .

   a) Sessile stigma b) Small smooth stigma
   c) Colored flower **d) Large feathery stigma**

6. Male gametes in angiosperms are formed by the division of _____ .

a) **Generative cell** b) Vegetative cell c) Microspore mother cell d) Microspore

7. What is true of gametes?

a) They are diploid b) They give rise to gonads
c) They produce hormones d) **They are formed from gonads**

8. 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

9. The large elongated cells that provide nutrition to developing sperms are

a) Primary germ cells b) **Sertoli cells** c) Leydig cells d) Spermatogonia

10. Estrogen is secreted by

a) Anterior pituitary b) Primary follicle c) **Graffian follicle** d) Corpus luteum

11. Which one of the following is an IUCD?

a) **Copper – T** b) Oral pills c) Diaphragm d) Tubectomy

12. The correct sequence of reproductive phases seen in a flower is _____

a) flowering, seed formation, fertilization, pollination
b) pollination, fertilisation, seed formation, flowering
c) seed formation, fertilization, flowering pollination
d) **flowering, pollination, fertilization, seed formation.**

13. The number of cells and nuclei in a mature embryo sac is _____

a) **7 cells 8 nuclei** b) 8 cells 7 nuclei c) 6 cells 8 nuclei d) 7 cells 6 nuclei

14. Mango is propagated through _____

a) tissue culture b) **grafting** c) stem cutting d) layer

15. Which one of the following generate new genetic combination leading to variation

a. Vegetative reproduction b. Parthenogenesis
c. **Sexual reproduction** d. Asexual reproduction

16. Process of fusion of haploid gametes is knows as _____

a) cell cycle b) meiosis c) mitosis d) **syngamy**

17. Which one of the following produce the male gamete

a) Endosperm b) synergid c) **pollen grain** d) antipodals

18. Cross pollination through insects are known as

a) anemophily b) **entomophily** c) hydrophily d) ornithophily

19. Find out the odd one

a) endosperm b) synergid c) **pollengrain** d) antipodals

20. Choose the correct match

a) endosperm - 2n b) embryo - 3n
c) egg - 2n d) **male gamete - n**

21. Which of the following is a post fertilization event in flowering plants?

a) transfer of pollen grains b) **fruit formation**
c) formation of flower d) germination of pollen grains

22. The release of sperms from the sertoli cells is called

a) spermateliosis b) vitellogenesis c) spermiogenesis d) **spermiation**

23. Graffian follicle contains

a) many oocytes b) many sperms
c) **a single oocyte** d) site for egg fertilization

24. Which is correctly matched in a normal menstrual cycle?

a) **Endometrium regenerates – 5 to 10 days**
b) Release of egg – 5^{th} day
c) Endometrium secretes – 11 to 18 days
d) Rise in progesterone level – 1 to 15 days

25. In human beings fertilization takes place in

a) **fallopian tube** b) eustachian tube c) ovary duct d) uterus

26. Which one of the following are primary sexual organs

a) **testes and ovaries** b) testes and penis
c) ovary and vagina d) testes, penis, ovary and vagina

27. Which one of the following is correct? After the removal of uterus.

a) **Ovulation occurs** b) Ovulation does not occur
c) fertilization takes place d) None of the above

28. Which one of the following is incorrect related to Asymptomatic Bacteria?

a) caused due to Bacteria b) infection occur in the urinary bladder
c) **it shows symptoms** d) it may not show symptoms

29. To avoid sanitary pad rash, the pads should be changed _____

a) **Every 6 hours** b) Every 4 hours c) Every 7 hours d) Twice in a day

30. A temporary association between the developing embryo and maternal tissues are called _____

a) Uterus b. Ovary c. **Placenta** d. Endometrium

31. The correct sequence of spermatogenesis is _____

a) Growth phase, multiplication phase, spermiogenesis, maturation phase
b) Multiplication phase, growth phase, maturation phase, spermiogenesis
c) Multiplications phase, maturation phase, spermiogenesis, growth phase
d) Spermiogenesis, maturation phase, multiplication phase, growth phase

Fill in the Blanks:

1. The embryo sac in a typical dicot at the time of fertilization is _____ . **(7 celled and 8 nucleated)**
2. After fertilization the ovary develops into _____ . **(Fruit)**
3. Planaria reproduces asexually by _____ . **(Regeneration)**
4. Fertilization is _____ in humans. **(Internal)**
5. The implantation of the embryo occurs at about _____ day of fertilization. **(6-7)**
6. ____ is the first secretion from the mammary gland after child birth. **(colostrum)**
7. Prolactin is a hormone produced by _____ . **(anterior pituitary)**

18. HEREDITY

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 the chromosome where the spindle fibres get attached during cell division

a) Chromomere 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 form the backbone of the DNA)

a) 5 carbon sugar b) Phosphate c) Nitrogenous bases d) **Sugarphosphate**

6. Okasaki fragments are joined together by _____.

a) Helicase b) DNA polymerase 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 allosome
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) Tetraploidy b) **Aneuploidy** c) Euploidy d) polyploidy

9. If a genotype consists of different types of alleles, it is called

a) **Heterozygous** b) monoallelic c) uniallelic d) homozygous

10. The graphical representation to calculate the probability of all possible genotypes of offspring in a genetic cross was developed by

a) Gregor Johann Mendel b) HarGobind Khorana
c) James Watson d) **Reginald C. Punnet**

11. The two versions of a trait which are brought in by the male and female gametes are situated on

a) Copies of the same chromosome b) **two different chromosomes**
c) sex chromosomes d) any chromosome

12. A tall plant was grown in nutrient deficient soil remained dwarf when it crossed with dwarf plants?

a) All hybrid plants are tall b) 50% of tall and 50% dwarf
c) **75% tall and 25% dwarf** d) 25% dwarf and 75%

13. The F1 generation has all tall and F2 generation ratio is 3:1, it proves

a) **Law of dominance** b) Linkage
c) incomplete dominance d) Law of segregation

14. In a dihybrid cross out of 16 plants obtained, the number of genotypes shall be

a) 4 b) 9 **c) 16** d) 12

15. Mendel found certain traits not assort independently , it is due to

a) **Dominance** b) Linkage c) Crossing over d) Amitosis

16. Which is the functional unit of inheritance?

a) cistron b) Muton c) Chromosome d) **gene**

17. The chromosome ends are called _____

a) **Satellite** b) Telomere c) Centromere d) Kinetochores

18. Which of the following descriptions of chromosome is not correctly matched?

a) metacentric - the chromosomes with two equal arms
b) submetacentric - the chromosomes with two unequal arms
c) **acrocentric - the chromosomes with two arms identical in size**
d) Telocentric - the chromosomes with one arms

19. The chromosomes other than sex chromosomes are called _____

a) Allosomes b) **autosomes**
c) lampbrush chromosomes d) heterosomes

20. Nucleotide of DNA molecule is made up of nitrogenous bases. The base pairing occurs in which of the following pattern?

a) Adenine – Thymine ; Cytosine – Guanine
b) Adenine – Cytosine ; Guanine- Thymine
c) Adenine – Guanine ; Cytosine – Thymine
d) Adenine – Guanine ; Cytosine –Taurine

21. Which of the following is not the correct match?

a) Helicases - binds the double helix near the replication fork
b) Topoisomerases – separates the two strands of DNA at the site of origin of replication
c) DNA polymerase- stops the DNA replication
d) DNA Ligase - joins the okazaki fragments

22. Sex is determined in human beings?

a) By ovum b) **At the time of fertilization**
c) 40 days after fertilization d) 7^{th} to 8^{th} week when genitals differentiate in foetus

23. Mutations are responsible for

a) Extinctions of organisms b) **Variations in populations**
c) increase in population d) Maintaining genetic continuity

24. One of the following is a random process

a) Variation b) Adaptation c) Evolution d) **Mutation**

25. Sickle cell anemia is called _____

a) Metabolic disorder b) degenerative disorder
c) **genetic disorder** d) pathogenic disorder

Fill in the Blanks

1. The pairs of contrasting character (traits) of Mendel are called _____. **(Alleles)**
2. Physical expression of a gene is called _____. **(Phenotype)**
3. The thin thread like structures found in the nucleus of each cell are called ___. **(Chromosome)**
4. DNA consists of two _____ chains. **(Polynucleotide)**
5. An inheritable change in the amount or the structure of a gene or a chromosome is called _____. **(mutation)**

19. ORIGIN AND EVOLUTION OF LIFE

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. Paleontologists 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 (c)

5. The term Ethnobotany was coined by

a) Khorana b) **J.W. Harshbberger** c) Ronald Ross d) Hugo de Vries

6. Fossils are generally found in

a) Sedimentary rocks b) igneous rocks
c) metamorphic rocks d) any type of rocks

7. Dinosaurs are

a) Extinct amphibians **b) extinct reptiles**
c) primitive mammals d) living reptiles

8. Which of the following would be easily fossilised?

a) Heart **b) tooth** c) skin d) liver

9. The organisms which live in extreme environmental conditions on earth are called

a) Thermophiles b) acidophiles **c) extremophiles** d) archaeobacteria

10. The study of local plants and their uses through the traditional knowledge is known as

a) Paleobotany **b) ethnobotany** c) palynology d) economic botany

11. Which is not Lamarckian concept?

a) Environmental changes cause variations.
b) Rate of survival of organisms varies due to variations
c) Inheritance of acquired characters
d) If an organ is used continuously, it will develop continuously.

12. According to Darwin, evolution is a

a) Sudden but discontinuous process. **b) Slow, gradual and continuous process**.
c) Slow, sudden and discontinuous process. d) Slow and discontinuous process.

13. Which of the following is not associated with the "Theory of natural selection"?

a) Internal vital force b) over production of the offspring
c) struggle for existence d) survival of the fittest

14. Human forelimb, wing of bat and flipper of whale represent

a) analogous organs b) vestigial organs
c) Homologous organs d) evolutionary organs

15. Analogous organs have

a) Dissimilar origin and dissimilar function b) Similar origin with similar function
c) Similar origin with dissimilar function **d) Dissimilar origin and similar function**

16. Which of the following is a vestigial organ?

a) Nails b) scalp hair c) wisdom tooth **d) all of the above**

17. Which of the following is not atavistic in humans?

a)Tail in some babies b) enlarged canines
c) dense body hair **d) six fingers**

18. Evolutionary history of an organism is known as

a) Phylogeny b) ontogeny c) ancestry d) palaeontology

19. 'Ontogeny recapitulates phylogeny'. This is

a) Hardy Weinberg law b) Darwin's law c) inheritance law **d) bio genetic law**

20. Archaeopteryx is known as missing/ connecting link. It has the characters of both

a) Fishes and amphibians b) Reptiles and mammals
c) Birds and reptiles d) Chordates and non chordates

Fill in the Blanks:

1. The characters developed by the animals during their life time, in response to the environmental changes are called _____. **(acquired characters)**
2. The degenerated and non-functional organs found in an organism are called _____. **(vestigeal organs)**
3. The forelimbs of bat and human are examples of _____ organs. **(Homologous)**
4. The theory of natural selection for evolution was proposed by _____. **(Charles Darwin)**

20. BREEDING AND BIOTECHNOLOGY

1. Which method of crop improvement can be practised by a farmer if he is inexperienced?

a) clonal selection b) **mass selection** c) pureline selection d) hybridisation

2. Pusa Komal is a disease resistant variety of _____.

a) sugarcane b) rice c) **cow pea** d) maize

3. Himgiri developed by hybridisation and selection for disease resistance against rust pathogens is a variety of _____.

a) chilli b) maize c) sugarcane d) **wheat**

4. The miracle rice which saved millions of lives and celebrated its 50th birthday is _____

a) **IR 8** b) IR 24 c) Atomita 2 d) Ponni

5. Which of the following is used to produce products useful to humans by biotechnology techniques?

a) enzyme from organism b) live organism
c) vitamins d) **both (a) and (b)**

6. We can cut the DNA with the help of

a) scissors b) **restriction endonucleases** c) knife d) RNAase

7. rDNA is a

a) vector DNA b) circular DNA
c) **recombinant of vector DNA and desired DNA** d) satellite DNA

8. DNA fingerprinting is based on the principle of identifying ---------- sequences of DNA

a) single stranded b) mutated c) polymorphic d) **repetitive**

9. Organisms with modified endogenous gene or a foreign gene are also known as

(a) transgenic organsims (b) genetically modified
(c) mutated (d) **both a and b**

10. In a hexaploid wheat (2n = 6 x = 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**

11. Triticale is the first man made cereal crop. The combination of parents involved in its production is Triticum and _____.

a) Sorghum b) Barley c) Saccharum **d) Rye**

12. Aims of plant breeding are to produce _____.

a) Disease free varieties b) High Yielding varieties
c) Early maturing varieties **d) All the above**

13. Scientists are trying to get hybridisation between tomato and potato. The most accurate name would be _____.

a) Topemo b) Mopato **c) Pomato** d) Tomepo

14. When a plant species is carried from its place of origin to a new place and cultivated, it is called _____.

a) Introduction **b) Transplantation** c) Aforestation d) Selection

15. _____ is the oldest breeding method

a) Introduction **b) Selection** c) Hybridization d) Mutation breeding

16. The progeny of a homozygous plant constitute a _____.

a) Pureline b) Mixed population c) Mass selection d) Clone

17. The method of mass selection is applied in _____ crops

a) Cross pollinated b) Self pollinated
c) Both self and cross pollinated d) Potato and Sugarcane

18. An improved variety is _____.

a) Always superior to the other existing varieties
b) Always inferior to the other existing varieties
c) May be superior to the other existing varieties
d) Both a and b are correct

19. Semi dwarf varieties of wheat developed from wheat varieties of Mexico are_____.

a) Sonalika and NP 836 b) Sharbati Sonora and Pusa Lema
c) Sonalika and Kalyan Sona d) Sonora 64 and HUW 468

20. When the breeding takes between animals of the same breed is called as_____.

a) inbreeding b) outbreeding c) breeding d) breed

21. The first cloned animal is _____.

a) cow **b) sheep** c) dog d) whale

22. The disease where the blood fails to clot due to te absence of clotting factor is _____.

a) Haemophobia **b) Haemophilia** c) Haemophotics d) Haemoethics

23. Which is an activator used to dissolve blood clot

a) plasminogen b) plasmogen c) plasmocoel d) plasmomonogen

24. Manmade antibodies are _____.

a) monoclonal b) diclonal c) triclonal d) tetraclonal

25. Pancreatic cells secretes _____.

a) insulin b) tripsin c) rennin d) thymine

26. Bone marrow produces the _____.

a) blood cells b) skin c) stomach d) brain

27. Which one of the following is the neurogenerative disorder

a) parkinson's disease **b) alzheimer's disease**
c) neurogenital disease d) replicable disease

28. What is the use of Restriction Endonuclease in Gene cloning technology ?

a) to cut the DNA at particular nucleotide b) to cut any place of the DNA
c) to join the two DNA fragments d) to separate the DNA strand

29. Which one of the following act as a vector ?

a) E.coli **b) plasmid of E.coli** c) Nucleoid of E.coli d) cytoplasm of E.coli

Fill in the Blanks:

1. Economically important crop plants with superior quality are raised by_____. **(plant breeding)**
2. A protein rich wheat variety is _____. **(Atlas 66)**
3. _____is the chemical used for doubling the chromosomes. **(Colchicine)**
4. The scientific process which produces crop plants enriched with desirable nutrients is called _____. **(Biofortification)**
5. Rice normally grows well in alluvial soil, but _____ is a rice variety produced by mutation breeding that grows well in saline soil. **(Atomita-2)**
6. _____ technique made it possible to genetically engineer living organism. **(rDNA)**
7. Restriction endonucleases cut the DNA molecule at specific positions known as _____. **(restriction site)**
8. Similar DNA fingerprinting is obtained for _____. **(Identical twins)**
9. _____ cells are undifferentiated mass of cells. **(stem)**
10. In gene cloning the DNA of interest is integrated in a _____. **(plasmid)**

Assertion and Reasoning

a. Assertion is correct and reason is wrong
b. Reason is correct and the assertion is wrong
c. Both assertion and reason is correct
d. Both assertion and reason is wrong.

1. **Assertion:** Hybrid is superior than either of its parents.
   Reason: Hybrid vigour is lost upon inbreeding.
   Ans (c)
2. **Assertion:** Colchicine reduces the chromosome number.
   Reason: It promotes the movement of sister chromatids to the opposite poles.
   Ans (d)
3. **Assertion:** rDNA is superior over hybridisation techniques.
   Reason: Desired genes are inserted without introducing the undesriable genes in target organisms.
   Ans (c)

21. HEALTH AND DISEASES

1. Tobacco consumption is known to stimulate secretion of adrenaline. 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 type of cancer affects lymph nodes and spleen?

   a) Carcinoma b) Sarcoma c) Leukemia d) **Lymphoma**

5. Excessive consumption of alcohol leads to

   a) Loss of memory b) **Cirrhosis of liver**
   c) State of hallucination d) Supression 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 the epithelial cells is called

   a) Leukemia b) Sarcoma c) **Carcinoma** d) Lipoma

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**

11. When was POSCO act introduced?

    a) 2017 b) 2012 c) 2008 d) 2011

12. World AntiTobacco Act.,

    a) May 31 st **b) May 1 st** c) May 15 th d) May 21 st

13. The target cells of the body do not respond to insulin

    a) IDDM **b) NIDDM**
    c) Gestational diabetes d) Juvenile diabetes

14. Myocardial infarction is

    a) death of heart muscle tissue
    b) deficient blood supply to heart muscle
    c) deposition of cholesterol in blood vessels
    d) heart valves are affected

15. The drug which stimulates the nervous system and makes a person more alert and active is called

    a) seductive b) Opiate narcotics **c) Stimulant** d) hallucinogen

16. Use of disposable syringes for administering medicines is recommended to prevent

a) Malaria b) Stroke **c) AIDS** d) Leprosy

17. Normal blood glucose level of blood is

a) 80 – 100 mg/dL **b) 80 – 120 mg/dL** c) 80 – 150 mg /dL d) 70 – 120 mg/dL

18. A doctor advised a patient to take less sugar in her diet. Which disease is she suffering from?

a) diabetes mellitus b) diabetes insipidus c) Goitre d) Cushing's syndrome

19. In alcoholics liver gets damaged as it

a) accumulates excess of fats b) stores excess of glycogen
b) secretes more bile **d) has to detoxify alcohol**

20. A communicable disease is caused by

a) metabolic disorder b) allergy **c) pathogen** d) hormonal imbalance

21. Health deals with

a) social well being b) physical fitness
c) mental fitness **d) all the above.**

Fill in the Blanks:

1. Cirrhosis is caused in liver due to excessive use of _____. **(alcohol)**
2. A highly poisonous chemicals derived from tobacco is _____. **(nicotine)**
3. Blood cancer is called _____. **(leukemia)**
4. Less response of a drug to a specific dose with repeated use is called ___. **(Drug tolerance)**
5. Insulin resistance is a condition in _____diabetes mellitus. **(Type II)**

Assertion and Reasoning

a. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
b. If both Assertion and Reason are true that Reason is not the correct explanation of Asssertion.
c. Assertion is true but Reason is false.
d. Both Assertion and Reason are false.

1. Assertion: All drugs act on the brain.
Reason: Drugs disturb the functioning of the body and mind.
Ans (a)

2. Assertion: Excretion of excess glucose in urine is observed in a person with diabetes mellitus.
Reason: Pancreas is unable to produce sufficient quantity of insulin.
Ans (a)

VI. Analogy type questions. Identify the first words and their relationship and suggest a suitable word for the fourth blank

1. Communicable: AIDS: Non communicable: **Coronory Heart disease**
2. Chemotherapy: Chemicals: Radiation therapy: **Radiation**
3. Hypertension: Hypercholesterolomia: Glycosuria: **Excessive Glucose in urine**

22. ENVIRONMENTAL MANAGEMENT

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 the 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 rain fall b) low rainfall c) **rain fall is high** d) none of these

7. An inexhaustible resources 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. Green house effect refers to

   a) cooling of earth b) trapping of UV 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 a 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 reduce the consumption of fossil fuels

13. The most rapidly dwindling natural resource in the world is

    a) water **b) forest** c) wind d) sunlight

14. Select the ecofriendly activity among the following

    a) using car for transportation b) using polybags for shopping
    c) using dyes for colouring clothes **d) using windmills to generate power**

15. Which one of the following fuels are formed by the degradation of biomass?

    a) biogas b) CNG **c) Coal and petroleum** d) Nuclear fuel

16. The three “R” s which help us to conserve natural resource for future generation are

a) reduce, regenerate, redistribute
b) reduce, recycle, regenerate
c) reduce, reuse, recycle
d) redistribute, regenerate, recycle

17. Which one of the following is not a fossil fuel?

a) LPG
b) Natural gas
c) Biogas
d) CNG

18. The CHIPKO Andolan is associated with

a) Tigers
b) Turtles
c)Trees
d) marine organisms

19. Afforestation should be done with

a) exotic species
b) Indigenous species
c) Bamboos
d) Eucalyptus

20. Sewage water is polluted and can be acidic in nature if the pH is

a) zero
b)above 7
c) below 7
d) exactly 7

Fill in the Blanks

1. Deforestation leads to _____ in rainfall. **(decrease)**
2. Removal of soil particles from the land is called _____. **(Soil erosion)**
3. Chipko movement is initiated against _____. **(deforestation)**
4. _____ is a biosphere reserve in Tamilnadu. **(The Nilgris)**
5. Tidal energy is _____ type of energy. **(renewable)**
6. Coal, petroleum and natural gas are called _____ fuels. **(fossil)**
7. _____ is the most commonly used fuel for the production of electricity. **(coal)**
8. A man bought a device which can cook food without any fuel like wood or kerosene but the device does not work during night. The device is _____. **(solar cooker)**
9. An electrical device which consumes less units of electricity when used for long hours a day is _____ **(LED bulbs)**

Assertion and Reasoning

a. Both assertion and reason are true and reason is correct explanation of assertion.
b. Both assertion and reason are true but reason is not the correct explanation of assertion.
c. Assertion is true but reason is false.
d. Both assertion and reason are false.

1. **Assertion:** Rainwater harvesting is to collect and store rain water.
Reason: Rainwater can be directed to recharge the underground water source. **Ans (a)**

2. **Assertion:** Energy efficient bulbs like CFL must be used to save electric energy.
Reason: CFL bulbs are costlier than ordinary bulbs, hence using ordinary bulbs can save our money. **Ans (b)**

23. VISUAL COMMUNICATION

1. Which software is used to create animation?
a) Paint
b) PDF
c) MS Word
d) **Scratch**

2. All files are stored in the _____
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

2 MARKS

1. LAWS OF MOTION

I. State whether the following statements are true or false. Correct the statement if it is false:

1. The linear momentum of a system of particles is always conserved.
2. Apparent weight of a person is always equal to his actual weight
3. Weight of a body is greater at the equator and less at the polar region.
4. Turning a nut with a spanner having a short handle is so easy than one with a long handle.
5. There is no gravity in the orbiting space station around the Earth. So the astronauts feel weightlessness.

II. Match the Following:

1. Newton's I law	-	Stable equilibrium of a body
2. Newton's II law	-	Law of force
3. Newton's III law	-	Flying nature of bird
4. Law of conservation of Linear momentum	-	propulsion of a rocket

III. Answer briefly.

1. Define inertia. Give its classification.
2. Classify the types of force based on their application.
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
4. Differentiate mass and weight.
5. Define moment of a couple.
6. State the principle of moments.
7. State Newton's second law.
8. Why a spanner with a long handle is preferred to tighten screws in heavy vehicles?
9. While catching a cricket ball the fielder lowers his hands backwards. Why?
10. How does an astronaut float in a space shuttle?
11. Define impulse.
12. Define couple.
13. Mention the effects of force.
14. Give the reason for the weightlessness of the astronauts in space stations.
15. Define one newton.
16. Define one dyne.
17. What will be the apparent weight of a person when the lift is at rest.
18. Two blocks of masses 8 kg and 2 kg respectively lie on a smooth horizontal surface in contact with one other. They are pushed by a horizontally applied force of 15 N. Calculate the force exerted on the 2 kg mass.

2. OPTICS

I. True or False. If false correct it.

1. Velocity of light is greater in denser medium than in rarer medium
2. The power of lens depends on the focal length of the lens
3. Increase in the converging power of eye lens cause 'hypermetropia'
4. The convex lens always gives small virtual image.

II. Match the following:

1. Retina	-	Screen of the eye
2. Pupil	-	Path way of light
3. Ciliary muscles	-	Power of accommodation
4. Myopia	-	Far point comes closer
5. Hypermetropia	-	near point moves away

III. Answer Briefly

1. What is refractive index?
2. State Snell's law.
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
5. State Rayleigh's law of scattering
6. Differentiate convex lens and concave lens.
7. What is power of accommodation of eye?
8. What are the causes of 'Myopia'?
9. Why does the sky appear in blue colour?
10. 10. Why are traffic signals red in colour?
11. The clouds appear white – justify.
12. What is Tyndall effect?
13. Define Magnification of lens.
14. Define Raman scattering.
15. Give the uses of simple microscope.
16. Define power of a lens and write its unit.
17. What is dispersion of light?
18. Why does the sky appear red colour at sunrise and sunset?
19. While doing an experiment for the determination of focal length of a convex lens, Raja Suddenly dropped the lens. It got broken into two halves along the axis. If he continues his experiment with the same lens, (a) can he get the image? (b) Is there any change in the focal length?
20. The eyes of the nocturnal birds like owl are having a large cornea and a large pupil. How does it help them?

3. THERMAL PHYSICS

I. State whether the following statements are true or false, if false explain why?

1. For a given heat in liquid, the apparent expansion is more than that of real expansion.
2. Thermal energy always flows from a system at higher temperature to a system at lower temperature.
3. According to Charles's law, at constant pressure, the temperature is inversely proportional to volume.

II. Match the following:

1. Linear expansion - change in length
2. Superficial expansion - change in area
3. Cubical expansion - change in volume
4. Heat transformation - hot body to cold body
5. Boltzmann constant - $1.381 \times 10^{-23}\ \mathrm{JK}^{-1}$

III. Answer briefly

1. Define one calorie.
2. Distinguish between linear, arial and superficial expansion.
3. What is co-efficient of cubical expansion?
4. State Boyle's law
5. State-the law of volume
6. Distinguish between ideal gas and real gas.
7. What is co-efficient of real expansion?
8. What is co-efficient of apparent expansion?
9. Define absolute temperature.
10. Deduce the relationship between the different types of scale of temperature.
11. Define thermal equilibrium. Give the characteristic features of heat transfer.
12. State Charles law.

13. State Avogadro's law.
14. What is an ideal or perfect gas?
15. What are the effects of heat energy.
16. Match the Co-efficient of cubical expansion of some materials:

Aluminium	$7x10^{-5} K^{-1}$
Brass	$6x10^{-5} K^{-1}$
Glass	$2.5x10^{-5} K^{-1}$
Water	$20.7 x10^{-5} K^{-1}$
Mercury	$18.2 x10^{-5} K^{-1}$

17. If you keep ice at 0° C and water at 0°C in either of your hands, in which hand you will feel more chillness? Why?

4. ELECTRICITY

I. State whether the following statements are true or false: If false correct the statement.

1. Ohm's law states the relationship between power and voltage.
2. MCB is used to protect house hold electrical appliances.
3. The SI unit for electric current is the coulomb.
4. One unit of electrical energy consumed is equal to 1000 kilowatt hour.
5. The effective resistance of three resistors connected in series is lesser than the lowest of the individual resistances.

II. Match the following:

(i)	electric current	-	ampere
(ii)	potential difference	-	volt
(iii)	specific resistance	-	ohm meter
(iv)	electrical power	-	watt
(v)	electrical energy	-	joule

III. Answer briefly

1. Define the unit of current.
2. What happens to the resistance, as the conductor is made thicker?
3. Why is tungsten metal used in bulbs, but not in fuse wires?
4. Name any two devices, which are working on the heating effect of the electric current.
5. Define electric potential and potential difference.
6. What is the role of the earth wire in domestic circuits?
7. State Ohm's law.
8. Distinguish between the resistivity and conductivity of a conductor.
9. What connection is used in domestic appliances and why?
10. What is MCB?
11. Why do we use LED bulbs instead of incandescent bulbs.
12. Define Electric power.
13. Define one volt.
14. Define resistance and give its unit.
15. What is the use of fuse wire.
16. Tungsten is commonly used as filament in Electric bulbs. Give reasons.
17. What is earthing?

18. Matching:

1.	Resistor	
2.	Ammeter	
3.	A diode	
4.	Ground connection	

5. ACOUSTICS

I. True or false:- (If false give the reason)

1. Sound can travel through solids, gases, liquids and even vacuum.
2. Waves created by Earth Quake are Infrasonic.
3. The velocity of sound is independent of temperature.
4. The Velocity of sound is high in gases than liquids.

II. Match the following:

1. Infrasonic - 10 Hz
2. Echo - Ultrasonography
3. Ultrasonic - 22 kHz
4. High pressure region - Compressions

III. Answer briefly

1. What is a longitudinal wave?
2. What is the audible range of frequency?
3. What is the minimum distance needed for an echo?
4. What will be the frequency sound having 0.20 m as its wavelength, when it travels with a speed of 331 m s^{-1}?
5. Name three animals, which can hear ultrasonic vibrations.
6. Differentiate sound and light waves.
7. What is Doppler Effect?
8. What is meant by rarer and denser medium.
9. Sound waves travel faster in warm air than in cool air. Explain.
10. Why does sound travels faster in solids than in gases?
11. Why does sound travel faster on a rainy day than on a dry day?
12. Why does an empty vessel produce more sound than a filled one?
13. Air temperature in the Rajasthan desert can reach 46°C. What is the velocity of sound in air at that temperature? (V_0 = 331 m s^{-1}).
14. Explain why, the ceilings of concert halls are curved.
15. Mention two cases in which there is no Doppler effect in sound?
16. Suppose that a sound wave and a light wave have the same frequency, then which one has a longer wavelength?
    a) Sound b) Light
    c) both a and b d) data not sufficient
17. When sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound remain the same. Do you hear an echo sound on a hotter day? Justify your answer.

6. NUCLEAR PHYSICS

I State whether the following statements are true or false: If false, correct the statement

1. Plutonium -239 is a fissionable material.
2. Elements having atomic number greater than 83 can undergo nuclear fusion.
3. Nuclear fusion is more dangerous than nuclear fission.
4. Natural uranium U-238 is the core fuel used in a nuclear reactor.
5. If a moderator is not present, then a nuclear reactor will behave as an atom bomb.
6. During one nuclear fission on an average, 2 to 3 neutrons are produced.
7. Einstein's theory of mass energy equivalence is used in nuclear fission and fusion.

II. Match the following

i)

a)	BARC	-	Mumbai
b)	India's first atomic power station	-	Tarapur
c)	IGCAR	-	Kalpakkam
d)	First nuclear reactor in India	-	Apsara

ii)

a)	Fuel	-	uranium
b)	Moderator	-	cadmium rods
c)	Coolant	-	heavy water
d)	Shield	-	lead

iii)

a)	Soddy Fajan	-	Displacement law
b)	Irene Curie	-	Artificial Radioactivity
c)	Henry Bequerel	-	Natural radioactivity
d)	Albert Einstein	-	Mass energy equivalence

iv)

a)	Uncontrolled fission reaction	-	Atom bomb
b)	Fertile material	-	Breeder reactor reaction
c)	Controlled fission	-	Nuclear Reactor
d)	Fusion reaction	-	Hydrogen Bomb

v)

a)	Co - 60	-	Leukemia
b)	I - 131	-	Thyroid disease
c)	Na - 24	-	Function of Heart
d)	C - 14	-	Age of fossil

III. Use the analogy to fill in the blank

1. Spontaneous process: Natural Radioactivity, Induced process : **Artificial Radioactivity.**
2. Nuclear Fusion: Extreme temperature, Nuclear Fission : **Room temperature**
3. Increasing crops: Radio phosphorous, Effective functioning of heart : **Radio sodium.**
4. Deflected by electric field : α ray, Null Deflection **(Gamma ray)**

IV. Arrange the following in the correct sequence:

1. Arrange in descending order, on the basis of their penetration power

Alpha rays, beta rays, gamma rays, cosmicrays

Ans: Gamma rays, beta rays, alpha rays, cosmicrays

2. **Arrange the following in the chronological order of discovery**
Nuclear reactor, radioactivity, artificial radioactivity, discovery of radium.

Ans: Radioativity, discovery of radium, artificial radioactivity, nuclear reactor.

V. Answer the following:

1. Who discovered natural radioactivity?
2. Which radioactive material is present in the ore of pitchblende?
3. Write any two elements which are used for inducing radioactivity?
4. Write the name of the electromagnetic radiation which is emitted during a natural radioactivity.
5. If A is a radioactive element which emits an α - particle and produces $_{104}\mathrm{Rf}^{259}$. Write the atomic number and mass number of the element A.
6. What is the average energy released from a single fission process?
7. Which hazardous radiation is the cause for the genetic disease?
8. What is the amount of radiation that may cause death of a person when exposed to it?
9. When and where was the first nuclear reactor built?
10. Give the SI unit of radioactivity.
11. Which material protects us from radiation?
12. Write any three features of natural and artificial radioactivity.
13. Define critical mass.
14. Define one roentgen.
15. State Soddy and Fajan's displacement law.
16. Give the function of control rods in a nuclear reactor.
17. In Japan, some of the new born children are having congenital diseases. Why?
18. What is meant by Natural Radioactivity?
19. Whay is alpha decay?
20. What is Beta decay?
21. What is mass defect?
22. What is subcritical and supercritical mass?
23. What is the principle used in atom bombs and hydrogen bombs?
24. What is radio carbon dating.
25. Give the conditions necessary for Nuclear fusion.
26. X-rays should not be taken often. Give reasons.
27. Cell phone towers should be placed far away from the residential area. Why?
28. 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?
29. What is stellar energy?
30. Give any two uses of radio isotopes in the field of agriculture?
31. Mass number of a radioactive element is 232 and its atomic number is 90. When this element undergoes certain nuclear reactions, it transforms into an isotope of lead with a mass number 208 and an atomic number 82. Determine the number of alpha and beta decay that can occur.

7. ATOMS AND MOLECULES

I. True or False: (If false give the correct statement)

1. Two elements sometimes can form more than one compound.
2. Noble gases are Diatomic
3. The gram atomic mass of an element has no unit
4. 1 mole of Gold and Silver contain same number of atoms
5. Molar mass of CO_2 is 42g.

II. Match the following:

a)

1.	8 g of O_2	-	0.25 moles
2.	4 g of H_2	-	2 moles
3.	52 g of He	-	13 moles
4.	112 g of N_2	-	4 moles
5.	35.5 g of Cl_2	-	0.5 moles

b) Relative atomic mass of elements (C-12 Scale)

Element	Symbol	A_r
Hydrogen	**H**	**1**
Carbon	**C**	**12**
Nitrogen	**N**	**14**
Oxygen	**O**	**16**
Sodium	**Na**	**23**
Magnesium	**Mg**	**24**
Sulphur	**S**	**32**

III. Answer the following:

1. Define: Relative atomic mass.
2. Write the different types of isotopes of oxygen and its percentage abundance.
3. Define: Atomicity
4. Give any two examples for heterodiatomic molecules.
5. What is Molar volume of a gas?
6. Find the percentage of nitrogen in ammonia.
7. Define one mole.
8. Define Average Atomic Mass (AAM).
9. Define Atomic Mass Unit.
10. Give examples for (a) homo diatomic molecule. (b) homo triatomic molecule.
11. What is a poly atomic molecule?
12. State Avogadro's Law.
13. $_{17}Cl^{35}$ and $_{17}Cl^{37}$ are isotopes. Give reasons.
14. Find the Gram Molecular Mass of CO_2.

8. PERIODIC CLASSIFICATION OF ELEMENTS

I. True or False: (If false give the correct statement)

1. Moseley's periodic table is based on atomic mass.
2. Ionic radius increases across the period from left to right.
3. All ores are minerals; but all minerals cannot be called as ores;
4. Al wires are used as electric cables due to their silvery white colour.
5. An alloy is a heterogenous mixture of metals.

II. Match the following:

1.	Galvanisation	:	Coating with Zn
2.	Calcination	:	Heating in the absence of air
3.	Redox reaction	:	Alumino thermic process
4.	Dental filling	:	Silver-tin amalgam
5.	Group 18 elements	:	Noble gas elements

III. Answer the following:

1. A is a reddish brown metal, which combines with O_2 at < 1370 K gives B, a black coloured compound. At a temperature > 1370 K, A gives C which is red in colour. Find A,B and C with reaction.
2. A is a silvery white metal. A combines with O_2 to form B at 800^oC, the alloy of A is used in making the aircraft. Find A and B
3. What is rust? Give the equation for formation of rust.
4. State two conditions necessary for rusting of iron.
5. Name the acid that renders aluminium passive. Why?
6. State "Modern Periodic Law"
7. What is the significance of the Modern Periodic Table.
8. Name the periodic properties and why are they called so?
9. The value of the distance between the two hydrogen nuclei of the hydrogen molecule is 0.74A^0. Find its covalent radius.
10. Atomic radii decreases as we move from left to right of the periodic table. Justify your answer.
11. Define Ionic Radii.
12. What is Electron affinity.
13. What is Electronegativity.
14. Ionisation energy increases along a period in the periodic table. Give reasons.
15. "Noble gases have Zero electron affinity" Say true or false. Justify your answer.
16. What is flux? Give example.
17. Aluminium alloys are used in making air craft parts. Give reasons.
18. All ores are minerals but all minerals are not ores. Why?
19. What is Alumino thermic process?
20. What are amalgams? How are they formed?
21. Give the uses of Aluminium.
22. What are ores?

9. SOLUTIONS

I. True or False: (If false give the correct statement)

1. Solutions which contain three components are called binary solution.
2. In a solution the component which is present in lesser amount is called solvent.
3. Sodium chloride dissolved in water forms a non-aqueous solution.
4. The molecular formula of green vitriol is $MgSO_4.7H_2O$.
5. When Silica gel is kept open, it absorbs moisture from the air, because it is hygroscopic in nature.

II. Match the following:

1.	Blue vitriol	– $CuSO_4.5H_2O$
2.	Gypsum	– $CaSO_4 .2H_2O$
3.	Deliquescence	– NaOH
4.	Hygroscopic	– CaO

III. Answer the following:

1. Define the term: Solution
2. What is mean by binary solution
3. Give an example for each i) gas in liquid ii) solid in liquid iii) solid in solid iv) gas in gas
4. What is aqueous and non-aqueous solution? Give an example.
5. Define Volume percentage
6. The aquatic animals live more in cold region Why?
7. Define Hydrated salt.
8. A hot saturated solution of copper sulphate forms crystals as it cools. Why?

9. Classify the following substances into deliquescent, hygroscopic.
(Conc. Sulphuric acid, Copper sulphate penta hydrate, Silica gel, Calcium chloride, and Gypsum salt.)
10. Vinu dissolves 50 g of sugar in 250 ml of hot water, Sarath dissolves 50 g of same sugar in 250 ml of cold water. Who will get faster dissolution of sugar? and Why?
11. Will the cool drinks give more fizz at top of the hills or at the foot? Explain
12. Define solute and solvent.
13. Find the concentration of the solution in terms of mass percent if 20g of sugar is dissolved in 40g of water.
14. What is water of crystalization?
15. You are given two samples of solution of NaCl. Can you identify which one is saturated. How?
16. What are hygroscopic substance? Give examples.
17. Give the IUPAC name and Molecular formula of the following. (a) Blue vitriol (b) Epsom salt.
18. Give the condition for maximum deliquescence.
19. Butter is an example for one type of colloidal solution. Name it and give reason.

10. TYPES OF CHEMICAL REACTIONS

I. True or False: (If false give the correct statement)

1. Silver metal can displace hydrogen gas from nitric acid.
2. The p^H of rain water containing dissolved gases like SO_3, CO_2, NO_2 will be less than 7.
3. At the equilibrium of a reversible reaction, the concentration of the reactants and the products will be equal.
4. Periodical removal of one of the products of a reversible reaction increases the yield.
5. On dipping a pH paper in a solution, it turns into yellow. Then the solution is basic.

II. Match the following:

	REACTION		**TYPE**
1.	$NH_4OH(aq) + CH_3COOH(aq) \rightarrow CH_3COONH_4(aq) + H_2O(l)$	:	Neutralisation
2.	$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$	:	Single Displacement
3.	$ZnCO_3(s) + Heat \rightarrow ZnO(s) + CO_2(g)$	:	Thermal decomposition
4.	$C_2H_4(g) + 4O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g) + Heat$	:	Combustion

III. Answer the following:

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?
3. Define combination reaction. Give one example for an exothermic combination reaction.
4. Differentiate reversible and irreversible reactions
5. Define p^H.
6. What is Universal Indicator?
7. Why do bubbles occur when hydrogen peroxide is poured on a wound?
8. Powered calcium carbonate reacts more readily with hydrochloric acid than marble chips. Give reasons.
9. Explain combustion of LPG.

10. Why is reaction rate important?
11. Differentiate combination and Decomposition reaction.
12. How does neutralization prevent tooth decay?
13. What happens when an iron nail is dipped in copper sulphate solution?
14. Why does aerated soft drink rush out of the pop bottle when the bottle is opened?
15. Can a nickel spatula be used to stir copper sulphate solution? Justify your answer.

11. CARBON AND ITS COMPOUNDS

I. Match the following:

a)

1.	Functional group –OH	-	Alcohol
2.	Heterocyclic	-	Furan
3.	Unsaturated	-	Ethene
4.	Soap	-	Potassium stearate
5.	Carbocyclic	-	Benzene

b)

1.	R-COOH	-	Carboxylic acid
2.	R-CO-R	-	ketone
3.	R-O-R	-	ether
4.	R-CHO	-	aldehyde

c)

1.	Soap	-	fatty acids
2.	Vinegar	-	acetic acid
3.	Detergent	-	sulphonic acid
4.	Polythene	-	alkene

II. Answer the following:

1. Name the simplest ketone and give its structural formula.
2. Classify the following compounds based on the pattern of carbon chain and give their structural formula: (i) Propane (ii) Benzene (iii) Cyclobutane (iv) Furan
3. How is ethanoic acid prepared from ethanol? Give the chemical equation.
4. How do detergents cause water pollution? Suggest remedial measures to prevent this pollution?
5. Differentiate soaps and detergents.
6. What is molasses?
7. How is nitrogen content of molasses fortified?
8. Give the reaction for identification of alcohols.
9. What happens when ethanol is passed over Cu at 573K?
10. Give the molecular formula and structural formula of acetic acid?
11. Give the reaction for Decarboxylation.
12. What is glacial acetic acid?
13. Give two uses of Ethanol.
14. What is Fermentation?
15. What is meant by hard water?
16. Why ordinary soap does not lather in hard water?
17. What is TFM?
18. What are biodegradable and Non-biodegradable detergents?
19. The molecular formula of an alcohol is $C_4H_{10}O$. 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?

20. An organic compound 'A' is widely used as a preservative and has the molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B'.

    (i) Identify the compound 'A'.
    (ii) Write the chemical equation for its reaction with ethanol to form compound 'B'.
    (iii) Name the process.

12. PLANT ANATOMY AND PLANT PHYSIOLOGY

I. State whether the statements are true or false. Correct the false statement.

1. Phloem tissue is involved in the transport of water in plant.
2. The waxy protective covering of a plant is called as cuticle.
3. In monocot stem cambium is present in between xylem and phloem.
4. Palisade parenchyma cells occur below upper epidermis in dicot root.
5. Mesophyll contains chlorophyll.
6. Anaerobic respiration produces more ATP than aerobic respiration.

II. Match the following:

1. Amphicribal - Fern
2. Cambium - Secondary growth
3. Amphivasal - Dracaena
4. Xylem - Conduction of water
5. Phloem - Translocation of food

III. Answer the following:

1. What is collateral vascular bundle?
2. Where does the carbon that is used in photosynthesis come from?
3. What is the common step in aerobic and anaerobic pathway?
4. Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.
5. Give an account on vascular bundle of dicot stem.
6. Write a short note on mesophyll.
7. Draw and label the structure of oxysomes.
8. Name the three basic tissues system in flowering plants.
9. What is photosynthesis and where in a cell does it occur?
10. What is respiratory quotient?
11. Why should the light dependent reaction occur before the light independent reaction?
12. Write the reaction for photosynthesis?
13. Where do the light dependent reaction and the Calvin cycle occur in the chloroplast?
14. What are oxysomes?
15. What are Bulliform cells?
16. What is protoxylem lacuna?
17. What is endarch xylem.
18. What is exarch xylem.
19. What are grana?
20. What are casparian strips?
21. Name the internal factors affecting photosynthesis?
22. What is reaction centre in photosynthesis?
23. What is anaerobic respiration?
24. What is electron transport chain?
25. Can human beings survive with anaerobic respiration? Explain.

13. STRUCTURAL ORGANISATION OF ANIMALS

I. Identify whether the statements are True or False. Correct the false statement

1. An anticoagulant present in saliva of leech is called heparin.
2. The vasa deferens serves to transport the ovum.
3. The rabbit has a third eyelid called tympanic membrane which is movable.
4. Diastema is a gap between premolar and molar teeth in rabbit.
5. The cerebral hemispheres of rabbit are connected by band of nerve tissue called corpora quadrigemina.

II. Match the following:

	Organs	Membranous Covering	Location
1.	Brain	- meninges	- cranial cavity
2.	Kidney	- capsule	- abdominal cavity
3.	Heart	- pericardium	- mediastinum
4.	Lungs	- pleura	- enclosed in thoracic cavity

III. Answer the following:

1. Give the common name of the *Hirudinaria granulosa*.
2. How does leech respire?
3. Write the dental formula of rabbit.
4. How many pairs of testes are present in leech?
5. How is diastema formed in rabbit?
6. What organs are attached to the two bronchi?
7. Which organ acts as suction pump in leech?
8. What does CNS stand for?
9. Why is the teeth of rabbit called heterodont?
10. How does leech suck blood from the host?
11. Why are the rings of cartilages found in trachea of rabbit?
12. List out the parasitic adaptations in leech.
13. Shylesh has some pet animals at his home. He has few rabbits too, one day while feeding them he observed something different with the teeth. He asked his grandfather, why is it so? What would have been the explanation of his grandfather?
14. What are vibrissae?
15. Do leeches have eyes and ears?
16. Explain how respiration takes place in Leech?
17. Mentions the divisions of body of Leech?
18. Name the accessory glands, which involve in the male reproductive system of Rabbit?
19. What are Receptors in Leech?
20. Leeches do not have an elaborate secretion of digestive juices and enzymes – Why?

14. TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

I. State whether True or False. If false write the correct statement

1. The phloem is responsible for the translocation of food.
2. Plants lose water by the process of transpiration.
3. The form of sugar transported through the phloem is glucose.
4. In apoplastic movement the water travels through the cell membrane and enter the cell.
5. When guard cells lose water the stoma opens.
6. Initiation and stimulation of heart beat take place by nerves.
7. All veins carry deoxygenated blood.
8. WBC defend the body from bacterial and viral infections.
9. The closure of the mitral and tricuspid valves at the start of the ventricular systole produces the first sound 'LUBB'.

II. Match the following

Section I

1. Symplastic pathway - Plasmodesmata
2. Transpiration - Leaf
3. Osmosis - Pressure gradient
4. Root Pressure - Pressure in xylem

Section II

1. Leukemia - Blood Cancer
2. Platelets - Thrombocytes
3. Monocytes - Phagocyte
4. Leucopenia - Decrease in leucocytes
5. AB blood group - Absence of antibody
6. O blood group - Absence of antigen
7. Eosinophil - Allergic condition
8. Neutrophils - Inflammation

III. Answer the following:

1. Name two layered protective covering of human heart.
2. What is the shape of RBC in human blood?
3. Why is the colour of the blood red?
4. Which kind of cells are found in the lymph?
5. Name the heart valve associated with the major arteries leaving the ventricles.
6. Mention the artery which supplies blood to the heart muscle.
7. What causes the opening and closing of guard cells of stomata during transpiration?
8. What is cohesion?
9. Trace the pathway followed by water molecules from the time it enters a plant root to the time it escapes into the atmosphere from a leaf.
10. What would happen to the leaves of a plant that transpires more water than its absorption in the roots?
11. Describe the structure and working of the human heart.
12. Why is the circulation in man referred to as double circulation?
13. What are heart sounds? How are they produced?
14. What is the importance of valves in the heart?
15. Who discovered Rh factor? Why was it named so?
16. How are arteries and veins structurally different from one another?
17. Why is the Sinoatrial node called the pacemaker of heart?
18. Differentiate between systemic circulation and pulmonary circulation.
19. The complete events of cardiac cycle last for 0.8 sec. What is the timing for each event?
20. Distinguish neurogenic and myogenic heart beat?
21. Define osmosis.
22. Why persons with blood group “O” called as universal donor? Explain.
23. What is single circulation?
24. What is cardiac cycle?
25. What is transpiration pull?
26. What are Rh antibodies?
27. What are Lymph Nodes?
28. Why does mammalian RBC lack cell organelles & nucleus?
29. What are the factors which affect transpiration?
30. When any dry plant material is kept in water, they swell up. Name and define the phenomenon involved in this change.
31. Why are the walls of the left ventricle thicker than the other chambers of the heart?
32. Doctors use stethoscope to hear the sound of the heart. Why?
33. How does the pulmonary artery and pulmonary vein differ in their function when compared to a normal artery and vein?
34. Transpiration is a necessary evil in plants. Explain.

IV. Give reasons for the following statements

1. Minerals cannot be passively absorbed by the roots.
2. Guard cells are responsible for opening and closing of stomata.
3. The movement of substances in the phloem can be in any direction.
4. Minerals in the plants are not lost when the leaf falls.
5. The walls of the right ventricle are thicker than the right auricles.
6. Mature RBC in mammals do not have cell organelles.

15. NERVOUS SYSTEM

I. State whether true or false, if false write the correct statement:

1. Dendrons are the longest fibres that conducts impulses away from the cell body.
2. Sympathetic nervous system is a part of central nervous system.
3. Hypothalamus is the thermoregulatory centre of human body.
4. Cerebrum controls the voluntary actions of our body.
5. In the central nervous system myelinated fibres form the white matter.
6. All the nerves in the body are covered and protected by meninges.
7. Cerebrospinal fluid provides nutrition to brain.
8. Reflex arc allows the rapid response of the body to a stimulus.
9. Pons helps in regulating respiration.

II. Match the following:

A)	Nissil's granules	-	Cyton
B)	Hypothalamus	-	Forebrain
C)	Cerebellum	-	Hindbrain
D)	Schwann cell	-	Peripheral Nervous system

III. Answer the following:

1. Define stimulus.
2. Name the parts of the hind brain.
3. What are the structures involved in the protection of brain?
4. Give an example for conditioned reflexes.
5. Which acts as a link between the nervous system and endocrine system?
6. Define reflex arc.
7. What is meningitis?
8. What are neurotransmitters?
9. Name the second largest part of the brain and its functions?
10. Classify the types of nerve fibres?
11. Why is Autonomous Nervous system called as Visceral Nervous system?
12. What is Electro encephalogram?
13. 'A' is a cylindrical structure that begins from the lower end of medulla and extend downwards. It is enclosed in bony cage 'B' and covered by membranes 'C'. As many as 'D' pairs of nerves arise from the structure 'A'.
    (i) What is A?
    (ii) Name (a) bony cage 'B' and (b) membranes 'C'
    (iii) How much is D?
14. Our body contains a large number of cells 'L' which are the longest cells in the body. L has long and short branch called as 'M' and 'N' respectively. There is a gap 'O' between two 'L' cells, through which nerve impulse transfer by release of chemical substance 'P'.
    (i) Name the cells L
    (ii) What are M and N?
    (iii) What is the gap O?
    (iv) Name the chemical substance P

16. PLANT AND ANIMAL HORMONES

I. State whether True or false, If false write the correct statement

1. A plant hormone concerned with stimulation of cell division and promotion of nutrient mobilization is cytokinin.
2. Gibberellins cause parthenocarpy in tomato.
3. Ethylene retards senescence of leaves, flowers and fruits.
4. Exopthalmic goiter is due to the over secretion of thyroxine.
5. Pituitary gland is divided into four lobes.
6. Estrogen is secreted by corpus luteum.

II. Match the following:

a) Hormones Disorders

1)	Thyroxine	- Simple goitre
2)	Insulin	- Diabetes mellitus
3)	Parathormone	- Tetany
4)	Growth hormone	- Acromegaly
5)	ADH	- Diabetes insipidus

b) Match Column I with Columns II and III

Column I	Column II	Column III
Auxin	Coleoptile tip	Apical dominance
Ethylene	Fruits	Ripening
Abscisic acid	Chloroplast	Abscission
Cytokinin	Coconut milk	Cell division
Gibberellins	*Gibberella fujikuroi*	Internodal elongation

III. Answer the following:

1. Which hormone promotes the production of male flowers in Cucurbits?
2. Write the name of a synthetic auxin.
3. Which hormone induces parthenocarpy in tomatoes?
4. What is the hormone responsible for the secretion of milk in female after child birth?
5. Name the hormones which regulates water and mineral metabolism in man.
6. Which hormone is secreted during emergency situation in man?
7. Which gland secretes digestive enzymes and hormones?
8. Name the endocrine glands associated with kidneys.
9. What are synthetic auxins? Give examples.
10. What is bolting? How can it be induced artificially?
11. Bring out any two physiological activities of abscisic acid
12. What will you do to prevent leaf fall and fruit drop in plants? Support your answer with reason.
13. What are chemical messengers?
14. Write the differences between endocrine and exocrine gland.
15. What is the role of parathormone?
16. What are the hormones secreted by posterior lobe of the pituitary gland? Mention the tissues on which they exert their effect.
17. Why are thyroid hormones refered as personality hormone?
18. Which hormone requires iodine for its formation? What will happen if intake of iodine in our diet is low?

19. What would be expected to happen if

    a. Gibberellin is applied to rice seedlings.
    b. A rotten fruit gets mixed with unripe fruits.
    c. When cytokinin is not added to culture medium

20. A plant hormone was first discovered in Japan when rice plants were suffering from Bakanae disease caused by *Gibberella fujikoroi*. Based on this information answer the following questions:
    a. Identify the hormone involved in this process.
    b. Which property of this hormone causes the disease?
    c. Give two functions of this hormone.

21. Senthil has high blood pressure, protruded eyeball and an increased body temperature. Name the endocrine gland involved and hormone secretion responsible for this condition.
22. Sanjay is sitting in the exam hall. Before the start of the exam , he sweats a lot, with increased rate of heart beat. Why does this condition occur?
23. Where are Auxins produced?
24. Name some synthetic auxins?
25. Why is melatonin known as time messenger?
26. What are the secretions of alpha and beta cells of Islets of langerhans?
27. Which is life saving hormone? Give reasons.
28. Name the types of plant Hormones?
29. What are ductless glands? Why they are called so?
30. Write any three physiological effect of gibberellins?

17. REPRODUCTION IN PLANTS AND ANIMALS

I. State whether the following statements are True or False. Correct the false statement

1. Stalk of the ovule is called pedicle.
2. Seeds are the product of asexual reproduction.
3. Yeast reproduces asexually by means of multiple fission.
4. The part of the pistil which serves as a receptive structure for the pollen is called as style.
5. Insect pollinated flowers are characterized by dry and smooth pollen.
6. Sex organs produce gametes which are diploid.
7. LH is secreted by the posterior pituitary.
8. Menstrual cycle ceases during pregnancy.
9. Surgical methods of contraception prevent gamete formation.
10. The increased level of estrogen and progesterone is responsible for menstruation.

II. Match the following:

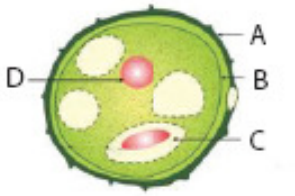
a)
1.	Fission	-	Amoeba
2.	Budding	-	Yeast
3.	Fragmentation	-	Spirogyra

b)
a)	Parturition	-	Delivery of baby from uterus
b)	Gestation	-	Duration between pregnancy and birth
c)	Ovulation	-	Release of egg from Graafian follicle
d)	Implantation	-	Attachment of zygote to endometrium

III. Answer the following:

1. If one pollen grain produces two male gametes, how many pollen grains are needed to fertilize 10 ovules?
2. In which part of the flower germination of pollen grains takes place?
3. Name two organisms which reproduces through budding.
4. Mention the function of endosperm.
5. Name the hormone responsible for the vigorous contractions of the uterine muscles.
6. What is the enzyme present in acrosome of sperm?

7. When is World Menstrual Hygiene Day observed?
8. What is the need for contraception ?
9. Name the part of the human female reproductive system where the following occurs.
    a. Fertilization b. Implantation
10. What will happen if you cut planaria into small fragments?
11. Why is vegetative propagation practiced for growing some type of plants?
12. How does binary fission differ from multiple fission?
13. Define triple fusion.
14. Write the characteristics of insect pollinated flowers.
15. Name the secondary sex organs in male
16. What is colostrum? How is milk production hormonally regulated ?
17. How can menstrual hygiene be maintained during menstrual days?
18. How does developing embryo gets its nourishment inside the mother's body?
19. Identify the parts A, B, C and D



20. Write the events involved in the sexual reproduction of a flowering plant.
    a. Discuss the first event and write the types.
    b. Mention the advantages and the disadvantages of that event.
21. Why are the human testes located outside the abdominal cavity? Name the pouch in which they are present .
22. Luteal phase of the menstrual cycle is also called the secretory phase. Give reason.
23. Why are family planning methods not adopted by all the people of our country?
24. What are antipodals?
25. What is Gestation period?
26. What is parturitions?
27. What is the significance of colostrums?
28. What are sertoli cells?
29. Name some common contraceptive methods?
30. Why calyx called as non-essential whorl of a flower?
31. List the post fertilization changes in a flower?
32. Mention any two way of maintaining menstrual hygiene?
33. What is the significance of fertilization?
34. How are identical twins formed in Human being?
35. What is gametogenesis?
36. What is gastrulation?
37. What is implantation?
38. Name the whorls of a flower?

18. HEREDITY

I. Identify whether the statement areTrue or False. Correct the false statement

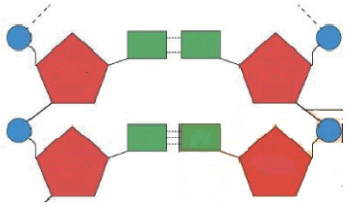
1. A typical Mendelian dihybrid ratio of F2 generation is 3:1.
2. A recessive factor is altered by the presence of a dominant factor.
3. Each gamete has only one allele of a gene.
4. Hybrid is an offspring from a cross between genetically different parent.
5. Some of the chromosomes have anelongated knob-like appendages known astelomere.
6. New nucleotides are added and new complementary strand of DNA is formed with the help of enzyme DNA polymerase.
7. Down’s syndrome is the genetic condition with 45 chromosomes.

II. Match the following

1.	Autosomes	-	22 pair of chromosome
2.	Diploid condition	-	2n
3.	Allosome	-	23rd pair of chromosome
4.	Down's syndrome	-	Trisomy 21
5.	Dihybrid ratio	-	9:3:3:1

III. Answer the following:

1. What is a cross in which inheritance of two pairs of contrasting characters are studied?
2. Name the conditions when both the alleles are identical?
3. A garden pea plant produces axial white flowers. Another of the same species produced terminal violet flowers. Identify the dominant trait?
4. What is the name given to the segments of DNA, which are responsible for the inheritance of a particular character?
5. Name the bond which binds the nucleotides in a DNA.
6. Why did Mendel select pea plant for his experiments?
7. What do you understand by the term phenotype and genotype?
8. What are allosomes?
9. What are Okazaki fragments?
10. Why is euploidy considered to be advantageous to both plants and animals?
11. A pure tall plant (TT) is crossed with pure dwarf plant (tt), what would be the F1 and F2 generations? Explain.
12. Explain the structure of a chromosome.
13. Label the parts of the DNA in the diagram given below. Explain the structure briefly.



14. What is replication of DNA?
15. What is RNA primer?
16. What is a karyotype?
17. Define Heredity and Variation?
18. Mention the types of gene (or) point mutation?
19. Flowers of the garden pea are bisexual and self-pollinated. Therefore, it is difficult to perform hybridization experiment by crossing a particular pistil with the specific pollen grains. How Mendel made it possible in his monohybrid and dihybrid crosses?
20. Pure-bred tall pea plants are first crossed with pure-bred dwarf pea plants. The pea plants obtained in F1 generation are then cross-bred to produce F2 generation of pea plants.
    a. What do the plants of F1 generation look like?
    b. What is the ratio of tall plants to dwarf plants in F2 generation?
    c. Which type of plants were missing in F1 generation but reappeared in F2 generation?
21. Kavitha gave birth to a female baby. Her family members say that she can give birth to only female babies because of her family history. Is the statement given by her family members true. Justify your answer.
22. Under which conditions does the law of independent assortment hold good and why?

19. ORIGIN AND EVOLUTION OF LIFE

I State true or false. Correct the false statements

1. The use and disuse theory of organs' was postulated by Charles Darwin.
2. The homologous organs look similar and perform similar functions but they have different origin and developmental pattern.
3. Birds have evolved from reptiles.

II Match the following

Column A Column B

a)	Atavism	--	rudimentary tail and thick hair on the body
b)	Vestigial organs	--	caudal vertebrae and vermiform appendix
c)	Analogous organs	--	a wing of a bat and a wing of an insect
d)	Homologous organs	--	a forelimb of a cat and bat's wing
e)	Wood park	--	Thiruvakkarai
f)	W.F. Libby	--	radiocarbon dating

III. Answer the following:

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?
2. Which organism is considered to be the fossil bird?
3. What is the study of fossils called?
4. The degenerated wing of a kiwi is an acquired character. Why is it an acquired character?
5. Why is Archaeopteryx considered to be a connecting link?
6. Define Ethnobotany and write its importance.
7. How can you determine the age of the fossils?
8. Explain the Theory of special Creation.
9. Explain Biogenesis.
10. Explain Atavism?
11. State the Biogenetic law / recapitulation theory.
12. What is Paleobotany?
13. What is Astrobiology / Exobiology?
14. What are extremophiles?
15. Define a fossil.
16. Arun was playing in the garden. Suddenly he saw a dragon fly sitting on a plant. He observed the wings of it. He thought it looked similar to a wing of a crow. Is he correct? Give reason for your answer.
17. Imprints of fossils tell us about evolution-How?
18. Octopus, cockroach and frog all have eyes. Can we group these animals together to establish a common evolutionary origin. Justify your answer.

20. BREEDING AND BIOTECHNOLOGY

I State whether true or false. If false, write the correct statement

1. *Raphano brassica* is a man-made tetraploid produced by colchicine treatment.
2. The process of producing an organism with more than two sets of chromosome is called mutation.
3. A group of plants produced from a single plant through vegetative or a sexual reproduction are called a pureline.
4. Iron fortified rice variety determines the protein quality of the cultivated plant
5. Golden rice is a hybrid.
6. Bt gene from bacteria can kill insects.
7. *In vitro fertilisation* means the fertilisation done inside the body.
8. DNA fingerprinting technique was developed by Alec Jeffrey.
9. Molecular scissors refers to DNA ligases.

II Match the following

Column A Column B

1.	Sonalika	-	Semi-dwarf wheat
2.	IR 8	-	Semi-dwarf Rice
3.	Saccharum	-	Sugarcane
4.	Mung No. 1	-	*Phaseolus mungo*
5.	TMV – 2	-	Ground nut
6.	Insulin	-	first hormone produced using rDNA technique
7.	Bt toxin	-	*Bacillus thuringienesis*
8.	Golden rice	-	Beta carotene

III Answer the following:

1. Give the name of wheat variety having higher dietary fibre and protein.
2. Semi-dwarf varieties were introduced in rice. This was made possible by the presence of dwarfing gene in rice. Name this dwarfing gene.
3. Define genetic engineering.
4. Name the types of stem cells.
5. What are transgenic organisms?
6. State the importance of biofertiliser.
7. Discuss the method of breeding for disease resistance.
8. Name three improved characteristics of wheat that helped India to achieve high productivity.
9. Name two maize hybrids rich in aminoacid lysine
10. Distinguish between
    a. somatic gene therapy and germ line gene therapy
    b. undifferentiated cells and differentiated cells
11. State the applications of DNA fingerprinting technique.
12. How are stem cells useful in regenerative process?
13. Differentiate between outbreeding and inbreeding.
14. What is Green Revolution?
15. Define mutation.
16. Mention two characteristics of stem cells.
17. What is inbreeding depression?
18. What is rDNA?
19. What are the applications of stem cell therapy?
20. A breeder wishes to incorporate desirable characters into the crop plants. Prepare a list of characters he will incorporate
21. Organic farming is better than Green Revolution. Give reasons
22. Polyploids are characterised by gigantism. Justify your answer.
23. 'P' is a gene required for the synthesis of vitamin A. It is integrated with genome of 'Q' to produce genetically modified plant 'R'.
    i) What is P, Q and R?
    ii. State the importance of 'R' in India.

21. HEALTH AND DISEASES

I. State whether True or False, if false write the correct statement

1. AIDS is an epidemic disease.
2. Cancer causing genes are called Oncogenes.
3. Obesity is characterized by tumour formation.
4. In leukemia both WBCs and RBCs increase in number.
5. Study of cause of disease is called etiology.
6. AIDS is not transmitted by contact with a patient's clothes.
7. Type 2 diabetes mellitus results due to insulin deficiency.

8. Carcinogens are cancer causing agents.
9. Nicotine is a narcotic drug.
10. Cirrhosis is associated with brain disorder.

II. Match the following:

1. Sarcoma	-	Connective tissue cancer
2. Carcinoma	-	Stomach cancer
3. Polydipsia	-	Excessive thirst
4. Polyphagia	-	Excessive hunger
5. Myocardial Infarction	-	Lack of blood flow to heart muscle

III. Answer the following:

1. What are psychotropic drugs?
2. Mention the diseases caused by tobacco smoke.
3. What are the contributing factors for Obesity?
4. What is adult onset diabetes?
5. What is metastasis?
6. How does insulin deficiency occur?
7. What are the various routes by which transmission of human immuno deficiency virus takes place?
8. How is a cancer cell different from a normal cell?
9. Differentiate between Type-1 and Type-2 diabetes mellitus
10. Why is a dietary restriction recommended for an obese individual?
11. What precautions can be taken for preventing heart diseases?
12. Mention some behavioural changes seen in drug users.
13. Write the harmful effects of alcohol on health.
14. Write a note on symptoms of diabetes mellitus.
15. Explain the causes of cancer.
16. What is the role of Child Helpline?
17. Define drug addiction.
18. What is diabetes mellitus?
19. Define Cancer.
20. What is AIDS?
21. What is detoxification?
22. What is the role of fat in the cause of atherosclerosis?
23. Eating junk food and consuming soft drinks results in health problems like obesity, still children prefer. What are the suggestions you would give to avoid children eating junk food/ consumption of soft drinks?
24. Regular physical exercise is advisable for normal functioning of human body. What are the advantages of practising exercise in daily life?
25. A leading weekly magazine has recently published a survey analysis which says that number of AIDS patient in the country is increasing day by day. The report says that the awareness among the people about AIDS is still very poor. You are discussing the magazine report in your class and a team of your class decides to help people to fight against the dreadful disease.
    i. What problem you face when trying to educate the people in your village nearby your school?
    ii. How do you overcome the problem ?
26. Once a person starts taking drugs or alcohol it is difficult to get rid of the habit. Why ?
27. Men addicted to tobacco lead to oxygen deficiency in their body. What could be the possible reason?
28. Name any three foods that are to be avoided and included in the diet of a diabetic patient. Why should it be followed?
29. How can informational efforts change people's HIV knowledge and behaviour?

22. ENVIRONMENTAL MANAGEMENT

I. State whether True or False. Correct the statements which are false

1. Biogas is a fossil fuel.
2. Planting trees increases the ground water level.
3. Habitat destruction cause loss of wild life.
4. Nuclear energy is a renewable energy.
5. Overgrazing prevents soil erosion.
6. Poaching of wild animals is a legal act.
7. National park is a protected park.
8. Wild life protection act was established in 1972.

II. Match the following

1. Soil erosion	-	removal of vegetation
2. Bio gas	-	CO_2
3. Natural gas	-	non-renewable energy
4. Green house gas	-	acid rain
5. CFL bulbs	-	energy saving
6. Wind	-	renewable energy
7. Solid waste	-	lead and heavy metals

III. Answer the following:

1. What will happen if trees are cut down?
2. What would happen if the habitat of wild animals is disturbed?
3. What are the agents of soil erosion?
4. Why fossil fuels are to be conserved?
5. Solar energy is a renewable energy. How?
6. How are e-wastes generated?
7. What is the importance of rain water harvesting?
8. What are the advantages of using biogas?
9. What are the environmental effect caused by sewage?
10. What are the consequences of deforestation?
11. Define wild life.
12. Differentiate a National Park and Sanctuary
13. What is the aim of wild life conservation?
14. How are Eris (Lakes) constructed?
15. List the sources of e-wastes.
16. Differentiate Non-renewable and Renewable energy sources.
17. Define ‘shale’.
18. List some ill effects of e-wastes.
19. Although coal and petroleum are produced by degradation of biomass, yet we need to conserve them. Why?
20. What are the objectives for replacing non-conventional energy resources from conventional energy resources?
21. Why is the Government imposing ban on the use of polythene bags and plastics? Suggest alternatives. How is this ban likely to improve the environment?
22. Why is it not possible to use solar cells to meet our energy needs? State three reason to support to your answer.
23. How would you dispose the following wastes?
    a. Domestic wastes like vegetable peels
    b. Industrial wastes like metallic cans
    c. Can the disposal protect the environment? How?
24. List any three activities based on 3R approach to conserve natural resources.

4 & 7 MARKS

1. LAWS OF MOTION

Answer in detail:

1. A heavy truck and bike are moving with the same kinetic energy. If the mass of the truck is four times that of the bike, then calculate the ratio of their momenta. (Ratio of momenta = 1:2
2. "Wearing helmet and fastening the seat belt is highly recommended for safe journey" Justify your answer using Newton's laws of motion.
3. What are the types of inertia? Give an example for each type.
4. State Newton's laws of motion?
5. Deduce the equation of a force using Newton's second law of motion.
6. State and prove the law of conservation of linear momentum.
7. Describe rocket propulsion.
8. State the universal law of gravitation and derive its mathematical expression
9. Give the applications of universal law gravitation.
10. Explain the different types of forces.
11. Derive the relation between g and G.

Formulae:

1. Torque, $\tau = \mathrm{F} \times \mathrm{d}$ (force x perpendicular distance)
2. Principle of moments = $F_1 \times d_1 = F_2 \times d_2$
3. Force, F = ma (mass x acceleration)
4. Impulse $\mathrm{J} = \mathrm{F} \times \mathrm{t}$ (Force x time)
5. Law of conservation of momentum = $m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2$
6. Newton's law of gravitation, $F = \frac{GMm}{R^2}\left(G = 6.674\times10^{-11} Nm^2kg^{-2}\right)$
7. Acceleration due to gravity, $g = \frac{GM}{R^2}$
8. Weight, W = mg

Solved Problems: (Book)

1. Calculate the velocity of a moving body of mass $5\ \mathrm{kg}$ whose linear momentum is $2.5kg\ ms^{-1}$.

   Solution: Linear momentum = mass × velocity
   Velocity = linear momentum / mass.
   $V = 2.5 / 5 = 0.5 ms^{-1}$.

2. A door is pushed, at a point whose distance from the hinges is 90 cm, with a force of 40 N. Calculate the moment of the force about the hinges.

   Solution:
   Formula: The moment of a force $\mathrm{M} = \mathrm{F} \times \mathrm{d}$

   Given: $\mathrm{F} = 40\ \mathrm{N}$ and $\mathrm{d} = 90\ \mathrm{cm} = 0.9\ \mathrm{m}$.
   Hence, moment of the force $= 40 \times 0.9 = 36\ \mathrm{N\ m}$.

3. At what height from the centre of the Earth the acceleration due to gravity will be ¼th of its value as at the Earth.

Solution:

Data: Height from the centre of the Earth, $R' = R + h$
The acceleration due to gravity at that height, $g' = g/4$

Formula: $g = GM/R^2$

$$\frac{g}{g'} = \left(\frac{R'}{R}\right)^2 = \left(\frac{R+h}{R}\right)^2 = \left(1+\frac{h}{R}\right)^2$$

$$4 = \left(1+\frac{h}{R}\right)^2,\ 2 = 1+\frac{h}{R} \text{ (or) } h=R.\ R'=2R$$

From the centre of the Earth, the object is placed at twice the radius of the earth.

Numerical problem (Unsolved problems):

1. Two bodies have a mass ratio of 3:4. The force applied on the bigger mass produces an acceleration of 12 ms^{-2}. What could be the acceleration of the other body if the same force acts on it?

Given:

$$Ratio\ of\ two\ masses = m_1 : m_2 = 3 : 4$$
$$a_2 = 12 ms^{-1}$$
$$F_1 = F_2$$
$$a_1 = ?$$

Solution:

$$F_1 = F_2$$
$$m_1 a_1 = m_2 a_2$$
$$3a_1 = 4 \times 12$$
$$a_1 = \frac{48}{3}$$
$$a_1 = 16 ms^{-2}$$

2. A ball of mass 1 kg moving with a speed of 10ms^{-1} rebounds after a perfect elastic collision with the floor. Calculate the change in linear momentum of the ball.

Given:

$$m = 1kg$$
$$u = 10 ms^{-1}$$
$$v = -10 ms^{-1}$$
$$\Delta p = ?$$

Solution:

$$\Delta p = mv - mu$$
$$= (1 \times -10) - (1 \times 10)$$
$$= -10 - 10$$
$$\Delta p = -20 kg\ ms^{-1}$$

3. A mechanic unscrew a nut by applying a force of 140N with a spanner of length 40cm. What should be the length of the spanner if a force of 40N is applied to unscrew the same nut?

Given:

$$F_1 = 140N$$
$$L_1 = 40cm$$
$$F_2 = 40N$$
$$L_2 = \ ?$$

Solution:

$$F_1 \times L_1 = F_2 \times L_2$$
$$140 \times 40 \times 10^{-2} = 40 \times L_2$$
$$L_2 = \frac{140 \times 40 \times 10^{-2}}{40}$$
$$L_2 = 140cm \ \ or \ 1.4m$$

4. The ratio of masses of two planets is 2:3 and the ratio of their radii is 4:7. Find the ratio of their acceleration due to gravity.

Given:

$$M_1 : M_2 = 2:3$$
$$R_1 : R_2 = 4:7$$
$$g_1 : g_2 = ?$$

Solution:

$$g = \frac{GM}{R^2}$$
$$\frac{g_1}{g_2} = \frac{GM_1}{R_1^{\ 2}} \times \frac{R_2^{\ 2}}{GM_2}$$
$$\frac{g_1}{g_2} = \frac{2 \times 7 \times 7}{4 \times 4 \times 3}$$
$$\frac{g_1}{g_2} = \frac{49}{24}$$
$$g_1 : g_2 = 49:24$$

2. OPTICS

Answer in detail

1. List any five properties of light
2. Explain the rules for obtaining images formed by a convex lens with the help of ray diagram.
3. Differentiate the eye defects: Myopia and Hypermetropia
4. Explain the construction and working of a 'Compound Microscope'.
5. State the two laws of refraction of light
6. List the Cartesian sign conventions in lenses
7. Explain the types of scattering
8. Give the applications of convex lens
9. Give the applications of concave lens
10. Give the advantages and disadvantages of telescope

Formulae:

1. $\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$
2. $\mu = \frac{speed\ of\ light\ in\ air\ or\ vacuum}{speed\ of\ light\ in\ median} = \frac{c_a}{c_m}$
3. $Amount\ of\ scattering, S \propto \frac{1}{\lambda^4}$
4. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
5. $m = \frac{height\ of\ image}{height\ of\ object} = \frac{h^1}{h}$
6. $m = \frac{image\ distance}{object\ distance} = \frac{v}{u}$
7. $P = \frac{1}{f}\ \ (D)$
8. $Focal\ length\ of\ concave\ lens\ for\ myopia\ f = \frac{xy}{x-y}$
9. $Focal\ length\ of\ convex\ lens\ for\ hypermetropia\ f = \frac{dD}{d-D}$

Solved Problems: (Book)

1. Light rays travel from vacuum into a glass whose refractive index is 1.5. If the angle of incidence is 30°, calculate the angle of refraction inside the glass.

Solution: *A*ccording to Snell's law,

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

$$\mu_1 \sin i = \mu_2 \sin r$$

Here $\mu_1 = 1.0,\ \mu_2 = 1.5,\ i = 30^\circ$

$$(1.0)\sin 30^\circ = 1.5 \sin r$$

$$1 \times \frac{1}{2} = 1.5 \sin r$$

$$\sin r = \frac{1}{2 \times 1.5} = \frac{1}{3} = (0.333)$$

$$r = \sin^{-1}(0.333)$$

$$r = 19.45^\circ$$

2. A beam of light passing through a diverging lens of focal length 0.3m appear to be focused at a distance 0.2m behind the lens. Find the position of the object.

Solution:

$$f = -0.3\ m,\ v = -0.2\ m$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\frac{1}{u} = \frac{1}{-0.2} - \frac{1}{-0.3} = \frac{-10}{6}$$

$$u = \frac{-6}{10} = -0.6\,\text{m}$$

3. A person with myopia can see objects placed at a distance of 4m. If he wants to see objects at a distance of 20m, what should be the focal length and power of the concave lens he must wear?

Solution: Given that $x = 4\,\text{m}$ and $y = 20\,\text{m}$.
Focal length of the correction lens is

$$f = \frac{xy}{x - y}$$

$$f = \frac{4 \times 20}{4 - 20} = \frac{80}{-16} = -5\,\text{m}$$

Power of the correction lens $= \frac{1}{f} = -\frac{1}{5} = -0.2\,\text{D}$

4. For a person with hypermetropia, the near point has moved to 1.5 m. Calculate the focal length of the correction lens in order to make his eyes normal.

Solution: Given that, $d = 1.5\,\text{m}$; $D = 25\,\text{cm} = 0.25\,\text{m}$ (For a normal eye).
The focal length of the correction lens is

$$f = \frac{d \times D}{d - D} = \frac{1.5 \times 0.25}{1.5 - 0.25} = \frac{0.375}{1.25} = 0.3\,\text{m}$$

Numerical problem (Unsolved problems):

1. An object is placed at a distance of 20cm from a convex lens of focal length 10cm. Find the image distance and nature of the image.

Given:

$$u = -20cm$$
$$f = 10cm$$
$$v = ?$$

Solution:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$
$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$
$$\frac{1}{v} = \frac{1}{10} + \frac{1}{(-20)}$$
$$\frac{1}{v} = \frac{-20 + 10}{-200}$$
$$\frac{1}{v} = \frac{-10}{-200}$$
$$v = \frac{-200}{-10}$$
$$v = 20cm$$
$$m = \frac{v}{u} = \frac{20}{-20}$$
$$m = -1(no\ unit)$$

Nature of the image: Real and inverted image of the same size as that of the object.

2. An object is height 3cm is placed at 10cm from a concave lens of local length 15cm. Find the size of the image.

Given:

$$u = -10cm$$
$$f = -15cm$$
$$h = 3cm$$
$$h^1 = ?$$

Solution:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{-15} + \frac{1}{(-10)} \qquad = \frac{1}{v} = \frac{-10-15}{150} \qquad = \frac{1}{v} = \frac{-25}{150}$$

$$v = \frac{-150}{25}$$

$$v = -6cm$$

$$m = \frac{v}{u} = \frac{h^1}{h} \qquad = \frac{-6}{-10} = \frac{h^1}{3} \qquad h^1 = 0.6 \times 3$$

$$h^1 = 1.8cm$$

3. THERMAL PHYSICS

Answer in detail

1. Derive the ideal gas equation.
2. Explain the experiment of measuring the real and apparent expansion of a liquid with a neat diagram.

Formulae:

1. $K = C + 273^0$
2. $K = (F + 460) \times \frac{5}{9}$
3. $Coefficient\ of\ linear\ expansion = \propto_L = \frac{\Delta L}{L_o \Delta T}$
4. $Coefficient\ of\ areal\ expansion = \propto_A = \frac{\Delta A}{A_o \Delta T}$
5. $Coefficient\ of\ cubical\ expansion = \propto_v = \frac{\Delta V}{V_o \Delta T}$
6. $Boyle's\ law = P \propto \frac{1}{v}\ (or)\ PV = a\ constant$
7. $Charle's\ law = V \propto T\ \ (or)\ \frac{V}{T} = a\ constant$
8. $Avogadro's\ law = V \propto n\ (or)\ \frac{V}{n} = a\ constant$
9. $Ideal\ gas\ equation,\ PV = RT$

Solved Problems: (Book)

1. A container whose capacity is 70 ml is filled with a liquid up to 50 ml. Then, the liquid in the container is heated. Initially, the level of the liquid falls from 50 ml to 48.5 ml. Then we heat more, the level of the liquid rises to 51.2 ml. Find the apparent and real expansion.

Data:

Level of the liquid $L_1 = 50$ ml

Level of the liquid $L_2 = 48.5$ ml

Level of the liquid $L_3 = 51.2$ ml

Apparent expansion $= L_3 - L_1$

$= 51.2 \text{ ml} - 50 \text{ ml} = 1.2\text{ml}$

Real expansion $= L_3 - L_1$

$= 51.2 \text{ ml} - 48.5\text{ml} = 2.7\text{ml}$

So, Real expansion > apparent expansion

2. Keeping the temperature as constant, a gas is compressed four times of its initial pressure. The volume of gas in the container changing from $20\text{cc}\ (V_1\ \text{cc})$ to V_2 cc. Find the final volume V_2.

Data:

Initial pressure $(P_1) = P$

Final Pressure $(P_2) = 4P$

Initial volume $(V_1) = 20\text{cc} = 20\text{cm}^3$

Final volume $(V_2) = ?$

Using Boyle's Law, PV = constant

$$P_1V_1 = P_2V_2$$

$$V_2 = \frac{P_1}{P_2} \times V_1$$

$$= \frac{P}{4P} \times 20cm^3$$

$$V_2 = 5cm^3$$

Numerical problem (Unsolved problems):

1. Find the final temperature of a copper rod whose area of cross section changes from $10m^2$ to $11m^2$ due to heating. The copper rod is initially kept at 90K. (Coefficient of superficial expansion is 0.0021/K).

Given:

$$A_o = 10m^2 \qquad A_f = 11m^2$$
$$\Delta A = (11-10)m^2 = 1m^2$$
$$T_i = 90K$$
$$\propto_A = 0.0021/K$$
$$T_f = ?$$

Solution:

$$\frac{\Delta A}{A_o} = \propto_A \Delta T$$
$$\frac{\Delta A}{A_o} = \propto_A (T_f - T_i)$$
$$\frac{1}{10} = 0.0021(T_f - 90)$$
$$0.1 = 0.0021(T_f - 90)$$
$$T_f = \frac{0.1}{0.0021} + 90$$
$$T_f = 47.6190 + 90$$
$$T_f = 137.62K$$

2. Calculate the coefficient of cubical expansion of a zinc bar whose volume is increased 0.25 m^3 from 0.3 m^3 due to the change in its temperature of 50K.

Given:

$$V_o = 0.3m^3$$
$$V = 0.25m^3$$
$$V_f = (0.3+0.25)m^3 = 0.55m^3$$
$$\Delta V = (0.55-0.3) = 0.25m^3$$
$$a_v = ?$$

Solution:

$$\frac{\Delta V}{V_o} = \propto_V \Delta T$$
$$\frac{0.25}{0.3} = \propto_v \times 50$$
$$\propto_v = \frac{0.25}{0.3\times 50} = \frac{25}{1500}$$
$$\propto_v = 0.0166K^{-1}$$

4. ELECTRICITY

Answer in detail

1. With the help of a circuit diagram derive the formula for the resultant resistance of three resistances connected: a) in series and b) in parallel
2. 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?
3. 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?
4. Explain about domestic electric circuits. (circuit diagram not required)
5. a) What are the advantages of LED TV over the normal TV?
   b) List the merits of LED bulb.
6. Explain overloading and short circuiting.
7. Differentiate series and parallel circuits.

Formulae:

1. $Ohm's\ law \qquad V = IR, \qquad R = \frac{V}{I} ohm$
2. $Resistivity \qquad \rho = \frac{RA}{L} \Omega m$
3. $Conductance \quad \sigma = \frac{1}{\rho}\ ohm^{-1}\ metre^{-1}$
4. $R_s = R_1 + R_2$
5. $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$
6. $H = I^2 Rt \ or \ H = VIt$
7. $P = \frac{work}{time} = \frac{VIt}{t} or\ P = VI$
8. $E = power \times time = VIt = VQ$

Solved Problems: (Book)

1. A charge of 12 coulomb flows through a bulb in 5 second. What is the current through the bulb?

Solution:

Charge Q = 12 C, Time t = 5 s. Therefore,

current $I = \frac{Q}{t} = \frac{12}{5} = 2.4A$

2. Calculate the resistance of a conductor through which a current of 2 A passes, when the potential difference between its ends is 30 V.

Solution:

Current through the conductor I = 2 A, Potential Difference V = 30 V

From Ohm's Law $R = \frac{V}{1}$

Therefore, $R = \frac{30}{2} = 15\Omega$

3. The work done in moving a charge of 10 C across two points in a circuit is 100 J. What is the potential difference between the points?

Solution: Charge, $Q = 10\ C$ Work Done, $W = 100\ J$

Potential Difference $V = \frac{W}{Q} = \frac{100}{10}.$

Therefore, $V = 10$ volt

4. The resistance of a wire of length 10 m is 2 ohm. If the area of cross section of the wire is $2 \times 10^{-7}\ m^2$, determine its (i) resistivity (ii) conductance and (iii) conductivity

Solution:

Given: Length, L = 10 m, Resistance, R = 2 ohm and Area, $A = 2 \times 10^{-7}\ m^2$

Resistivity, $\rho = \frac{RA}{L} = \frac{2 \times 2 \times 10^{-7}}{10}$

$= 4 \times 10^{-8}\ \Omega\ m$

Conductance, $G = \frac{1}{R} = \frac{1}{2} = 0.5\ mho$

Conductoivity, $\sigma = \frac{1}{\rho} = \frac{1}{4 \times 10^{-8}}$

$= 0.25 \times 10^{-8}\ mho\ m^{-1}$

5. Three resistors of resistances 5 ohm, 3 ohm and 2 ohm are connected in series with 10 V battery. Calculate their effective resistance and the current flowing through the circuit.

Solution:

$R_1 = 5\ \Omega,\ R_2 = 3\ \Omega,\ R_3 = 2\ \Omega,\ V = 10\ V$

$R_s = R_1 + R_2 + R_3,\ \ R_s = 5 + 3 + 2 = 10,$ hence

$R_s = 10\ \Omega$

Then, $I = \frac{V}{R_s} = \frac{10}{10} = 1A$

6. An electric heater of resistance 5 Ω is connected to an electric source. If a current of 6 A flows through the heater, then find the amount of heat produced in 5 minutes.

Solution: Given resistance $R = 5\ \Omega$, Current $I = 6\ A$,
Time $t = 5$ minutes $= 5 \times 60\ s = 300\ s$
Amount of heat produced, $H = I^2Rt$,
$H = 6^2 \times 5 \times 300$. Hence, $H = 54000\ J$

7. Two bulbs are having the ratings as 60 W, 220 V and 40 W, 220 V respectively. Which one has a greater resistance?

Solution: Electric power $P = \frac{V^2}{R}$

For the same value of V, R is inversely proportional to P. Therefore, lesser the power, greater the resistance. Hence, the bulb with 40 W, 220 V rating has a greater resistance.

8. Calculate the current and the resistance of a 100 W, 200 V electric bulb in an electric circuit.

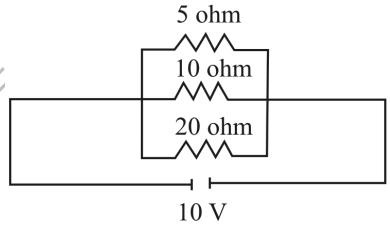
Solution: Power $P = 100$ W and Voltage $V = 200$ V Power $P = V I$

$$\text{So, Current, } I = \frac{P}{V} = \frac{100}{200} = 0.5\,A$$

$$\text{Resistance, } R = \frac{V}{I} = \frac{200}{0.5} = 400\,\Omega$$

9. In the circuit diagram given below, three resistors R_1, R_2 and R_3 of 5 Ω, 10 Ω and 20 Ω respectively are connected as shown.

Calculate:



A) Current through each resistor
B) Total current in the circuit
C) Total resistance in the circuit

Solution:

A) Since the resistors are connected in parallel, the potential difference across each resistor is same (i.e. V=10V)
Therefore, the current through R_1 is,

$$I_1 = \frac{V}{R_1} = \frac{10}{5} = 2A$$

$$\text{Current through } R_2 = I_2 = \frac{V}{R_2} = \frac{10}{10} = 1A$$

$$\text{Current through } R_3 = I_3 = \frac{V}{R_3} = \frac{10}{20} = 0.5A$$

B) Total current in the circuit, $I = I_1 + I_2 + I_3$

$= 2 + 1 + 0.5 = 3.5A$

C) Total resistance in the circuit, $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= \frac{1}{5} + \frac{1}{10} + \frac{1}{20}$

$= \frac{4+2+1}{20}$

$= \frac{7}{20}$

Hence, $R_p = \frac{20}{7} = 2.857\,\Omega$

10. Three resistors of 1 Ω, 2 Ω and 4 Ω are connected in parallel in a circuit. If a 1 Ω resistor draws a current of 1 A, find the current through the other two resistors.

Solution: $R_1 = 1\,\Omega$, $R_2 = 2\,\Omega$, $R_3 = 4\,\Omega$ Current $I_1 = 1$ A

The potential difference across the 1 Ω resistor

$= I_1 R_1 = 1 \times 1 = 1$ V

Since, the resistors are connected in parallel in the circuit, the same potential difference will exist across the other resistors also.

So, the current in the 2 Ω resistor, $\frac{V}{R_2} = \frac{1}{2} = 0.5A$

Similarly, the current in the 4 Ω resistor, $\frac{V}{R_3} = \frac{1}{4} = 0.25A$

Numerical problem (Unsolved problems):

1. An electric iron consumes energy at the rate of 420 W when heating is at the maximum rate and 180 W when heating is at the minimum rate. The applied voltage is 220 V. what is the current in each case?

Given:

$P_{max} = 420W$

$P_{min} = 180W$

$V = 220V$

$I_1 = ?$ $I_2 = ?$

Solution:

$P = VI$

$P_{max} = VI_1$

$I_1 = \frac{P_{max}}{V}$

$= \frac{420}{220}$

$$I_1 = 1.909A$$

$$I_2 = \frac{P_{\min}}{V}$$

$$= \frac{180}{220}$$

$$I_1 = 0.818A$$

2. A 100 W electric bulb is used for 5 hours daily and four 60W bulbs are used for 5 hours daily. Calculate the energy consumed in KWh in the month of January.

Given:

No. of 100 W bulb = 1
No. of 60 W bulb = 4
Energy consumed by 100W bulb (E_1) = 5 hr/day
Energy consumed by four 60W bulb (E_2) = 5 hr/day
No. of days in January = 31 days.
E = ?

Solution:

E_1 = 100 x 5 x 31 = 1550 Wh. = 15.5 KWh
E_2 = 4 x 6 x 5 x 31 = 37200 Wh. = 37.2 KWh
Total energy E = $E_1 + E_2$
= 15.5 + 37.2 KWh
E_{total} = 52.7 KWh
52.7 KWh energy is consumed in the month of January.

3. A torch bulb is rated at 3V and 600mA. Calculate its a) power, b) resistance, c) energy consumed if it is used for 4 hours.

Given:

$$V = 3V$$
$$I = 600mA$$
$$I = 600\times10^{-3}A = 0.6A$$
$$t = 4hour$$

Solution:

$a)\ P = VI$	$b)\ R = V/I$	$c)\ E = P\times t$
$P = 3\times0.6$ $P = 1.8W$	$R = 3/0.6$ $R = 5\Omega$	$E = 1.8\times4$ $E = 7.2Wh$

4. A piece of wire having a resistance R is cut into five equal parts. a) How will the resistance of each part of the wire change compared with the original resistance? b) If the five parts of the wire are placed in parallel, how will be the resistance of the combination change. c) what will be the ratio of the effective resistance in series connection to that of the parallel connection.

Given:

$$R_s = R\Omega$$

$$Total\ no\ of\ parts = 5$$

$$Each\ part\ of\ resistance = \frac{R}{5}$$

$$\therefore R_1 = R_2 = R_3 = R_4 = R_5 = \frac{R}{5}$$

Solution:

$$a) \quad R \propto \frac{L}{A}$$

$$\frac{R}{5} = \frac{\rho L}{A} \qquad R = \frac{5\rho L}{A}$$

Therefore the resistance of a piece of wire is proportional to the length.

$$b) \quad \frac{1}{R_p} = \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R}$$

$$\frac{1}{R_p} = \frac{25}{R}$$

$$R_p = \frac{R}{25}\Omega$$

$$c) \quad \frac{R_s}{R_p} = \frac{25R}{R}$$

$$R_s : R_p : 25 : 1$$

5. Two resistors when connected in parallel give the resultant resistance of 2 ohm; but when connected in series the effective resistance becomes 9 ohm. Calculate the value of each resistance.

Given: $R_s = 9\Omega$ $R_p = 2\Omega$ $R_1 = ?$ $R_2 = ?$

Solution:

$$R_1 + R_2 = 9$$

$$R_2 = 9 - R_1$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_p} = \frac{(9 - R_1) + R_1}{(9 - R_1) \times R_1}$$

$$\frac{1}{R_p} = \frac{9}{9R_1 - R_2^{\,2}}$$

$$\frac{1}{2} = \frac{9}{9R_1 - R_2^{\,2}}$$

$$18 = -R_1^{\,2} + 9R_1$$

$$18 + R_1^{\,2} - 9R_1 = 0$$

$$(R_1 - 3)(R_1 - 6) = 0$$

$$R_1 = 3\Omega, 6\Omega$$

$$R_2 = 9 - 3 = 6\Omega \qquad R_2 = 9 - 6 = 3\Omega$$

$$\therefore R_1 = 3\Omega, 6\Omega \qquad R_2 = 6\Omega, 3\Omega$$

6. How many electrons are passing per second in a circuit in which there is a current of 5A?

Given:

$$I = 5A \qquad t = 1s \qquad n = ?$$

Solution:

$$Q = ne$$

$$n = \frac{Q}{e} = \frac{I \times t}{e} \quad \left(since\, I = \frac{Q}{t} \right)$$

$$n = \frac{5 \times 1}{1.6 \times 10^{-19}} = \frac{5}{1.6} \times 10^{19}$$

$$n = 3.125 \times 10^{19}\, electrons$$

7. A piece of wire of resistance 10 ohm is drawn out so that its length is increased to three times its original length. Calculate the new resistance.

Given:

$$Resistance\, of\, a\, piece\, of\, wire, \frac{\rho L}{A} = 10\Omega$$

$$Increase\, in\, length = 3L$$

$$new\, area = \frac{A}{3};\ new\, resistance = R = ?$$

Solution:

$$R = \frac{3\rho L}{A/3} = \frac{9\rho L}{A} = 9 \times 10 = 90\Omega$$

$$R = 90\Omega$$

5. ACOUSTICS

Answer in Detail

1. What are the factors that affect the speed of sound in gases?
2. What is mean by reflection of sound? Explain:
   a) reflection at the boundary of a rarer medium
   b) reflection at the boundary of a denser medium
   c) Reflection at curved surfaces
3. a) What do you understand by the term 'ultrasonic vibration'?
   b) State three uses of ultrasonic vibrations.
   c) Name three animals which can hear ultrasonic vibrations.
4. 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?
5. Derive an expression for the velocity of sound waves.
6. Give the applications of sound waves.

Formulae:

1. $Time\ period \quad T = \frac{1}{n}$
2. $Frequency \quad n = \frac{1}{T}$
3. $v = n\lambda$
4. $v \propto \sqrt{\frac{1}{d}}$
5. $V_T = (v_o + 0.61T)$
6. $\frac{V_2}{V_1} = \sqrt{\frac{T_2}{T_1}}$
7. $Velocity\ (for\ echo) = \frac{2d}{t}$

Solved Problems: (Book)

1. At what temperature will the velocity of sound in air be double the velocity of sound in air at $0^{\circ}C$?

Solution: Let To C be the required temperature. Let v_1 and v_2 be the velocity of sound at temperatures T_1K and T_2K respectively. $T_1 = 273K\ (0^{o}C)$ and $T_2 = (T^{o}C + 273)K$

$$\frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{273+T}{273}} = 2$$

$$\frac{v_2}{v_1} = 2$$

Here, it is given that, $So, \frac{273+T}{273} = 4$

$$T = (273 \times 4) - 273 = 819^{0}C$$

2. A source producing a sound of frequency 90 Hz is approaching a stationary listener with a speed equal to (1/10) of the speed of sound. What will be the frequency heard by the listener?

Solution: When the source is moving towards the stationary listener, the expression for apparent frequency is

$$n' = \left(\frac{v}{v - v_2}\right) n$$

$$n' = \left(\frac{v}{v - \left(\frac{1}{10}\right)v}\right) n = \left(\frac{10}{9}\right) n$$

$$= \left(\frac{10}{9}\right) \times 90 = 100\,\text{Hz}$$

3. A source producing a sound of frequency 500 Hz is moving towards a listener with a velocity of $30\ \text{m s}^{-1}$. The speed of the sound is $330\ \text{m s}^{-1}$. What will be the frequency heard by listener?

Solution: When the source is moving towards the stationary listener, the expression for apparent frequency is

$$n' = \left(\frac{v}{v - v_s}\right) n$$

$$n' = \left(\frac{330}{330 - 30}\right) \times 500$$

$$= 550\,\text{Hz}$$

4. A source of sound is moving with a velocity of $50\ \text{m s}^{-1}$ towards a stationary listener. The listener measures the frequency of the source as $1000\ \text{Hz}$. What will be the apparent frequency of the source when it is moving away from the listener after crossing him? (velocity of sound in the medium is $330\ \text{m s}^{-1}$)

Solution: When the source is moving towards the stationary listener, the expression for apparent frequency is

$$n' = \left(\frac{v}{v - v_s}\right) n$$

$$1000 = \left(\frac{330}{330 - 50}\right) n$$

$$n = \left(\frac{1000 \times 280}{330}\right)$$

$$n = 848.48\,\text{Hz}$$

The actual frequency of the sound is 848.48 Hz. When the source is moving away from the stationary listener, the expression for apparent frequency is

$$n' = \left(\frac{v}{v + v_s}\right) n$$

$$= \left(\frac{330}{330 + 50}\right) \times 848.48$$

$$n = 736.84\,\text{Hz}$$

5. A source and listener are both moving towards each other with a speed v/10 where v is the speed of sound. If the frequency of the note emitted by the source is f, what will be the frequency heard by the listener?

Solution: When source and listener are both moving towards each other, the apparent frequency is

$$n' = \left(\frac{v+v_l}{v-v_s}\right)n.$$

$$n' = \left(\frac{v+\frac{v}{10}}{v-\frac{v}{10}}\right)n. \qquad n' = \left(\frac{11}{9}\right).f$$

$$= 1.22f$$

6. At what speed should a source of sound move away from a stationary observer so that observer finds the apparent frequency equal to half of the original frequency?

Solution: When the source is moving away from the stationary listener, the expression for the apparent frequency is

$$n' = \left(\frac{v}{v+v_s}\right).n$$

$$\frac{n}{2} = \left(\frac{v}{v+v_s}\right).n$$

$$V_s = V$$

Numerical problems: (Unsolved)

1. A sound wave has a frequency of 200Hz and a speed of 400 ms^{-1} in a medium. Find the wavelength of the sound wave.

Given : $v = n\lambda \qquad n = 200Hz \qquad V = 400ms^{-1} \qquad \lambda = 1$

Solution :

$$\lambda = \frac{v}{n} = \frac{400}{200} = 2m$$

2. A thunder of cloud is heard 9.8 seconds later than the flash of lightening If the speed of sound in air is 330ms^{-1}, what will be the height of the cloud?

Given : $t = 9.8s \qquad V = 330ms^{-1} \qquad d = ?$

Solution :

$$d = v \times t = 330 \times 9.8 = 3234m$$

$$\therefore The\ height\ of\ the\ cloud\ is\ 3234m.$$

3. A person who is sitting at a distance of 400m from a source of sound is listening to a sound of 600Hz. Find the time period between successive compressions from the source.

Given:

$$n = 600Hz \qquad T = ?$$

Solution:

$$n = \frac{1}{T}$$

$$T = \frac{1}{n} = \frac{1}{600} = 0.0017s$$

4. An ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the transmission and reception of the wave is 1.6 s. What is the depth of the sea, if the velocity of sound in sea water is 1400ms^{-1}?

Given : $V = 1400ms^{-1}$ $t = 1.6s$ $depth(\propto) = ?$

Solution :

$$since\, v = \frac{2d}{t}$$

$$d = \frac{v \times t}{2} = \frac{1400 \times 1.6}{2} = \frac{2240}{2} = 1120m$$

5. A man is standing between two vertical walls 680m apart. He claps his hands and hears two distinct echoes after 0.9s and 1.1s respectively. What is the speed of sound in the air?

Given : $d = 680m,$ $t_1 = 0.9s,$ $t_2 = 1.1s$ $V = ?$

Solution :

$$t = t_1 + t_2 = 0.9 + 1.1 = 2s$$

$$v = \frac{2d}{t} = \frac{2 \times 680}{2}$$

$$v = 680ms^{-1}$$

6. Two observers are stationed in two boats 4.5km apart. A sound signal sent by one, under water reaches the other after 3s. What is the speed of sound in the water?

Given :

$$Distance\, between\, two\, observers\,(2d) = 4.5km$$

$t = 3s,$ $V = ?$

Solution :

$$v = \frac{2d}{t} = \frac{4.5}{3} = 1.5kms^{-1}$$

7. A strong sound signal is sent from a ship towards the bottom of the sea. It is received back after 1s. What is the depth of sea given that the speed of sound in water 1450ms^{-1}?

Given : $v = 1450ms^{-1}$ $t = 1s,$ $depth\,(d) = ?$

Solution :

$$d = \frac{v \times t}{2} = \frac{1450 \times 1}{2} = 725m$$

6. NUCLEAR PHYSICS

I. Answer in detail

1. Explain the process of controlled and uncontrolled chain reactions.
2. Compare the properties of alpha, beta and gamma radiations.
3. What is a nuclear reactor? Explain its essential parts with their functions.
4. Write a note on the uses of Radio activity in medicinal field.
5. Give the safety measures to be taken in radiation labs.

Solved problems: (Book)

1. Identify A, B, C, and D from the following nuclear reactions.

$$\text{(i)} \quad {}_{13}Al^{27} + A \rightarrow {}_{15}P^{30} + B$$
$$\text{(ii)} \quad {}_{12}Mg^{24} + B \rightarrow {}_{11}Na^{24} + C$$
$$\text{(iii)} \quad {}_{92}U^{238} + B \rightarrow {}_{93}Np^{239} + D$$

Solution:

$$\text{(i)} \quad {}_{13}Al^{27} + {}_{2}He^{4} \rightarrow {}_{15}P^{30} + {}_{o}n^{1}$$
$$\text{(ii)} \quad {}_{12}Mg^{24} + {}_{o}n^{1} \rightarrow {}_{11}Na^{24} + {}_{1}H^{1}$$
$$\text{(iii)} \quad {}_{92}U^{238} + {}_{o}n^{1} \rightarrow {}_{93}Np^{239} + {}_{-1}e^{0}$$

A is alpha particle, B is neutron, C is proton, and D is electron.

2. A radon specimen emits radiation of 3.7×10^3 GBq per second. Convert this disintegration in terms of curie. ($\text{one curie} = 3.7 \times 10^{10}$ disintegration per second)

1 Bq= one disintegration per second one curie $= 3.7 \times 10^{10}$ Bq

$$1\text{Bq} = \frac{1}{3.7\times10^{10}}\text{curie}$$

$$\therefore 3.7\times10^{3}\,\text{GBq} = 3.7\times10^{3}\times10^{9}\times\frac{1}{3.7\times10^{10}}$$

$$= 100 \text{ curie}$$

3. ${}_{92}U^{235}$ experiences one **α -** decay and one **β -** decay. Find number of neutrons in the final daughter nucleus that is formed.

Solution: Let X and Y be the resulting nucleus after the emission of the alpha and beta particles respectively.

$${}_{92}U^{235} \xrightarrow{\alpha \text{ decay}} {}_{90}X^{231} + {}_{2}He^{4}$$
$${}_{90}X^{231} \xrightarrow{\beta \text{ decay}} {}_{91}Y^{231} + {}_{-1}e^{0}$$

Number of neutrons = Mass number – Atomic number

$$= 231 - 91 = 140$$

4. Calculate the amount of energy released when a radioactive substance undergoes fusion and results in a mass defect of 2 kg.

Solution: Mass defect in the reaction (m) $= 2$ kg

Velocity of light (c) $= 3 \times 10^8$ m s^{-1}

By Einstein's equation,

Energy released $E = mc^2$

So $E = 2 \times \left(3 \times 10^8\right)^2$

$$= 1.8\times10^{17} J$$

Numerical problems: (Unsolved)

1. $88^{Ra^{226}}$ experiences three $\propto$ –decay. Find the number of neutrons in the daughter element.

Given:

$$Radioactive\ element = 88^{Ra^{226}}$$
$$No.of\ neutrons\ in\ the\ daughter\ elements = ?$$

Solution:

$$3 \propto -decay$$
$$88 - 6^{Ra^{226-12}} \rightarrow_{82} X^{214} + 3(_2He^4)$$
$$No.of\ neutrons\ in\ the\ daughter\ elements$$
$$= mass\ number - atomic\ number$$
$$= 214 - 82$$
$$= 132$$

2. A cobalt specimen emits induced radiation of 75.6 milli curie per second. Convert this disintegration into Becquerel (one curie = 3.7×10^{10}Bq)

Given:

$$Induced\ radiation = 75.6 milli\ curie\ per\ second$$

Solution:

$$1\ curie = 3.7 \times 10^{10}\ Bq$$
$$75.6\ milli\ curie\ per\ second = 75.6 \times 10^{-3} \times 3.7 \times 10^{10}$$
$$= 279.72 \times 10^{7}\ Bq$$

7. ATOMS AND MOLECULES

I. Answer in detail:

1. Calculate the number of water molecule present in one drop of water which weighs 0.18 g.
2. $N_2 + 3\ H_2 \rightarrow 2\ NH_3$
   (The atomic mass of nitrogen is 14, and that of hydrogen is 1)

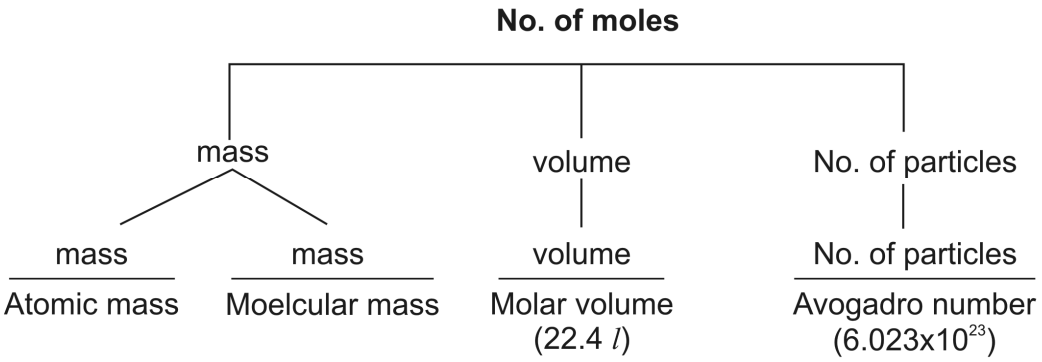
   1 mole of nitrogen (_____g) + 3 moles of hydrogen (_____ g) →
   2 moles of ammonia (_____ g)
3. Calculate the number of moles in

   i) 27g of Al ii) 1.51×10^{23} molecules of NH_4Cl
4. Give the salient features of “Modern atomic theory”.
5. Derive the relationship between Relative molecular mass and Vapour density.
6. Give the applications of Avogadro’s hypothesis.
7. Differentiate atoms and molecules.
8. Calcium carbonate is decomposed on heating in the following reaction

   $CaCO_3 \rightarrow CaO + CO_2$

   i. How many moles of Calcium carbonate are involved in this reaction?
   ii. Calculate the gram molecular mass of calcium carbonate involved in this reaction
   iii. How many moles of CO_2 are there in this equation?

Formulae:



Solved problems:

1. Oxygen is the most abundant element in both the Earth's crust and the human body. It exists as a mixture of three stable isotopes in nature as shown in Table.

Isotope	Mass (amu)	% abundance
$_8O^{16}$	15.9949	99.757
$_8O^{17}$	16.9991	0.038
$_8O^{18}$	17.9992	0.205

The atomic mass of oxygen = (15.9949 × 0.99757) + (16.9991 × 0.00038) + (17.9992 × 0.00205)
= 15.999 amu.

2. Boron naturally occurs as a mixture of boron-10 (5 protons + 5 neutrons) and boron-11 (5 protons + 6 neutrons) isotopes. The percentage abundance of B-10 is 20 and that of B-11 is 80. Then, the atomic mass of boron is calculated as follows:

$$\begin{aligned}\text{Atomic mass of boron} &= (10 \times)\frac{20}{100} + (11 \times \frac{80}{100}) \\ &= (10 \times 0.20) + (11 \times 0.80) \\ &= 2 + 8.8 \\ &= 10.8 \text{ amu}\end{aligned}$$

3. Relative molecular mass of sulphuric acid (H_2SO_4) is calculated as follows:
Sulphuric acid conatins 2 atoms of hydrogen, 1 atom of sulphur and 4 atoms of oxygen.

Therefore, Relative molecular mass of sulphuric acid

$$\begin{aligned}&= (2 \times \text{mass of hydrogen}) + (1 \times \text{mass of sulphur}) + (4 \times \text{mass of oxygen}) \\ &= (2 \times 1) + (1 \times 32) + (4 \times 16) \\ &= 98\end{aligned}$$

i.e., one molecule of H_2SO_4 is 98 times as heavy as $\frac{1}{12^{th}}$ of the mass of a carbon -12

4. Relative molecular mass of water (H_2O) is calculated as follows: A water molecule is made of 2 atoms of hydrogen and one atom of oxygen.

So, the relative molecular mass of water
= (2 × mass of hydrogen) + (1 × mass of oxygen)
= (2 × 1) + (1 × 16)
= 18
i.e., one molecule of H_2O is 18 times as heavy as $\frac{1}{12^{th}}$ of the mass of a carbon -12.

5. Find the mass percentage composition of water (H_2O).

$$\text{Mass \% of an element} = \frac{\text{mass of that element in the compound}}{\text{molar mass of the compound}} \times 100$$

Now,

Molar mass of H_2O $= 2(1) + 16$
$= 18$ g

Mass % of hydrogen $= \frac{2}{18} \times 100$
$= 11.11\%$

Mass % of oxygen $= \frac{16}{18} \times 100$
$= 88.89\%$

6. Find the mass percentage composition of methane (CH_4).

Molar mass of CH_4 $= 12 + 4$
$= 16$ g

Mass % of carbon $= \frac{12}{16} \times 100$
$= 75\%$

Mass % of hydrogen $= \frac{4}{16} \times 100$
$= 25\%$

7. Calculate the gram molar mass of the following.

a) H_2O b) CO_2 c) $Ca_3(PO_4)_2$

Solution:

a) H_2O Atomic masses of $H = 1$, $O = 16$

Gram molar mass of H_2O
$= (1 \times 2) + (16 \times 1)$
$= 2 + 16$

Gram molar mass of $H_2O = 18$ g

b) CO_2

Atomic masses of C = 12, O = 16

Gram molar mass of CO_2

$$= (12 \times 1) + (16 \times 2)$$
$$= 12 + 32$$

Gram molar mass of $CO_2 = 44\,g$

c) $Ca_3(PO_4)_2$

Atomic masses of Ca = 40, P = 30, O = 16.

Gram molar mass of $Ca_3(PO_4)_2$

$$= (40 \times 3) + [30 + (16 \times 4)] \times 2$$
$$= 120 + (94 \times 2)$$
$$= 120 + 188$$

Gram molar mass of $Ca_3(PO_4)_2 = 308\,g$

8. Calculate the number of moles in:

a) $46g$ sodium.

$$\text{Number of moles} = \frac{\text{Mass of the element}}{\text{Atomic mass of the element}}$$
$$= \frac{46}{23} = 2 \text{ moles of sodium}$$

b) 5.6 litre of oxygen at S.T.P.

$$\text{Number of moles} = \frac{\text{Given volume of } O_2 \text{ at S.T.P}}{\text{Molar volume at S.T.P.}}$$

$$\text{Number of moles of oxygen} = \frac{5.6}{22.4} = 0.25 \text{ mole of oxygen}$$

c) 12.046×10^{23} atoms of iron?

$$\text{Number of moles} = \frac{\text{Number of atoms of iron}}{\text{Avogadro's number}}$$
$$= 12.046 \times 10^{23} / 6.023 \times 10^{23}$$
$$= 2 \text{ moles of iron}$$

9. Calculate the mass of the following.

a) 0.3 mole of aluminium (Atomic mass of Al = 27)

$$\text{Number of moles} = \frac{\text{Mass of Al}}{\text{Atomic mass of Al}}$$

Mass = No. of moles $\times$ atomic mass

So, mass of Al $= 0.3 \times 27$

$$= 8.1\,g$$

b) 2.24 litre of SO_2 gas at S.T.P

Molecular mass of SO_2 $= 32 + (16 \times 2)$

$= 32 + 32 = 64$

Number of moles of $SO_2 = \dfrac{\text{Given volume of } SO_2 \text{ at S.T.P.}}{\text{Molar volume of } SO_2 \text{ at S.T.P.}}$

No. of moles of SO_2 $= \dfrac{2.24}{22.4}$

$= 0.1$ mole

$$\text{Number of moles} = \frac{\text{Mass}}{\text{Molecular mass}}$$

$\text{Mass} = \text{No. of moles} \times \text{molecular mass}$

$\text{Mass} = 0.1 \times 64$

Mass of $SO_2 = 6.4\,g$

c) 1.51×10^{23} molecules of water

Molecular mass of $H_2O = 18$

$$\text{Number of moles} = \frac{\text{Number of molecules of water}}{\text{Avogadro's number}}$$

$= 1.51 \times 10^{23} / 6.023 \times 10^{23}$

$= 1/4$

$= 0.25\,mole$

$$\text{Number of moles} = \frac{\text{Mass}}{\text{Molecular mass}}$$

$0.25 = \text{mass}/18$

$\text{Mass} = 0.25 \times 18$

$\text{Mass} = 4.5\,g$

d) 5×10^{23} molecules of glucose

Molecular mass of glucose = 180

$$\text{Mass of glucose} = \frac{\text{Molecular mass} \times \text{number of particles}}{\text{Avogadro's number}}$$

$= (180 \times 5 \times 10^{23} / 6.023 \times 10^{23}$

$= 149.43\,g$

10. Calculate the number of molecules/atoms in the following:

a) 11.2 litre of CO_2 at S.T.P.

$$\text{Number of moles of } CO_2 = \frac{\text{Volume at S.T.P.}}{\text{Molar volume}}$$

$$= 11.2 / 22.4$$

$$= 0.5 \text{ mole}$$

$$\text{Number of molecules of } CO_2 = \text{number of moles of } CO_2 \times \text{Avogardro's number}$$

$$= 0.5 \times 6.023 \times 10^{23}$$

$$= 3.011 \times 10^{23} \text{ molecules of } CO_2$$

b) 1 gram of gold (Atomic mass of $Au = 198$)

$$\text{Number of atoms of Au} = \frac{\text{Mass of Au} \times \text{Avogardro's number}}{\text{Atomic mass of Au}}$$

$$\text{Number of atoms of Au} = \frac{1}{198} \times 6.023 \times 10^{23}$$

$$\text{Number of atoms of Au} = 3.042 \times 10^{21} g$$

c) $54 \, gm \, of \, H_2O$

$$\text{Number of molecules} = \frac{\text{Avogardro's number} \times \text{Given mass}}{\text{Gram molecular mass}}$$

$$\text{Number of molecules of water} = 6.023 \times 10^{23} \times 54 / 18$$

$$= 18.069 \times 10^{23} \text{ molecules}$$

d) Calculate the number of atoms of oxygen and carbon in 5 moles of CO_2.

- 1 mole of CO_2 contains 2 moles of oxygen
- 5 moles of CO_2 contain 10 moles of oxygen

$$\text{Number of atoms of oxygen} = \text{Number of moles of oxygen} \times \text{Avogadro's number}$$

$$= 10 \times 6.023 \times 10^{23}$$

$$= 6.023 \times 10^{24} \text{ atoms of Oxygen}$$

- 1 mole of CO_2 contains 1 moles of carbon
- 5 moles of CO_2 contain 5 moles of carbon

$$\text{Number of atoms of oxygen} = \text{Number of moles of carbon} \times \text{Avogadro's number}$$

$$= 5 \times 6.023 \times 10^{23}$$

$$= 3.011 \times 10^{24} \text{ atoms of Carbon}$$

11. Calculate the volume occupied by:

a) 2.5 mole of CO_2 at S.T.P.

$$\text{Number of moles of } CO_2 = \frac{\text{Given volume at S.T.P.}}{\text{Molar volume at S.T.P.}}$$

$$2.5 \text{ moles of } CO_2 = \frac{\text{Volume of } CO_2 \text{ at S.T.P.}}{22.4}$$

$$\text{Volume of } CO_2 \text{ at S.T.P.} = 22.4 \times 2.5$$

$$= 56 \text{ litres}$$

b) 3.0115×10^{23} molecules of ammonia gas

$$\text{Number of moles} = \frac{\text{Number of molecules}}{\text{Avogadro's number}}$$

$$= 3.0115 \times 10^{23} / 6.023 \times 10^{23}$$

$$= 0.5 \text{ moles}$$

Volume occupied by NH_3

$$= \text{number of moles} \times \text{molar volume}$$

$$= 2 \times 22.4$$

$$= 44.8 \text{ litres at S.T.P.}$$

c) 14 g nitrogen gas

$$\text{No.of moles} = 14 / 28$$

$$= 0.5 \text{ mole}$$

Volume occupied by N_2 at S.T.P.

$$= \text{no. of moles} \times \text{molar volume}$$

$$= 0.5 \times 22.4$$

$$= 11.2 \text{ litres}$$

12. Calculate the percentage of S in H_2SO_4

$$\text{Molar mass of } H_2SO_4 = (1 \times 2) + (32 \times 1) + (16 \times 4)$$

$$= 2 + 32 + 64$$

$$= 98\, g$$

$$\% \text{ of } S \text{ in } H_2SO_4 = \frac{\text{Mass of sulphur}}{\text{Molar mass of } H_2SO_4} \times 100$$

$$\% \text{ of } S \text{ in } H_2SO_4 = \frac{32}{98} \times 100$$

$$= 32.65\%$$

Unsolved problems:

1. How many grams are there in the following?
   i) 2 moles of hydrogen molecule, H_2
   ii) 3 moles of chlorine molecule, Cl_2
   iii) 5 moles of sulphur molecule, S_8
   iv) 4 moles of phosphorus molecule, P_4

$$Mass = no.of\ moles \times Atomic\ mass\ (\text{or})\ molar\ mass$$

   i) mass of 2 moles of $H_2 = 2 \times 2 = 4g$
   ii) mass of 3 moles of $Cl_2 = 3 \times 2 \times 35.5 = 213g$
   iii) mass of 5 moles of $S_8 = 5 \times 8 \times 32 = 1280g$
   iv) mass of 4 moles of $P_4 = 4 \times 4 \times 31 = 496g$

2. Calculate the % of each element in calcium carbonate (Atomic mass: $C-12,\ O-16,\ Ca-40$)

$$\%\ of\ an\ element = \frac{Total\ mass\ of\ the\ element\ in\ the\ compound}{molar\ mass\ of\ the\ compound} \times 100$$

$$molar\ mass\ of\ CaCO_3 = 40 + 12 + (3 \times 16) = 100$$

$$\%\ of\ Carbon = \frac{12}{100} \times 100 = 12\%$$

$$\%\ of\ Calcium = \frac{40}{100} \times 100 = 40\%$$

$$\%\ of\ Oxygen = \frac{48}{100} \times 100 = 48\%$$

3. Calculate the % of Oxygen in $Al_2(SO_4)_3$ (Atomic mass: Al-27, O-16, S-32)

$$\%\ of\ an\ element = \frac{Total\ mass\ of\ the\ element\ in\ the\ compound}{molar\ mass\ of\ the\ compound} \times 100$$

$$molar\ mass\ of\ Al_2(SO_4)_3 = (2 \times 27) + (3 \times 32) + (12 \times 16)$$
$$= 54 + 96 + 192$$
$$= 342$$

$$\%\ of\ Oxygen = \frac{12 \times 16 \times 100}{342} = \frac{192}{342} \times 100$$
$$= 56.14\%$$

4. Calculate the % relative abundance of B-10 and B-11, if its average atomic mass is 10.804 amu.

$$Let\ \%\ relative\ abundance\ of\ B\text{-}10 = x$$
$$\%\ relative\ abundance\ of\ B\text{-}11 = (100 - x)$$

$$Average\ atomic\ mass\ of\ B = \frac{mass\ of\ 1^{st}\ isotope \times \%\ abundance\ of\ 1^{st}\ isotope + mass\ of\ 2^{nd}\ isotope \times \%\ abundance\ of\ 2^{nd}\ isotope}{100}$$

$$10.804 = \frac{10\times x+11\times(100-x)}{100}$$

$$10.804 = \frac{10x+1100-11x}{100}$$

$$1080.4 = 1100-x$$

$$x = 1100-1080.4$$

$$x = 19.6\%$$

$$\therefore \%\ relative\ abundance\ of\ B\text{-}10 = x = 19.6\%$$

$$\%\ relative\ abundance\ of\ B\text{-}11 = 100-x = 100-19.6 = 80.4\%$$

8. PERIODIC CLASSIFICATION OF ELEMENTS

I. Answer in detail

1. a) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite.
   b) Along with cryolite and alumina, another substance is added to the electrolyte mixture. Name the substance and give one reason for the addition.
2. The electronic configuration of metal A is 2,8,18,1.
   The metal A when exposed to air and moisture forms B a green layered compound. A with con. H_2SO_4 forms C and D along with water. D is a gaseous compound. Find A,B,C and D.
3. Explain smelting process.
4. Metal A belongs to period 3 and group 13. A in red hot condition reacts with steam to form B. A with strong alkali forms C. Find A,B and C with reactions
5. a) Identify the bond between H and F in HF molecule.
   b) What property forms the basis of identification?
   c) How does the property vary in periods and in groups?
6. Give the salient features of periods in the modern periodic table.
7. Give the salient features of groups in the modern periodic table.
8. How will you predict the nature of chemical bonds using electronegativity values?
9. How are magnetic ores separated from Non-magnetic impurities? Explain.
10. Give the uses of copper.
11. Give reasons for alloying.
12. Explain the methods of preventing corrosion.

9. SOLUTIONS

I. Answer in detail:

1. Write notes on i) saturated solution ii) unsaturated solution
2. Write notes on various factors affecting solubility.
3. a) What happens when $MgSO_4.7H_2O$ is heated? Write the appropriate equation
   b) Define solubility
4. In what way hygroscopic substances differ from deliquescent substances.
5. A solution is prepared by dissolving 45 g of sugar in 180 g of water. Calculate the mass percentage of solute.
6. 3.5 litres of ethanol is present in 15 litres of aqueous solution of ethanol. Calculate volume percent of ethanol solution.
7. 'A' is a blue coloured crystaline salt. On heating it loses blue colour and to give 'B'. When water is added, 'B' gives back to 'A'. Identify A and B, write the equation.
8. Classify solutions based on the amount of solute.

Solved problems:

1. 1.5 g of solute is dissolved in 15 g of water to form a saturated solution at 298K. Find out the solubility of the solute at the temperature.

$$\text{Mass of the solute} = 1.5\ \text{g}$$
$$\text{Mass of the solvent} = 15\ \text{g}$$
$$\text{Solubility of the solute} = \frac{\text{Mass of the solute}}{\text{Mass of the solvent}} \times 100$$
$$\text{Solubility of the solute} = \frac{1.5}{15} \times 100$$
$$= 10\,g$$

2. Find the mass of potassium chloride that would be needed to form a saturated solution in 60 g of water at 303 K? Given that solubility of the KCl is 37/100 g at this temperature.

Mass of potassium chloride in 100 g of water in saturated solution = 37 g

$$\text{Mass of potassium chloride in 60 g of water in saturated solution} = \frac{37}{100} \times 60$$
$$= 22.2\,g$$

3. What is the mass of sodium chloride that would be needed to form a saturated solution in 50 g of water at 30℃. Solubility of sodium chloride is 36 g at 30℃?

At 30°C, 36 g of sodium chloride is dissolved in 100 g of water.

∴Mass of sodium chloride that would be need for 100 g of water = 36 g

$$\therefore \text{ Mass of sodium chloride dissolved in 50 g of water} = \frac{36 \times 50}{100}$$
$$= 18\,g$$

4. The Solubility of sodium nitrate at 50℃ and 30℃ is 114 g and 96 g respectively. Find the amount of salt that will be thrown out when a saturated solution of sodium nitrate containing 50 g of water is cooled from 50℃ to 30℃?

Amount of sodium nitrate dissolved in 100 g of water at 50℃ is 114 g

$$\therefore \text{ Amount of sodium nitrate dissolved in 50 g of water at } 50^{\circ}\text{C is} = \frac{114 \times 50}{100}$$
$$= 57\,g$$

$$\text{Similarly amount of sodium nitrate dissolving in 50g of water at 30°C is} = \frac{96 \times 50}{100}$$
$$= 48\,g$$

Amount of sodium nitrate thrown when 50g of water is cooled from 50°C to 30°C is

$$57 - 48 = 9\,\text{g}$$

5. A solution was prepared by dissolving 25 g of sugar in 100 g of water. Calculate the mass percentage of solute.

Mass of the solute = 25 g

Mass of the solvent = 100 g

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

$$\text{Mass percentage} = \frac{\text{Mass of the solute}}{\text{Mass of the solute + Mass of the solvent}} \times 100$$

$$= \frac{25}{25+100} \times 100$$

$$= \frac{25}{125} \times 100$$

$$= 20\%$$

6. 16 grams of NaOH is dissolved in 100 grams of water at 25°C to form a saturated solution. Find the mass percentage of solute and solvent.

Mass of the solute $(NaOH) = 16$ g

Mass of the solvent $H_2O = 100$ g

(i) Mass percentage of solute $= \frac{\text{Mass of the solute}}{\text{Mass of the solute + Mass of the solvent}} \times 100$

$$= \frac{16 \times 100}{16+100} \qquad = \frac{1600}{116}$$

Mass percentage of the solute $= 13.79\ \%$

(ii) Mass percentage of solvent $= 100 - (\text{Mass percentage of the solute})$

$= 100 - 13.79$

$= 86.21\%$

7. Find the amount of urea which is to be dissolved in water to get 500 g of 10% w/w aqueous solution?

$$\text{Mass percentage w/w} = \frac{\text{Mass of the solute}}{\text{Mass of the solution}} \times 100$$

$$10 = \frac{\text{Mass of the urea}}{500} \times 100$$

$$\text{Mass of urea} = 50\text{g}$$

Problem based on Volume – volume percentage:

8. A solution is made from 35 ml of Methanol and 65 ml of water. Calculate the volume percentage.

Volume of the ethanol $= 35$ ml

Volume of the water $= 65$ ml

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

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

$$\text{Volume percentage} = \frac{35}{35+65} \times 100$$

$$\text{Volume percentage} = \frac{35}{100} \times 100$$

$$= 35\%$$

9. Calculate the volume of ethanol in 200 ml solution of 20% v/v aqueous solution of ethanol.

$$\text{Volume of aqueous solution} = 200 \text{ ml}$$

$$\text{Volume percentage} = 20\%$$

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

$$20 = \frac{\text{Volume of ethanol}}{200} \times 100$$

$$\text{Volume of ethanol} = \frac{20 \times 200}{100} = 40 \text{ ml}$$

10. TYPES OF CHEMICAL REACTIONS

I. Answer in detail:

1. What are called thermolysis reactions?
2. Explain the types of double displacement reactions with examples.
3. Explain the factors influencing the rate of a reaction
4. How does p^H play an important role in everyday life?
5. What is a chemical equilibrium? What are its characteristics?
6. A solid compound 'A' decomposes on heating into 'B' and a gas 'C'. On passing the gas 'C' through water, it becomes acidic. Identify A, B and C.
7. Which of the metals displace hydrogen gas from HCl, Silver or Zinc? Give the chemical reaction and justify your answer.
8. Explain the process and the chemical reaction involved in white washing.
9. What happens during a chemical reaction?

Formulae:

$$p^H = -\log_{10}[H^+]$$

$$p^{OH} = -\log_{10}[OH^-]$$

$$p^H + p^{OH} = 14$$

Solved problems:

1. Calculate the p^H of 0.01 M HNO_3?

Solution:

$[H+] = 0.01$

$p^H = -\log_{10}[H+]$

$p^H = -\log_{10}[0.01]$

$p^H = -\log_{10}[1 \times 10^{-2}]$

$p^H = -(\log_{10}1 - 2\log_{10}10)$

$p^H = 0 + 2 \times \log_{10}10$

$p^H = 2 \times 1 = 2$

$p^H = 2$

2. The hydroxyl ion concentration of a solution is 1×10^{-9} M. What is the p^{OH} of the solution?

Solution:

$$p^{OH} = -\log_{10} [OH^-]$$
$$p^{OH} = -\log_{10} [1 \times 10^{-9}]$$
$$p^{OH} = -(\log_{10} 1.0 + \log_{10} 10^{-9})$$
$$p^{OH} = -(0 - 9 \log_{10} 10)$$
$$p^{OH} = -(0 - 9)$$
$$p^{OH} = 9$$

3. A solution has a p^{OH} of 11.76. What is the p^{H} of this solution?

$$p^{H} = 14 - p^{OH}$$
$$p^{H} = 14 - 11.76 = 2.24$$

4. Calculate the p^{H} of 0.001 molar solution of HCl.

$$[H^+] = 1 \times 10^{-3} \text{ mol litre}^{-1}$$
$$p^{H} = -\log_{10}[H^+] = -\log_{10} 10^{-3}$$
$$= -(-3 \times \log_{10}) = -(3 \times 1) = 3$$
$$\text{Thus, } p^{H} = 3$$

5. Calculate the p^{H} of 1×10^{-4} molar solution of NaOH.

$$[OH^-] = 1 \times 10^{-4} \text{ mol litre}^{-1}$$
$$p^{OH} = -\log_{10}[OH^-] = -\log_{10} \times [10^{-4}]$$
$$= -(-4 \times \log_{10} 10) = -(-4) = 4$$
$$\text{Since, } p^{H} + p^{OH} = 14$$
$$p^{H} = 14 - p^{OH} = 14 - 4$$
$$= 10$$

6. Calculate the p^{H} of a solution in which the concentration of the hydrogen ions is 1.0×10^{-8} mol litre^{-1}.

$$p^{H} = -\log_{10}[H^+]$$
$$\text{given } [H^+] = 1.0 \times 10^{-8} \text{ mol litre}^{-1}$$
$$p^{H} = -\log_{10} 10^{-8}$$
$$= -(-8 \times \log_{10} 10)$$
$$= -(-8 \times 1)$$
$$= 8$$

7. If the p^H of a solution is 4.5, what is its p^{OH} ?

$$p^H + p^{OH} = 14$$
$$p^{OH} = 14 - 4.5 = 9.5$$
$$p^{OH} = 9.5$$

Unsolved problems:

1. Lemon juice has a p^H 2 , what is the concentration of H^+ ions?

$$p^H = 2$$
$$[H^+] = ?$$
$$p^H = -\log_{10}[H^+]$$
$$-p^H = \log_{10}[H^+]$$
$$[H^+] = 10^{-p^H}$$
$$[H^+] = 10^{-2}$$

2. Calculate the p^H of 1.0 x 10^{-4} molar solution of HNO_3.

$$[H^+] = 1.0\times10^{-4} M$$
$$p^H = -\log_{10}[H^+]$$
$$p^H = -\log_{10}[1.0\times10^{-4}]$$
$$p^H = -(\log_{10}^{1} + \log_{10}^{10^{-4}}) \qquad [\log_{10}^{1} = 0]$$
$$p^H = -(0 - 4\log_{10}^{10})$$
$$p^H = -(0-4) \qquad [\log_{10}^{10} = 1]$$
$$p^H = 4$$

3. What is the p^H of 1.0 x 10^{-5} molar solution of KOH?

$$p^{OH} = -\log_{10}[OH^-]$$
$$p^{OH} = 1.0\times10^{-5}$$
$$p^{OH} = -\log_{10}[1.0\times10^{-5}]$$
$$p^{OH} = -(\log_{10}^{1} + \log_{10}^{10^{-5}}) \qquad \therefore [\log_{10}^{10} = 1]$$
$$p^{OH} = -(0 - 5\log_{10}^{10})$$
$$p^{OH} = -(0 - 5\times1) \qquad \therefore [\log_{10}^{1} = 0]$$
$$p^{OH} = 5$$
$$p^H + p^{OH} = 14$$
$$p^H = 14 - p^{OH}$$
$$p^H = 14 - 5$$
$$p^H = 9$$

4. The hydroxide ion concentration of a solution is 1 x 10^{-11} M. What is the p^H of a solution?

$$[OH^-] = 1\times10^{-11} M$$
$$p^H = ?$$
$$p^{OH} = -\log_{10}[OH^-]$$
$$p^{OH} = -\log_{10}[1\times10^{-11}]$$
$$p^{OH} = -(\log_{10}^{1} + \log_{10}^{10^{-11}}) \qquad \therefore [\log_{10}^{1} = 0]$$
$$p^{OH} = -(0 - 11\ \log_{10}^{10})$$
$$p^{OH} = -(0 - 11\times1) \qquad \therefore [\log_{10}^{10} = 1]$$
$$p^{OH} = 11$$
$$p^{OH} + p^{OH} = 14$$
$$p^H = 14 - p^{OH}$$
$$p^H = 14 - 11$$
$$p^H = 3$$

11. CARBON AND ITS COMPOUNDS

I. Answer in detail:

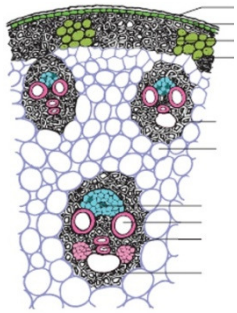
1. What is called homologous series? Give any three of its characteristics?
2. Arrive at, systematically, the IUPAC name of the compound: $CH_3 - CH_2 - CH_2 - OH$.
3. How is ethanol manufactured from sugarcane?
4. Give the balanced chemical equation of the following reactions:
   i) Neutralization of NaOH with ethanoic acid.
   (ii) Evolution of carbon dioxide by the action of ethanoic acid with $NaHCO_3$.
   (iii) Oxidation of ethanol by acidified potassium dichromate.
   (iv) Combustion of ethanol.
5. Write the characteristics of organic compounds.
6. Explain the classification of hydrocarbons.
7. Give the tests to identify saturated and unsaturated compounds.
8. List out the characteristics of hydrocarbons.
9. Give the uses of ethanoic acid.
10. Discuss the uses of organic compounds in our daily life.
11. Give the advantages of detergents over soaps.
12. Compare soaps and detergents.

12. PLANT ANATOMY AND PLANT PHYSIOLOGY

I. Answer in detail:

1. Differentiate the following
   a) Monocot root and Dicot root
   b) Aerobic and Anaerobic respiration
2. Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.
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?

4. The reactions of photosynthesis make up a biochemical pathway.
    A) What are the reactants and products for both light and dark reactions.
    B) Explain how the biochemical pathway of photosynthesis recycles many of its own reactions and identify the recycled reactants.
5. What are the functions of chloroplast?
6. What are the functions of mitochondria?
7. Difference between Dicot and Monocot stems.
8. Differentiate Dicot leaf and Monocot leaf?
9. Label the parts of the transverse section of a monocot stems?



10. How does photo synthesis takes place in plants that have red, brown and yellow leaves. How do they prepare food?
11. Write a note on vascular tissue system?
12. Describe the structure of mitochondria why is it is called power house of the cell?
13. Explain the role of sunlight in photosynthesis?
14. Explain the ultra structure of chloroplast?

13. STRUCTURAL ORGANISATION OF ANIMALS

I. Answer in detail

1. How is the circulatory system designed in leech to compensate the heart structure ?
2. How does locomotion take place in leech?
3. Explain the male reproductive system of rabbit with a labelled diagram.
4. Arjun is studying in tenth standard. He was down with fever and went to meet the doctor. As he went to the clinic he saw a patient undergoing treatment for severe leech bite. Being curious, Arjun asked the doctor why leech bite was not felt as soon as it attaches to the skin? What would have been the reply given by the doctor?
5. Write about the medicinal value of Leech.
6. Explain how the external morphology of leeches suited to his habitat and mode of life?
7. Explain the Digestive system of rabbit, with a neat labelled diagram.

14. TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

I. Answer in detail:

1. How do plants absorb water? Explain.
2. What is transpiration? Give the importance of transpiration.
3. Why are leucocytes classified as granulocytes and agranulocytes? Name each cell and mention its functions.
4. Differentiate between systole and diastole. Explain the conduction of heart beat.
5. Enumerate the functions of blood.
6. Explain open type and closed type circulation.
7. Write the functions of blood?
8. What is blood pressure? How is it expressed?
9. Tabulate the distribution of Antigen and Antibody in different blood groups?
10. Explain the type of blood circulation.

11. List the differences between artery and vein.
12. Write a note on ascent of sap
13. Define diffusion, Osmosis and Plasmolysis.
14. Explain the functions of Lymph?
15. Write a few strategies to prevent Heart disease.
16. Explain transpiration process in plants?

15. NERVOUS SYSTEM

I. Answer in detail:

1. Differentiate
    1. Voluntary and involuntary actions.
    2. Medullated and non-medullated nerve fibre.
2. With a neat labelled diagram explain the structure of a neuron.
3. Illustrate the structure and functions of brain.
4. What will you do if someone pricks your hand with a needle? Elucidate the pathway of response with a neat labelled diagram.
5. Describe the structure of spinal cord.
6. How nerve impulses are transferred from one neuron to next neuron?
7. Classify neurons based on its structure.
8. List the function of Cerebrospinal fluid?
9. Explain the types of reflexes?
10. Seetha accidentally touched hot cooker and immediately removed her hand. Explain the pathway taken by the nerve impulse to accomplish this reflex action.

16. PLANT AND ANIMAL HORMONES

1. (a) Name the gaseous plant hormone. Describe its three different actions in plants. (b) Which hormone is known as stress hormone in plants? Why?
2. Describe an experiment which demonstrates that growth stimulating hormone is produced at the tip of coleoptile.
3. Write the physiological effects of gibberellins.
4. Where are estrogens produced? What is the role of estrogens in the human body?
5. What are the conditions which occur due to lack of ADH and insulin? How are the conditions different from one another?
6. Susan's father feels very tired and frequently urinates. After clinical diagnosis he was advised to take an injection daily to maintain his blood glucose level. What would be the possible cause for this? Suggest preventive measures.
7. Explain three functions of Oestrogens?
8. Write physiological effects of cytokinins?
9. What would happen if the thyroid gland was removed?
10. What will happen, if the pancreas of a person stop functioning?
11. Pituitary gland are called as master gland? Justify.
12. Write a neat labelled diagram, explain the pituitary gland and the types of hormones?
13. Write a neat labelled diagram, explain thyroid gland, functions of thyroid hormone and its dysfunctions.
14. Explain the physiological effects of Auxins?

17. REPRODUCTION IN PLANTS AND ANIMALS

1. With a neat labelled diagram describe the parts of a typical angiospermic ovule.
2. What are the phases of menstrual cycle? Indicate the changes in the ovary and uterus.
3. In angiosperms the pollen germinates to produce pollen tube that carries two gametes. What is the purpose of carrying two gametes when single gamete can fertilize the egg?
4. Why menstrual cycle does not take place before puberty and during pregnancy?
5. Read the following passage and answer the questions that follow:

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

   a) What is first menstruation called? When does it occur?
   b) List out the napkin hygiene measures taken during menstruation?
   c) Do you think that Rahini's objection towards her parents was correct? If so, Why?

6. List the salient features of family welfare programmes?
7. Women generally cannot give birth to a girl child after 50 years of age? Why?
8. Sertoli cells are called nurse cells? Why?
9. In a bisexual flower, the stamens have been removed. Is it possible for this flower to produce seeds.
10. Write a note on agents of pollination?
11. Describe the structure of a human sperm.

18. HEREDITY

I. Answer in detail

1. Explain with an example the inheritance of dihybrid cross. How is it different from monohybrid cross?
2. How is the structure of DNA organised? What is the biological significance of DNA?
3. The sex of the new born 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?
4. Why DNA molecule is also called a Polynucleotide?
5. The human males are called heterogametic? Why?
6. How sickle cell anaemia is caused by the mutation of a single gene?
7. State the law of purity of gametes or the law of segregation?
8. Explain the role of okasaki fragments?
9. Write a note on euploidy?
10. List any three traits of pea plant selected by Mendel for his experiments and Mention their dominant and recessive form?
11. State the law of independent Assortment?
12. Differentiate diploid and haploid condition?
13. Mention the symptoms seen in the case of Down's syndrome?
14. How are chromosomes classified based on the position of centromere?
15. Write a note on DNA replication?
16. Write a note on mutation?

19. ORIGIN AND EVOLUTION OF LIFE

I. Answer in detail:

1. Natural selection is a driving force for evolution-How?
2. How do you differentiate homologous organs from analogous organs?
3. How does fossilization occur in plants?
4. Give the importance of fossils.
5. Explain Use and Disuse theory.

20. BREEDING AND BIOTECHNOLOGY

I Answer in detail

1. What are the effects of hybrid vigour in animals.
2. Describe mutation breeding with an example.
3. Biofortification may help in removing hidden hunger. How?
4. With a neat labelled diagram explain the techniques involved in gene cloning.
5. Discuss the importance of biotechnology in the field of medicine.
6. Write a note on selection.
7. "Genetically modified organisms" is one of the most tremendous development of genetic engineering. Justify.

21. HEALTH AND DISEASES

I. Answer in detail:

1. Suggest measures to overcome the problems of an alcoholic.
2. Changes in life style is a risk factor for occurrence of cardiovascular diseases. Can it be modified? If yes, suggest measures for prevention.
3. Write a note on smoking hazards and effects of Tobacco.
4. Write a note on prevention and control of AIDS.
5. What is Diabetes? Explain its types.
6. List the Harmful effects of Alcohol to Health.
7. Write a note on the treatment of Cancer.
8. Write a note on Coronary Heart Disease.
9. Give the ways of prevention and control of diabetes.

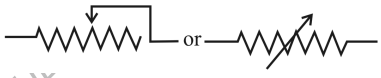
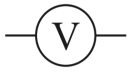
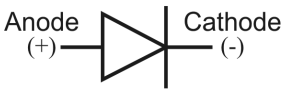
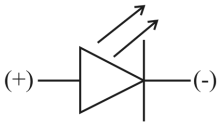
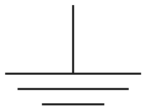
22. ENVIRONMENTAL MANAGEMENT

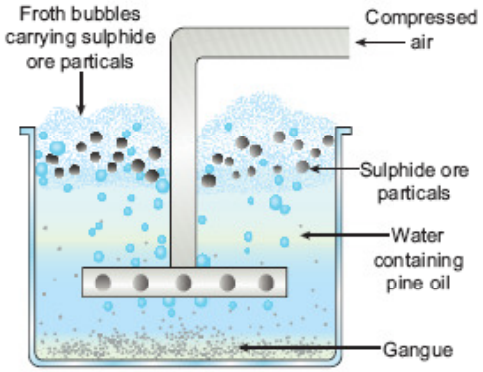
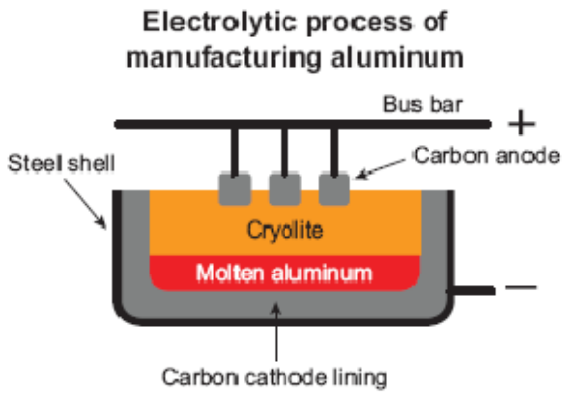
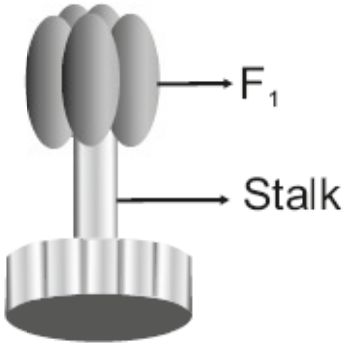
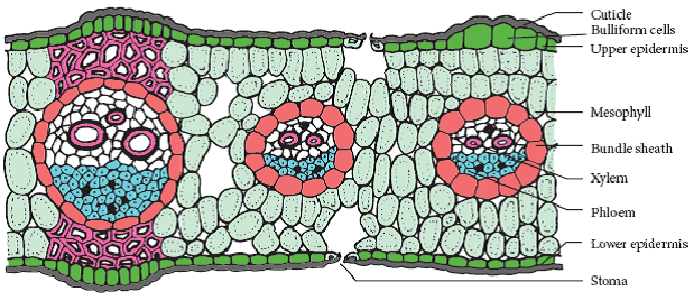
I. Answer in detail:

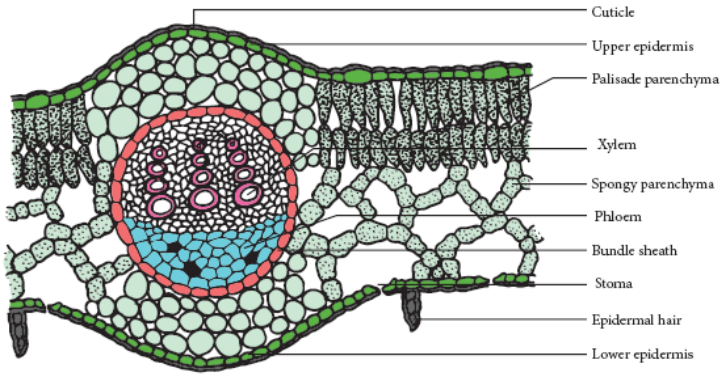
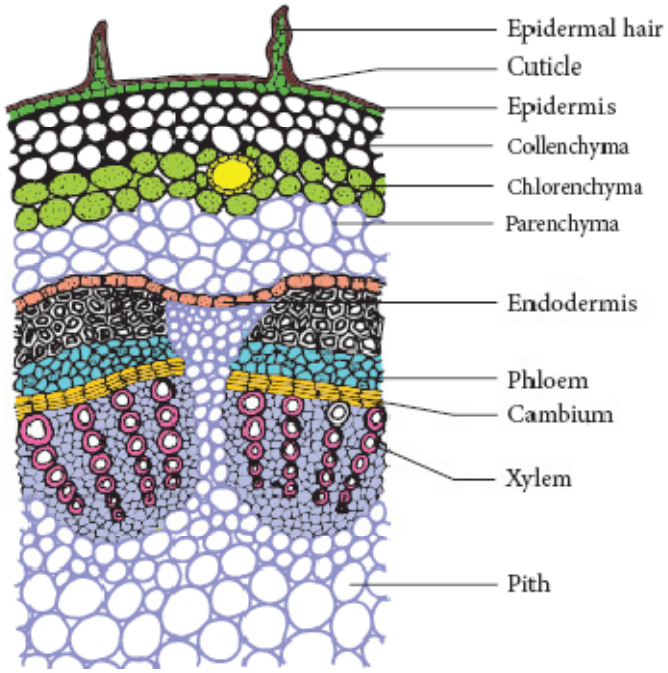
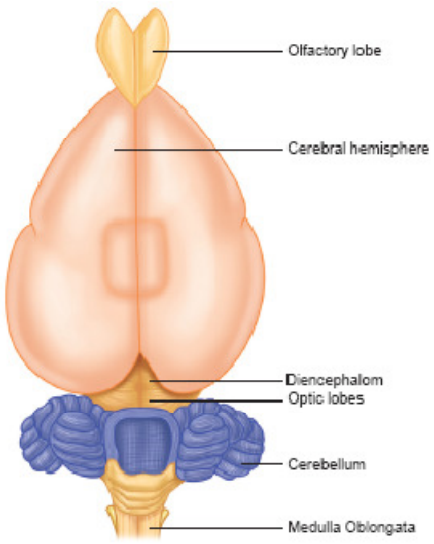
1. How does rainwater harvesting structures recharge ground water?
2. How will you prevent soil erosion?
3. What are the sources of solid wastes? How are solid wastes managed?
4. Enumerate the importance of forest.
5. What are the consequences of soil erosion?
6. Why is the management of forest and wildlife resource considered as a challenging task?
7. Mention the aims of Wildlife management.
8. List the steps to conserve Coal and Petroleum resources.
9. Explain the various steps involved in waste water treatment.

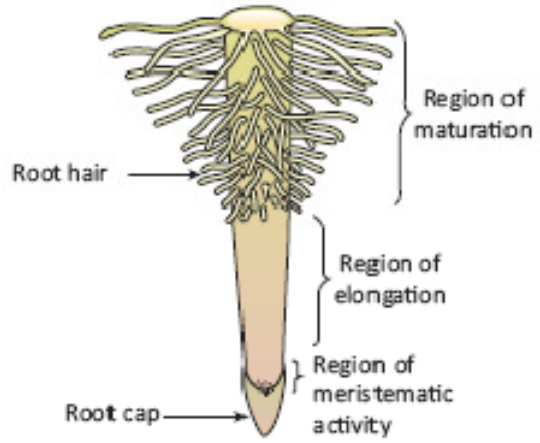
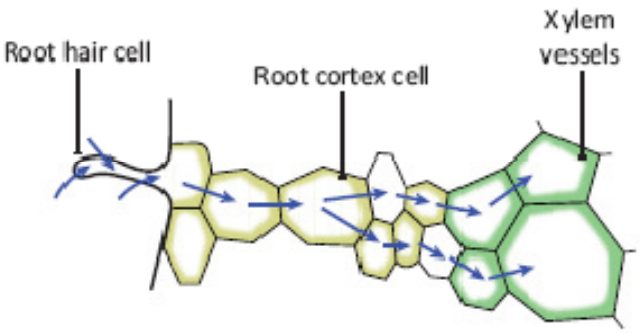
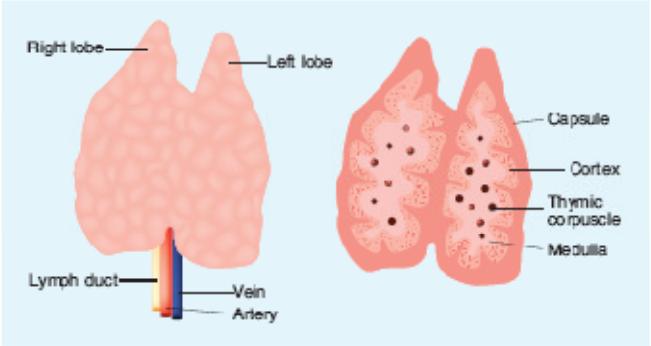
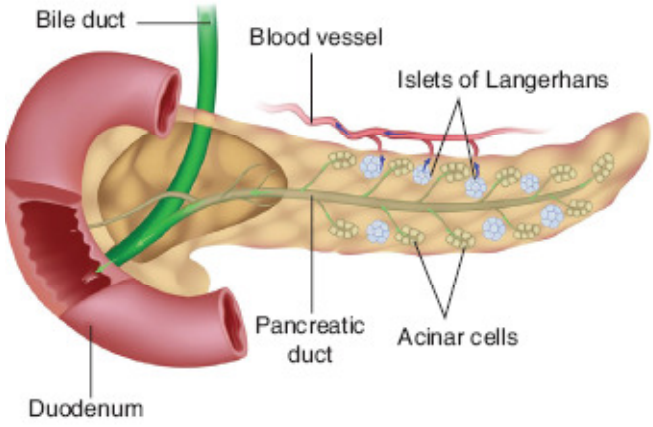
TABLE

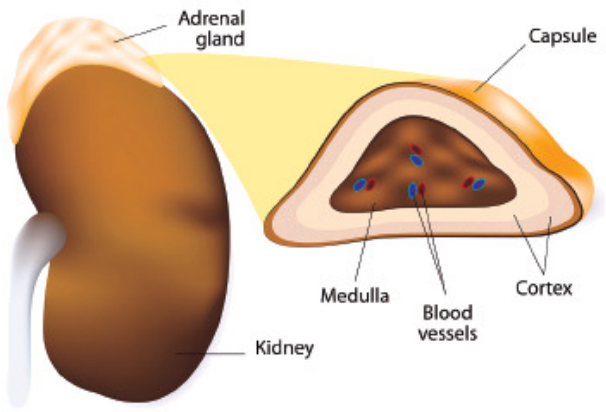
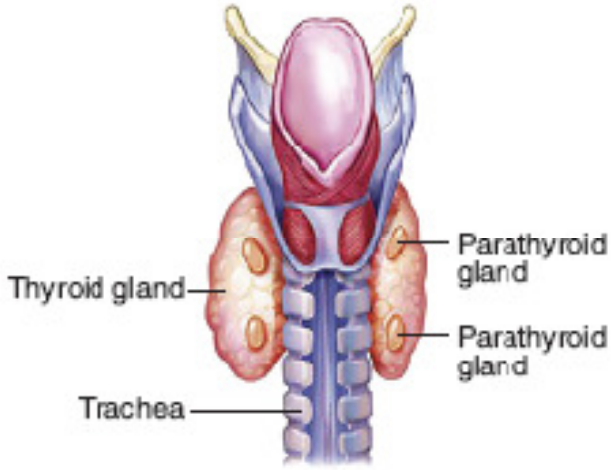
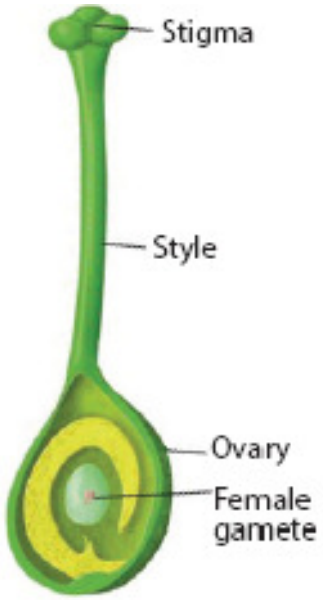
SYMBOLS OF SOME COMPONENTS OF A CIRCUIT

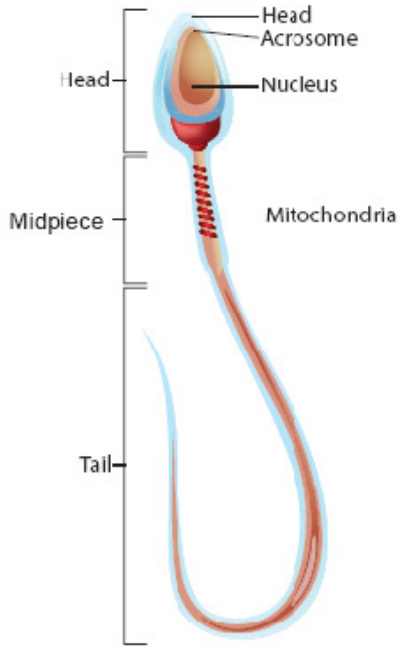
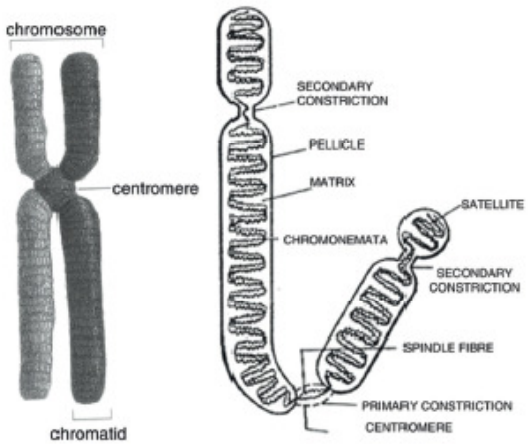
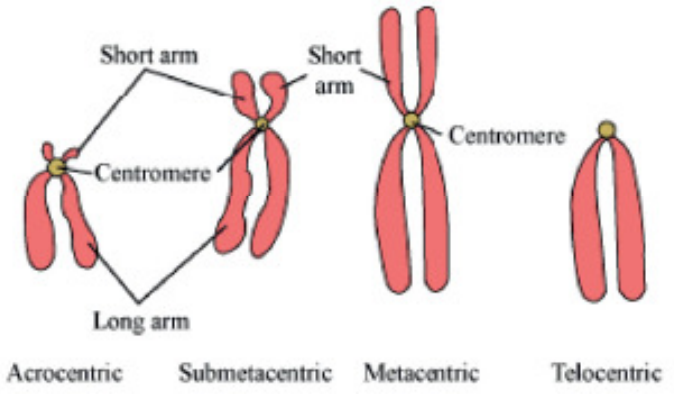
COMPONENT	USE OF THE COMPONENT	SYMBOL USED
Resistor	Used to fix the magnitude of the current through a circuit	
Variable resistor or Rheostat	Used to select the magnitude of the current through a circuit.	
Ammeter	Used to measure the current.	
Voltmeter	Used to measure the potential difference.	
Galvanometer	Used to indicate the direction of current.	
A diode	A diode has various uses, which you will study in higher classes.	
Light Emitting Diode (LED)	A LED has various uses which you will study in higher classes.	
Ground connection	Used to provide protection to the electrical components. It also serves as a reference point to measure the electric potential.	

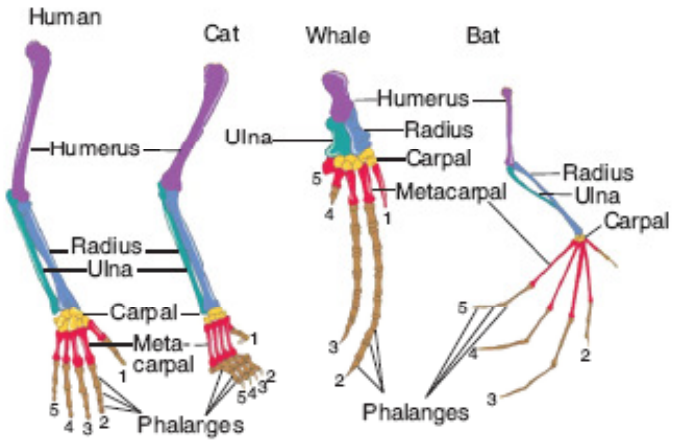
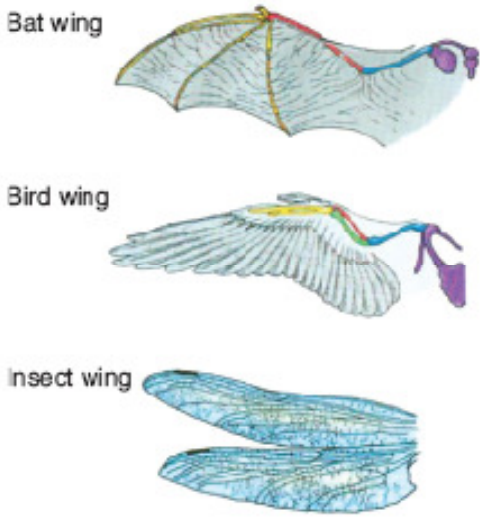
1. Froth floatation	 Froth floatation process for the concentration of sulphide ores.
2. Hall's Process	
3. Oxysomes	
4. Transverse section of monocot leaf	

5. Transverse section of dicot leaf	
6. Transverse section of dicot stem	
7. Brain of Rabbit (Dorsal view)	

8. Root tip with root hairs	
9. T.S. of root showing movement of water from soil to xylem.	
10. Thymus Gland	
11. Pancreas	

12. Adrenal Gland	
13. Parathyroid Gland	
14. Gynoecium	

15. Structure of sperm	
16. Structure of chromosome	
17. Types of chromosome based on position of centromere	

18. Forelimbs of vertebrates showing homologous structure	
19. Analogous structure showing a bat wing, a bird wing and an insect wing	
20. Bacterial cell