HINTS & SOLUTIONS
for
CBSE Preliminary 2010

1. The dimension of $\frac{1}{2}\varepsilon_0 E^2$, where ε_0 is permittivity of free space and E is electric field, is

   (1) MLT^{-1} (2) ML^2T^{-2}

   (3) $ML^{-1}T^{-2}$ (4) ML^2T^{-1}

Sol. Answer (3)

$$\text{Energy density} = \frac{M^1L^2T^{-2}}{L^3}$$

$$= M^1L^{-1}T^{-2}$$

2. A particle moves a distance x in time t according to equation $x = (t + 5)^{-1}$. The acceleration of particle is proportional to

   (1) (Velocity)$^{2/3}$ (2) (Velocity)$^{3/2}$

   (3) (Distance)^2 (4) (Distance)$^{-2}$

Sol. Answer (2)

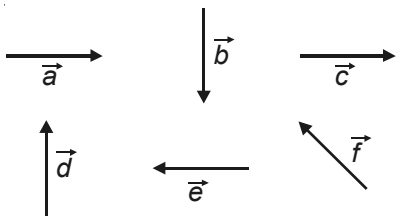
$x = (t + 5)^{-1}$

$v = -(t + 5)^{-2}$

$a = 2(t + 5)^{-3}$

$= 2v^{3/2}$

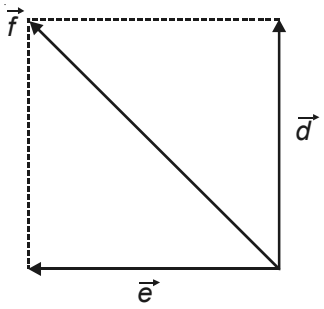
3. Six vectors, $\vec{a}$ through $\vec{f}$ have the magnitudes and directions indicated in the figure. Which of the following statements is true?



   (1) $\vec{b} + \vec{e} = \vec{f}$ (2) $\vec{b} + \vec{c} = \vec{f}$

   (3) $\vec{d} + \vec{c} = \vec{f}$ (4) $\vec{d} + \vec{e} = \vec{f}$

Sol. Answer (4)



4. A particle has initial velocity $(3\hat{i} + 4\hat{j})$ and has acceleration $(0.4\hat{i} + 0.3\hat{j})$. Its speed after 10 s is

(1) 10 units (2) 7 units

(3) $7\sqrt{2}$ units (4) 8.5 units

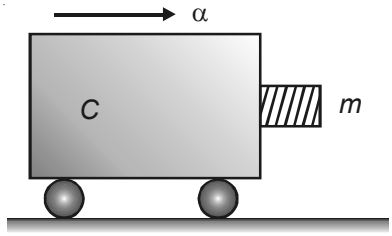
Sol. Answer (3)

$\vec{v} = \vec{u} + \vec{a}t$

$= 7\hat{i} + 7\hat{j}$

$v = 7\sqrt{2}$

5. A block of mass *m* is in contact with the cart *C* as shown in the figure.



The coefficient of static friction between the block and the cart is μ. The acceleration α of the cart that will prevent the block from falling satisfies

(1) $\alpha < \frac{g}{\mu}$ (2) $\alpha > \frac{mg}{\mu}$

(3) $\alpha > \frac{g}{\mu m}$ (4) $\alpha \geq \frac{g}{\mu}$

Sol. Answer (4)

$\mu m\alpha \geq mg$

$\alpha \geq \frac{g}{\mu}$

6. A man of 50 kg mass is standing in a gravity free space at a height of 10 m above the floor. He throws a stone of 0.5 kg mass downwards with a speed 2 m/s. When the stone reaches the floor, the distance of the man above the floor will be

(1) 20 m (2) 9.9 m

(3) 10.1 m (4) 10 m

Sol. Answer (3)

$m_1x_1 = m_2x_2$

$\Rightarrow \quad x_2 = \dfrac{m_1x_1}{m_2} = \dfrac{0.5 \times 10}{50} = 0.1$

Total height = 10 + 0.1 = 10.1 m

7. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of 2 m/s. The mass per unit length of water in the pipe is 100 kg/m. What is the power of the engine?

(1) 800 W (2) 400 W

(3) 200 W (4) 100 W

Sol. Answer (1)

$P = dv^3\rho$

$= \mu v^3$

$= 100 \times 8 = 800$ W

8. A ball moving with velocity 2 m/s collides head on with another stationary ball of double the mass. If the coefficient of restitution is 0.5 then their velocities (in m/s) after collision will be

(1) 0, 2 (2) 0, 1

(3) 1, 1 (4) 1, 0.5

Sol. Answer (2)

$m \times 2 = m \times v_1 + 2mv_2$

$2 = v_1 + 2v_2$

$0.5 \times 2 = v_2 - v_1$

Adding $v_2 = 1$, $v_1 = 0$

9. A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if

(1) $r \geq \dfrac{\mu g}{\omega^2}$ (2) $r = \mu g\omega^2$

(3) $r < \dfrac{\omega^2}{\mu g}$ (4) $r \leq \dfrac{\mu g}{\omega^2}$

Sol. Answer (4)

$\mu mg \geq mr\omega^2$

$\Rightarrow \quad r \leq \dfrac{\mu g}{\omega^2}$

10. A circular disk of moment of inertia I_t is rotating in a horizontal plane, about its symmetry axis, with a constant angular speed ω_i. Another disk of moment of inertia I_b is dropped coaxially onto the rotating disk. Initially the second disk has zero angular speed. Eventually both the disks rotate with a constant angular speed ω_f. The energy lost by the initially rotating disc to friction is

(1) $\dfrac{1}{2}\dfrac{I_bI_t}{(I_t + I_b)}\omega_i^2$ (2) $\dfrac{1}{2}\dfrac{I_b^2}{(I_t + I_b)}\omega_i^2$

(3) $\dfrac{1}{2}\dfrac{I_t^2}{(I_t + I_b)}\omega_i^2$ (4) $\dfrac{I_b - I_t}{(I_t + I_b)}\omega_i^2$

Sol. Answer (1)

Loss of energy,

$$\Delta E = \frac{1}{2} I_t \omega_i^2 - \frac{I_t^2 \omega_i^2}{2(I_t + I_b)}$$

$$= \frac{I_b I_t \omega_i^2}{2(I_t + I_b)}$$

11. Two particles which are initially at rest, move towards each other under the action of their internal attraction. If their speeds are v and $2v$ at any instant, then the speed of centre of mass of the system will be

(1) v (2) $2\ v$

(3) Zero (4) $1.5\ v$

Sol. Answer (3)

12. The radii of circular orbits of two satellites A and B of the earth, are $4R$ and R, respectively. If the speed of satellite A is $3\ V$, then the speed of satellite B will be

(1) $\frac{3V}{2}$ (2) $\frac{3V}{4}$

(3) $6\ V$ (4) $12\ V$

Sol. Answer (3)

$$V \propto \frac{1}{\sqrt{r}}$$

$$\Rightarrow \frac{V_2}{V_1} = \sqrt{\frac{r_1}{r_2}}$$

$$\Rightarrow V_2 = 2\ V_1$$

$$= 6\ V$$

13. A particle of mass M is situated at the centre of a spherical shell of same mass and radius a. The gravitational potential at a point situated at $\frac{a}{2}$ distance from the centre, will be

(1) $-\frac{4GM}{a}$ (2) $-\frac{3GM}{a}$

(3) $-\frac{2GM}{a}$ (4) $-\frac{GM}{a}$

Sol. Answer (2)

$$\frac{-GM}{a} - \frac{GM}{\frac{a}{2}}$$

$$= \frac{-3GM}{a}$$

14. A ball is dropped from a high rise platform at $t = 0$ starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18$ s. What is the value of v? (Take $g = 10\ m/s^2$)

(1) 60 m/s (2) 75 m/s

(3) 55 m/s (4) 40 m/s

Sol. Answer (2)

$$\frac{1}{2}g \times 18^2 = v \times 12 + \frac{1}{2}g \times 12^2$$

$v = 75$ m/s

15. A cylindrical metallic rod in thermal contact with two reservoirs of heat at its two ends conducts an amount of heat Q in time t. The metallic rod is melted and the material is formed into a rod of half the radius of the original rod. What is the amount of heat conducted by the new rod, when placed in thermal contact with the two reservoirs in time t?

(1) $\frac{Q}{2}$ (2) $\frac{Q}{4}$

(3) $\frac{Q}{16}$ (4) $2Q$

Sol. Answer (3)

$$A' = \frac{A}{4}$$

$$\Rightarrow L' = 4L$$

$$\Rightarrow \frac{Q'}{Q} = \frac{A'}{A}\frac{L}{L'} = \frac{1}{16}$$

$$\Rightarrow Q' = \frac{Q}{16}$$

16. The total radiant energy per unit area, normal to the direction of incidence, received at a distance R from the centre of a star of radius r, whose outer surface radiates as a black body at a temperature T K is given by

(1) $\frac{4\pi\sigma r^2 T^4}{R^2}$ (2) $\frac{\sigma r^2 T^4}{R^2}$

(3) $\frac{\sigma r^2 T^4}{4\pi r^2}$ (4) $\frac{\sigma r^4 T^4}{r^4}$

(Where σ is Stefan's Constant)

Sol. Answer (2)

17. If ΔU and ΔW represent the increase in internal energy and work done by the system respectively in a thermodynamical process, which of the following is true?

(1) $\Delta U = -\Delta W$, in a isothermal process (2) $\Delta U = -\Delta W$, in a adiabatic process

(3) $\Delta U = \Delta W$, in a isothermal process (4) $\Delta U = \Delta W$, in a adiabatic process

Sol. Answer (2)

18. The displacement of a particle along the x-axis is given by $x = a\sin^2\omega t$. The motion of the particle corresponds to

(1) Simple harmonic motion of frequency $\frac{\omega}{2\pi}$ (2) Simple harmonic motion of frequency $\frac{\omega}{\pi}$

(3) Simple harmonic motion of frequency $\frac{3\omega}{2\pi}$ (4) Non simple harmonic motion

Sol. Answer (4)

$\frac{d^2x}{dt^2} = -\omega^2 x$, for S.H.M. is not satisfied.

19. The period of oscillation of a mass M suspended from a spring of negligible mass is T. If along with it another mass M is also suspended, the period of oscillation will now be

(1) $\sqrt{2}T$ (2) T

(3) $\frac{T}{\sqrt{2}}$ (4) $2\ T$

Sol. Answer (1)

$T \propto \sqrt{M}$

$\frac{T_2}{T_1} = \sqrt{\frac{M+M}{M}}$

$T_2 = \sqrt{2}T_1$

20. A transverse wave is represented by $y = A\ \sin(\omega t - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity?

(1) A (2) $\frac{\pi A}{2}$

(3) πA (4) $2\pi A$

Sol. Answer (4)

$\frac{\omega}{k} = A\omega$

$\Rightarrow \frac{\lambda}{2\pi} = A$

$\Rightarrow \lambda = 2\pi A$

21. A tuning fork of frequency 512 Hz makes 4 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per sec when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

(1) 508 Hz (2) 510 Hz

(3) 514 Hz (4) 516 Hz

Sol. Answer (1)

Number of beats decreases so frequency of unknow $f = 512 - 4$

$= 508$ Hz

22. Which of the following statement is false for the properties of electromagnetic waves?

(1) These waves do not require any material medium for propagation

(2) Both electric and magnetic field vectors attains the maxima and minima at the same place and same time

(3) The energy in electromagnetic wave is divided equally between electric and magnetic vectors

(4) Both electric and magnetic field vectors are parallel to each other and perpendicular to the direction of propagation of wave

Sol. Answer (4)

23. A lens having focal length f and aperture of diameter d forms an image of intensity I. Aperture of diameter $\frac{d}{2}$ in central region of lens is covered by a black paper. Focal length of lens and intensity of image now will be respectively

(1) $\frac{f}{2}$ and $\frac{I}{2}$

(2) f and $\frac{I}{4}$

(3) $\frac{3f}{4}$ and $\frac{I}{2}$

(4) f and $\frac{3I}{4}$

Sol. Answer (4)

Focal length remains same $I \propto d^2$, Intensity of image will be $I - \frac{I}{4} = \frac{3I}{4}$.

24. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 45º. For which of the following value of μ the ray can undergo total internal reflection?

(1) $\mu = 1.25$

(2) $\mu = 1.33$

(3) $\mu = 1.40$

(4) $\mu = 1.50$

Sol. Answer (4)

$\mu > \sqrt{2}$

25. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be (e being the charge on an electron)

(1) $\frac{4\pi\varepsilon_0 Fd^2}{q^2}$

(2) $\frac{4\pi\varepsilon_0 Fd^2}{e^2}$

(3) $\sqrt{\frac{4\pi\varepsilon_0 Fe^2}{d^2}}$

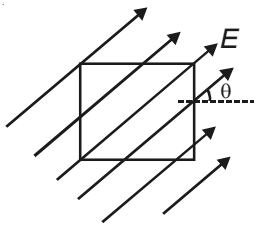
(4) $\sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$

Sol. Answer (4)

$F = \frac{1}{4\pi\varepsilon_0} \times \frac{e^2 n^2}{d^2}$

$n = \sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$

26. A square surface of side L meter in the plane of the paper is placed in a uniform electric field E (volt/m) acting along the same plane at an angle θ with the horizontal side of the square as shown in figure. The electric flux linked to the surface, in units of volt-m, is



(1) Zero

(2) EL^2

(3) $EL^2 \cos\theta$

(4) $EL^2 \sin\theta$

Sol. Answer (1)

$\phi = \vec{E} . \vec{S}$, here $\vec{E} \perp \vec{S} \Rightarrow \phi = 0$

27. A series combination of n_1 capacitors, each of value C_1, is charged by a source of potential difference 4 V. When another parallel combination of n_2 capacitors, each of value C_2, is charged by a source of potential difference V, it has the same (total) energy stored in it, as the first combination has. The value of C_2, in terms of C_1, is then

(1) $\frac{16C_1}{n_1n_2}$

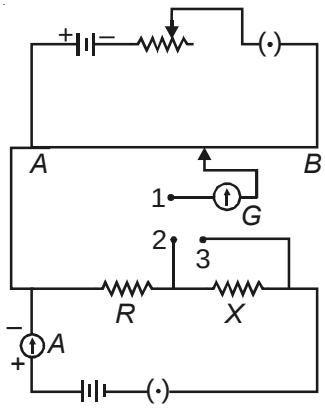
(2) $\frac{2C_1}{n_1n_2}$

(3) $16\frac{n_2}{n_1}C_1$

(4) $2\frac{n_2}{n_1}C_1$

Sol. Answer (1)

28. A potentiometer circuit is set up as shown. The potential gradient, across the potentiometer wire, is k volt/cm and the ammeter, present in the circuit, reads 1.0 A when two way key is switched off. The balance points, when the key between the terminals (i) 1 and 2 (ii) 1 and 3, is plugged in, are found to be at lengths l_1 cm and l_2 cm respectively. The magnitudes, of the resistors R and X, in ohms, are then, equal, respectively, to



(1) kl_1 and kl_2

(2) $k(l_2 - l_1)$ and kl_2

(3) kl_1 and $k(l_2 - l_1)$

(4) $k(l_2 - l_1)$ and kl_1

Sol. Answer (3)

Resistance per unit length = $k\frac{\Omega}{cm}$

$R \propto l_1$

$\Rightarrow R = kl_1$

$\Rightarrow x \propto (l_2 - l_1)$

$\Rightarrow x = k(l_2 - l_1)$

29. A galvanometer has a coil of resistance 100 ohm and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be

(1) 1000 Ω (2) 900 Ω

(3) 1800 Ω (4) 500 Ω

Sol. Answer (2)

$$R = \frac{V}{I_g} - G$$

30. Consider the following two statements

(A) Kirchhoff's junction law follows from the conservation of charge.

(B) Kirchhoff's loop law follows from the conservation of energy.

Which of the following is correct?

(1) Both (A) and (B) are correct

(2) Both (A) and (B) are wrong

(3) (A) is correct and (B) is wrong

(4) (A) is wrong and (B) is correct

Sol. Answer (1)

31. In producing chlorine by electrolysis 100 kW power at 125 V is being consumed. How much chlorine per minute is liberated (E.C.E. of chlorine is 0.367×10^{-6} kg/C)

(1) 3.67×10^{-3} kg (2) 1.76×10^{-3} kg

(3) 9.67×10^{-3} kg (4) 17.61×10^{-3} kg

Sol. Answer (4)

$$I = \frac{P}{V}$$

$m = ZIt$

32. A square current carrying loop is suspended in a uniform magnetic field acting in the plane of the loop . If the force on one arm of the loop is $\vec{F}$, the net force on the remaining three arms of the loop is

(1) $\vec{F}$ (2) $3\vec{F}$

(3) $-\vec{F}$ (4) $-3\vec{F}$

Sol. Answer (3)

$$\vec{F}_1 + \vec{F}_2 = 0$$

$$\vec{F}_1 = -\vec{F}_2$$

33. A thin ring of radius R meter has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolutions/s. The value of magnetic induction in Wb/m^2 at the centre of the ring is

(1) $\frac{\mu_0 qf}{2R}$ (2) $\frac{\mu_0 qf}{2\pi R}$

(3) $\frac{\mu_0 q}{2\pi fR}$ (4) $\frac{\mu_0 q}{2fR}$

Sol. Answer (1)

$I = qf$

$$B = \frac{\mu_0 I}{2R} = \frac{\mu_0 qf}{2R}$$

34. Electromagnets are made of soft iron because soft iron has

(1) High retentivity and low coercive force

(2) Low retentivity and high coercive force

(3) High retentivity and high coercive force

(4) Low retentivity and low coercive force

Sol. Answer (4)

35. A vibration magnetometer placed in magnetic meridian has a small bar magnet., The magnet executes oscillations with a time period of 2 sec in earth's horizontal magnetic field of 24 microtesla. When a horizontal field of 18 microtesla is produced opposite to the earth's field by placing a current carrying wire, the new time period of magnet will be

(1) 4 s

(2) 1 s

(3) 2 s

(4) 3 s

Sol. Answer (1)

$$T \propto \frac{1}{\sqrt{B}}$$

$$\frac{T_2}{T_1} = \sqrt{\frac{B_1}{B_2}} = \sqrt{\frac{24}{6}} = 2$$

36. A conducting circular loop is placed in a uniform magnetic field, B = 0.025 T with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of 1 mms^{-1}. The induced emf when the radius is 2 cm is

(1) 2 μV

(2) 2 $\pi\mu$V

(3) $\pi\mu V$

(4) $\frac{\pi}{2}\mu$V

Sol. Answer (3)

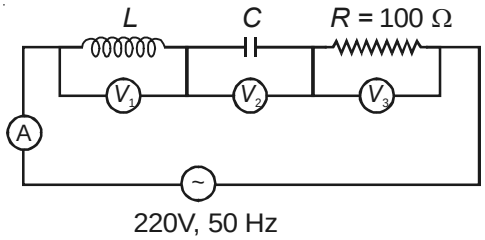
$\phi = B\pi r^2$

$$|\varepsilon| = \frac{d\phi}{dt} = B\pi 2r\frac{dr}{dt}$$

$= 0.025 \times \pi \times 2 \times 10^{-2} \times 1 \times 10^{-3}$

$= \pi\mu V$

37. In the given circuit the reading of voltmeter V_1 and V_2 are 300 volts each. The reading of the voltmeter V_3 and ammeter A are respectively



220V, 50 Hz

(1) 100 V, 2.0 A

(2) 150 V, 2.2 A

(3) 220 V, 2.2 A

(4) 220 V, 2.0 A

Sol. Answer (3)

38. A 220-volt input is supplied to a transformer. The output circuit draws a current of 2.0 ampere at 440 volts. If the efficiency of the transformer is 80%, the current drawn by the primary windings of the transformer is

(1) 5.0 ampere
(2) 3.6 ampere
(3) 2.8 ampere
(4) 2.5 ampere

Sol. Answer (1)

$$I_1 = \frac{E_2 I_2}{\eta E_1}$$

$$= \frac{440 \times 2}{220} \times \frac{100}{80}$$

$$= 5 \text{ A}$$

39. A source S_1 is producing 10^{15} photons per second of wavelength 5000 Å. Another source S_2 is producing 1.02×10^{15} photons per second of wavelength 5100 Å

Then (power of S_2)/(power of S_1) is equal to

(1) 0.98
(2) 1.00
(3) 1.02
(4) 1.04

Sol. Answer (2)

$$\frac{P_1}{P_2} = \frac{n_1 \frac{hc}{\lambda_1}}{n_2 \frac{hc}{\lambda_2}}$$

$$\frac{P_2}{P_1} = \frac{n_2 \lambda_1}{n_1 \lambda_2} = \frac{1.02 \times 10^{15} \times 5000 \text{Å}}{10^{15} \times 5100 \text{ Å}} = 1$$

40. A beam of cathode rays is subjected to crossed Electric (E) and Magnetic field (B). The fields are adjusted such that the beam is not deffected. The specific charge of the cathode rays is given by (where V is the potential difference between cathode and anode)

(1) $\frac{E^2}{2VB^2}$
(2) $\frac{B^2}{2VE^2}$
(3) $\frac{2VB^2}{E^2}$
(4) $\frac{2VE^2}{B^2}$

Sol. Answer (1)

$$qV = \frac{1}{2}mv^2$$

$$\Rightarrow \frac{q}{m} = \frac{v^2}{2V}, \; v = \frac{E}{B}$$

$$= \frac{E^2}{2VB^2}$$

41. The potential difference that must be applied to stop the fastest photo electrons emitted by a nickel surface, having work function 5.01 eV, when ultraviolet light of 200 nm falls on it, must be

(1) 1.2 V (2) 2.4 V

(3) –1.2 V (4) –2.4 V

Sol. Answer (3)

$$eV_0 = \frac{hc}{\lambda} - \phi$$

$$= \frac{1240\,evnm}{200\,nm} - 5.01\,\text{eV}$$

= (6.2 – 5.01) eV = 1.2 eV

42. The activity of a radioactive sample is measured as N_0 counts per minute at t = 0 and N_0/e counts per minute at t = 5 minutes. The time (in minutes) at which the activity reduces to half its value is

(1) $5 \log_e 2$ (2) $\log_e \frac{2}{5}$

(3) $\frac{5}{\log_e 2}$ (4) $5 \log_{10} 5$

Sol. Answer (1)

Mean life = T_{av} = 5 minute

$$\Rightarrow \quad \lambda = \frac{1}{5}/\text{minute}$$

$$T_{1/2} = \frac{\log_e 2}{\lambda} = 5 \log_e 2$$

43. The energy of a hydrogen atom in the ground state is –13.6 eV. The energy of a He^+ ion in the first excited state will be

(1) –6.8 eV (2) –13.6 eV

(3) –27.2 eV (4) –54.4 eV

Sol. Answer (2)

$$E_n = \frac{z^2}{n^2}(-13.6\text{ eV})$$

$$= \frac{4}{4}(-13.6\text{ eV})$$

= –13.6 eV

44. The mass of a ^7_3Li nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of ^7_3Li nucleus is nearly

(1) 23 MeV (2) 46 MeV

(3) 5.6 MeV (4) 3.9 MeV

Sol. Answer (3)

$BE = \Delta Mc^2$

$= 0.042 \times 931$ MeV

$$\frac{BE}{A} = \frac{0.042 \times 931}{7} \text{MeV}$$

$= 5.6$ MeV

45. A alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then the distance of closest approach for the alpha nucleus will be proportional to

(1) $\frac{1}{v^4}$ (2) $\frac{1}{Ze}$

(3) v^2 (4) $\frac{1}{m}$

Sol. Answer (4)

$$r_0 = \frac{1}{4\pi\varepsilon_0} \frac{ze^2}{\frac{1}{2}mv^2}$$

46. A common emitter amplifier has a voltage gain of 50, an input impedance of 100 Ω and an output impedance of 200 Ω. The power gain of the amplifier is

(1) 50 (2) 500

(3) 1000 (4) 1250

Sol. Answer (4)

$$A_V = \frac{I_C R_{out}}{R_{in}} \Rightarrow \frac{I_C}{I_B} = \frac{50 \times 100}{200} = 25$$

$$P_{out} = \frac{V_{out}}{V_{in}}\left(\frac{I_C}{I_B}\right)$$

47. Which one of the following bonds produces a solid that reflects light in the visible region and whose electrical conductivity decreases with temperature and has high melting point?

(1) Covalent bonding

(2) Metallic bonding

(3) van der Waal's bonding

(4) Ionic bonding

Sol. Answer (2)

48. The device that can act as a complete electronic circuit is

(1) Zener diode

(2) Junction diode

(3) Integrated circuit

(4) Junction transistor

Sol. Answer (3)

49. Which of the following statement is False?

(1) The resistance of intrinisic semiconductor decreases with increase of temperature

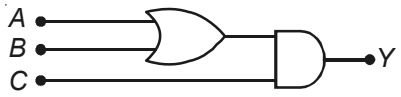
(2) Pure Si doped with trivalent impurities gives a p-type semiconductor

(3) Majority carries in a n-type semiconductors are holes

(4) Minority carries in a p-type semiconductor are electrons

Sol. Answer (3)

50. To get an output $Y = 1$ from the circuit shown below, the input must be



	A	B	C
(1)	1	0	0
(2)	0	1	0
(3)	0	0	1
(4)	1	0	1

Sol. Answer (4)

51. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to

(1) Increase in number of ions

(2) Increase in ionic mobility of ions

(3) 100% ionisation of electrolyte at normal dilution

(4) Increase in both i.e. number of ions and ionic mobility of ions

Sol. Answer (2)

In strong electrolyte, number of ions remains constant so equivalent conductance increases due to increase in ionic mobility

52. 25.3 g of sodium carbonate, Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na^+ and carbonate ions, CO_3^{2-} are respectively (Molar mass of Na_2CO_3 = 106 g mol^{-1})

(1) 0.477 M and 0.477 M

(2) 0.955 M and 1.910 M

(3) 1.910 M and 0.955 M

(4) 1.90 M and 1.910 M

Sol. Answer (3)

$$\text{Molarity} = \frac{25.3 \times 1000}{106 \times 250} = 0.955 \text{ M}$$

$$Na_2CO_3 \rightarrow 2Na^+ + CO_3^{-2}$$

= 2 × 0.955 0.955 M

= 1.910 M

53. Property of the alkaline earth metals that increase with their atomic number

(1) Electronegativity
(2) Solubility of their hydroxides in water
(3) Solubility of their sulphates in water
(4) Ionization energy

Sol. Answer (2)

Solubility of alkaline earth metals increases with increase in atomic number

54. Which of the following pairs has the same size?

(1) Zn^{2+}, Hf^{4+}
(2) Fe^{2+}, Ni^{2+}
(3) Zr^{4+}, Ti^{4+}
(4) Zr^{4+}, Hf^{4+}

Sol. Answer (4)

Zr^{+4} and Hf^{+4} has similar ionic radii due to lanthanoid contraction

55. In a buffer solution containing equal concentration of B^- and HB, the K_b for B^- is 10^{-10}. The pH of buffer solution is

(1) 4
(2) 10
(3) 7
(4) 6

Sol. Answer (1)

$$pOH = pK_b + \log\frac{[B^-]}{[HB]}$$

pOH = 10 ($\because$ concentration of $[B^-]$ = [HB])

$\therefore$ pH = 14 – 10 = 4

56. An aqueous solution is 1.00 molal in KI. Which change will cause the vapour pressure of the solution to increase?

(1) Addition of water
(2) Addition of NaCl
(3) Addition of Na_2SO_4
(4) Addition of 1.00 molal KI

Sol. Answer (1)

With addition of water, concentration decreases thus vapour pressure increases

57. What is $[H^+]$ in mol/L of a solution that is 0.20 M in CH_3COONa and 0.10 M in CH_3COOH? K_a for $CH_3COOH = 1.8 \times 10^{-5}$.

(1) 9.0×10^{-6}
(2) 3.5×10^{-4}
(3) 1.1×10^{-5}
(4) 1.8×10^{-5}

Sol. Answer (1)

$$\underset{C-x}{CH_3COOH} \rightleftharpoons \underset{x}{CH_3COO^-} + \underset{x}{H^+}$$

$$\underset{0.2}{CH_3COONa} \longrightarrow \underset{0.2M}{CH_3COO^-} + \underset{0.2M}{Na^+}$$

$$K_a = \frac{[CH_3COO^-]\,[H^+]}{[CH_3COOH]}$$

$[CH_3COOH] = C - x \approx C = 0.1\ M$

$[CH_3COO^-] = 0.2 + x \approx 0.2\ M$

$\therefore \quad [H^+] = \dfrac{K_a[CH_3COOH]}{[CH_3COO^-]}$

$= \dfrac{1.8\times10^{-5}\times0.1}{0.2}$

$[H^+] = 9 \times 10^{-6}$

58. For the reaction $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ the value of rate of disappearance of N_2O_5 is given as 6.25×10^{-3}mol $L^{-1}s^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as:

(1) 1.25×10^{-2} mol $L^{-1}s^{-1}$ and 6.25×10^{-3} mol $L^{-1}s^{-1}$

(2) 6.25×10^{-3} mol $L^{-1}s^{-1}$ and 6.25×10^{-3} mol $L^{-1}s^{-1}$

(3) 1.25×10^{-2} mol $L^{-1}s^{-1}$ and 3.125×10^{-3} mol $L^{-1}s^{-1}$

(4) 6.25×10^{-3} mol $L^{-1}s^{-1}$ and 3.125×10^{-3} mol $L^{-1}s^{-1}$

Sol. Answer (3)

$N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$

$-\dfrac{d[N_2O_5]}{dt} = \dfrac{1}{2}\dfrac{d[NO_2]}{dt} = \dfrac{2d[O_2]}{dt}$

$\dfrac{d[NO_2]}{dt} = \dfrac{-2d[N_2O_5]}{dt} = 2\times6.25\times10^{-3}$

$= 1.25 \times 10^{-2}$ mol $L^{-1}s^{-1}$

$\dfrac{d[O_2]}{dt} = -\dfrac{1}{2}\dfrac{d[N_2O_5]}{dt}$

$= \dfrac{1}{2}\times6.25\times10^{-3}$

$= 3.125 \times 10^{-3}$ mol $L^{-1}s^{-1}$

59. Standard entropies of X_2, Y_2 and XY_3 are 60, 40 and 50 $JK^{-1}mol^{-1}$ respectively. For the reaction $\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$, $\Delta H = -30kJ$ to be at equilibrium, the temperature should be

(1) 500 K (2) 750 K

(3) 1000 K (4) 1250 K

Sol. Answer (2)

$\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$

$\Delta S^o = \sum S_P^o - \sum S_R^o$

$= 50 - (30 + 60)$

$\Delta S° = -40\ JK^{-1}\ mol^{-1}$

$$T = \frac{\Delta H^o}{\Delta S^o} = \frac{-30 \times 10^3\ J\ mol^{-1}}{-40\ JK^{-1} mol^{-1}} = 750K$$

60. During the kinetic study of the reaction $2A + B \rightarrow C + D$, following results were obtained

Run	[A] / mol L^{-1}	[B] / mol L^{-1}	Initial rate of formation of D/mol $L^{-1}min^{-1}$
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Based on the above data which one of the following is correct?

(1) rate = $k[A][B]^2$ (2) rate = $k[A]^2[B]$

(3) rate = $k[A][B]$ (4) rate = $k[A]^2[B]^2$

Sol. Answer (1)

$$\frac{7.2 \times 10^{-2}}{2.88 \times 10^{-1}} = \frac{[0.2]^b [0.3]^a}{[0.4]^b [0.3]^a}$$

$$\therefore \frac{1}{4} = \frac{1}{2^b}$$

$2^2 = 2^b$

$b = 2$

$$\frac{6 \times 10^{-3}}{2.4 \times 10^{-2}} = \frac{[0.1]^a [0.1]^b}{[0.4]^a [0.1]^b}$$

$$\frac{1}{4} = \frac{1}{4^a}$$

$4^1 = 4^a$

$a = 1$

61. For the reduction of silver ions with copper metal, the standard cell potential was found to be +0.46 V at 25°C. The value of standard Gibbs energy, ΔG^0 will be (F = 96500 C mol^{-1})

(1) –98.0 kJ (2) –89.0 kJ

(3) –89.0 J (4) –44.5 kJ

Sol. Answer (2)

$Cu + 2Ag^{+} \rightarrow Cu^{+2} + 2Ag$

$\Delta G^{\circ} = -nFE^{\circ} = -2 \times 96500 \times 0.46$

$= -88780\ J$

$\approx -89\ kJ$

62. Which one of the following species does not exist under normal conditions?

(1) Li_2 (2) Be_2^{+}

(3) Be_2 (4) B_2

Sol. Answer (3)

Bond order of Be_2 is zero so, does not exist.

63. AB crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between two oppositively charged ions in the lattice is

(1) 300 pm (2) 335 pm

(3) 250 pm (4) 200 pm

Sol. Answer (2)

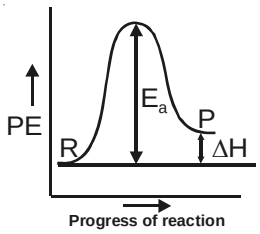
$2(r^{+} + r^{-}) = \sqrt{3}a$

64. For an endothermic reaction, energy of activation is E_a and enthalpy of reaction is ΔH (both of these in kJ/mol). Minimum value of E_a will be

(1) Equal to zero (2) Less than ΔH

(3) Equal to ΔH (4) More than ΔH

Sol. Answer (4)



65. Which one of the following ions has electronic configuration $[Ar]3d^6$?

(1) Co^{3+} (2) Ni^{3+}

(3) Mn^{3+} (4) Fe^{3+}

(At. nos. Mn = 25, Fe = 26, Co = 27, Ni = 28)

Sol. Answer (1)

$Co = [Ar]3d^7 4s^2$

$\therefore \quad Co^{+3} = [Ar]3d^6$

66. In which of the following equilibrium K_C and K_P are not equal?

(1) $2C_{(s)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$ (2) $2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$

(3) $SO_{2(g)} + NO_{2(g)} \rightleftharpoons SO_{3(g)} + NO_{(g)}$ (4) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

Sol. Answer (1)

$K_P = K_C (RT)^{\Delta n_g}$

$\Delta n_g = 0$ for the reaction $2C(g) + O_2(g) \rightleftharpoons 2CO_2(g)$

Thus $K_P = K_C$

67. If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its $K_{(SP)}$ is

(1) $5.00 \times 10^{-7}\ M^3$ (2) $4.00 \times 10^{-6}\ M^3$

(3) $4.00 \times 10^{-7}\ M^3$ (4) $5.00 \times 10^{-6}\ M^3$

Sol. Answer (1)

pH = 12, so pOH = 2

$\therefore [OH^-] = 10^{-2}$

$$Ba(OH)_2 \rightleftharpoons \underset{S}{Ba^{+2}} + \underset{2S}{2OH^-}$$

$2S = 10^{-2}$

$$S = \frac{10^{-2}}{2} = 5 \times 10^{-3} M$$

$K_{SP} = [Ba^{+2}]\ [OH^-]^2$

$= [5 \times 10^{-3}]\ [10^{-2}]^2$

$K_{SP} = 5 \times 10^{-7} M^3$

68. Which of the following ions will exhibit colour in aqueous solutions?

(1) Sc^{3+} (z = 21) (2) La^{3+} (z = 57)

(3) Ti^{3+} (z = 22) (4) Lu^{3+} (z = 71)

Sol. Answer (3)

$Ti^{+3} = 3d^1$, Ti^{+3} contains an unpaired electron so will exhibit colour in aqueous solution

69. The correct order of increasing bond angles in the following species is

(1) $ClO_2^- < Cl_2O < ClO_2$ (2) $Cl_2O < ClO_2 < ClO_2^-$

(3) $ClO_2 < Cl_2O < ClO_2^-$ (4) $Cl_2O < ClO_2^- < ClO_2$

Sol. Answer (1)

Fact

70. Which one of the following compounds is a peroxide?

(1) NO_2 (2) KO_2

(3) BaO_2 (4) MnO_2

Sol. Answer (3)

BaO_2 has peroxide linkage

71. In which of the following pairs of molecules/ions, the central atoms have sp^2 hybridization?

(1) BF_3 and NH_2^- (2) NO_2^- and NH_3

(3) BF_3 and NO_2^- (4) NH_2^- and H_2O

Sol. Answer (3)

BF_3 and NO_2^- are sp^2 while NH_2^-, NH_3 and H_2O are sp^3 hybridised

72. The correct order of the decreasing ionic radii among the following isoelectronic species is

(1) $K^+ > Ca^{2+} > Cl^- > S^{2-}$ (2) $Ca^{2+} > K^+ > S^{2-} > Cl^-$

(3) $Cl^- > S^{2-} > Ca^{2+} > K^+$ (4) $S^{2-} > Cl^- > K^+ > Ca^{2+}$

Sol. Answer (4)

Among isoelectronic species, ionic radii increases with increase in negative charge as Z_{eff} decreases and ionic radii decreases with increase in positive charge as Z_{eff} increases.

73. The number of atoms in 0.1 mol of a triatomic gas is ($N_A = 6.02 \times 10^{23}$ mol^{-1})

(1) 1.800×10^{22} (2) 6.026×10^{22}

(3) 1.806×10^{23} (4) 3.600×10^{23}

Sol. Answer (3)

Number of atoms $= N_A \times \text{mole} \times 3$

$= 6.023 \times 10^{23} \times 0.1 \times 3$

$= 1.806 \times 10^{23}$

74. Which of the following complex ion is not expected to absorb visible light?

(1) $[Ni(H_2O_6)]^{2+}$ (2) $[Ni(CN)_4]^{2-}$

(3) $[Cr(NH_3)_6]^{3+}$ (4) $[Fe(H_2O)_6]^{2+}$

Sol. Answer (2)

$[Ni(CN)_4]^{-2}$ do not contain unpaired electrons so cannot absorb visible light.

75. Which of the following alkaline earth metal sulphates has hydration enthalpy higher than the lattice enthalpy?

(1) $SrSO_4$ (2) $CaSO_4$

(3) $BeSO_4$ (4) $BaSO_4$

Sol. Answer (3)

Hydration energy decreases down the group, whereas lattice energy remains almost constant.

76. The existence of two different coloured complexes with the composition of $[Co(NH_3)_4Cl_2]^+$ is due to

(1) Ionization isomerism (2) Linkage isomerism

(3) Geometrical isomerism (4) Cooridnation isomerism

Sol. Answer (3)

As cis and trans forms present

77. Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$, are respectively

(1) + 3, + 4, + 5 (2) + 3, + 5, + 4

(3) + 5, + 3, + 4 (4) + 5, + 4, + 3

Sol. Answer (1)

$H_4P_2O_5$ $2x = 6$
$x = 3$

$H_4P_2O_6$ $2x = 8$
$x = 4$

$H_4P_2O_7$ $2x = 10$
$x = 5$

78. The tendency of BF_3, BCl_3 and BBr_3 to behave as Lewis acid decreases in the sequence

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BCl_3 > BF_3 > BBr_3$

(3) $BBr_3 > BCl_3 > BF_3$ (4) $BBr_3 > BF_3 > BCl_3$

Sol. Answer (3)

$p\pi$ back bonding decreases in the order $BBr_3 > BCl_3 > BF_3$

79. Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl?

(1) S < O < Cl < F (2) Cl < F < O < S

(3) O < S < F < Cl (4) F < S < O < Cl

Sol. Answer (3)

Group 17 > Group 16

Group 17 $\rightarrow$ Cl > F > Br > I

Group 16 $\rightarrow$ S > Se > Te > Po > O

80. Crystal field stabilization energy for high spin d^4 octahedral complex is

(1) $-0.6\ \Delta_0$ (2) $-1.8\ \Delta_0$

(3) $-1.6\ \Delta_0 + P$ (4) $-1.2\ \Delta_0$

Sol. Answer (1)

$3(-0.4) + 1(0.6)$

$= -0.6\ \Delta_0$

81. In which one of the following species the central atom has the type of hybridisation which is not the same as that present in the other three?

(1) PCl_5 (2) SF_4

(3) I_3^- (4) $SbCl_5^{2-}$

Sol. Answer (4)

$SbCl_5^{2-} - sp^3d^2$

82. Which one of the following molecular hydrides acts as a Lewis acid?

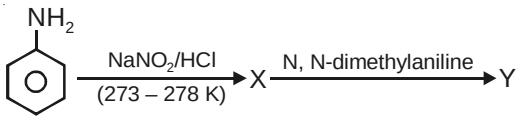
(1) CH_4 (2) NH_3

(3) H_2O (4) B_2H_6

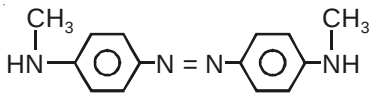
Sol. Answer (4)

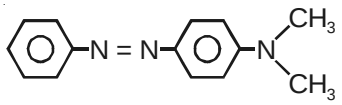
B_2H_6 is e^- deficient

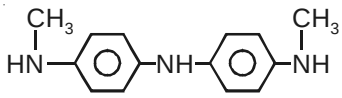
83. Aniline in a set of the following reactions yielded a coloured product Y

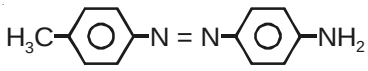


The structure of Y would be

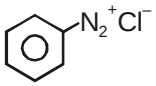
(1) 

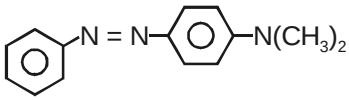
(2) 

(3) 

(4) 

Sol. Answer (2)

X = 

Y = 

84. The reaction of toluence with Cl_2 in presence of $FeCl_3$ gives X and reaction in presence of light gives Y. Thus, X and Y are

(1) X = Benzyl chloride, Y = m-chlorotoluene

(2) X = Benzal chloride, Y = o-chlorotoluene

(3) X = m-chlorotoluene, Y = p-chlorotoluene

(4) Y = o-and p-chlorotoluene, Y = Trichloromethyl benzene

Sol. Answer (4)

Cl_2 in presence of $FeCl_3 \rightarrow$ Ring substitution.

Cl_2 in presence of light $\rightarrow$ Side chain substitution.

85. Liquid hydrocarbons can be converted to a mixture gaseous hydrocarbons by

(1) Hydrolysis (2) Oxidation

(3) Cracking (4) Distillation under reduced pressure

Sol. Answer (3)

Due to cracking.

86. Which one of the following is employed as a Tranquilizer drug?

(1) Mifepristone (2) Promethazine

(3) Valium (4) Naproxen

Sol. Answer (3)

Fact.

87. Which one of the following does *not* exhibit the phenomenon of mutarotation?

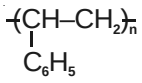
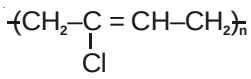
(1) (–) Fructose (2) (+) Sucrose

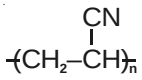
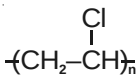
(3) (+) Lactose (4) (+) Maltose

Sol. Answer (2)

Due to absence of hemiacetal linkage.

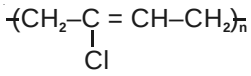
88. Which of the following structures represents Neoprene polymer?

(1)  (2) 

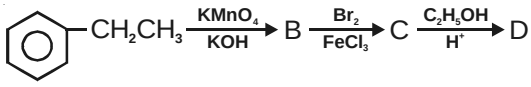
(3)  (4) 

Sol. Answer (2)

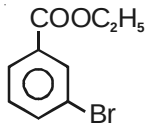
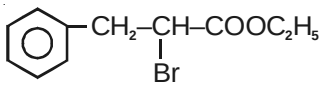
Polymer is neoprene.

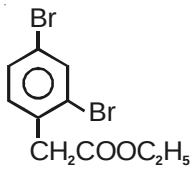
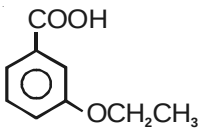
Chloroprene is monomer = 

89. In a set of reactions, ethyl benzene yielded a product D.

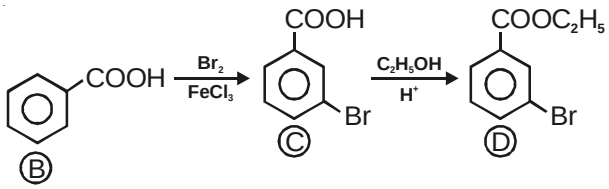


'D' would be

(1)  (2) 

(3)  (4) 

Sol. Answer (1)

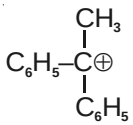


90. Which one is most reactive towards S_N1 reaction?

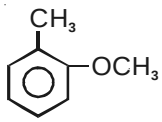
(1) $C_6H_5CH_2Br$ (2) $C_6H_5CH(C_6H_5)Br$

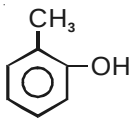
(3) $C_6H_5CH(CH_3)Br$ (4) $C_6H_5C(CH_3)(C_6H_5)Br$

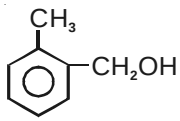
Sol. Answer (4)

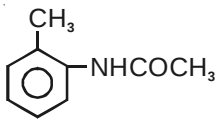
As  carbocation most stable.

91. Which one is most reactive towards electrophilic reagent?

(1) 

(2) 

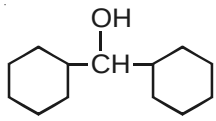
(3) 

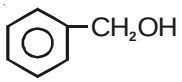
(4) 

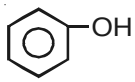
Sol. Answer (2)

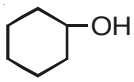
Due to greater e^- releasing effect.

92. Which one of the following compounds has the most acidic nature?

(1) 

(2) 

(3) 

(4) 

Sol. Answer (3)

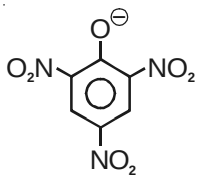
Phenoxide ions more resonance stabilized, therefore more acidic.

93. Given are cyclohexanol (I), acetic acid (II), 2, 4, 6-trinitrophenol (III) and phenol (IV). In these the order of decreasing acidic character will be

(1) III > IV > II > I (2) III > II > IV > I

(3) II > III > I > IV (4) II > III > IV > I

Sol. Answer (2)



Maximum resonance stabilized and maximum-I and –M effect due to three $–NO_2$ groups, therefore more acidic than CH_3COOH.

94. Which of the following statements about primary amines is 'False'?

(1) Alkyl amines are stronger bases than ammonia

(2) Alkyl amines are stronger bases than aryl amines

(3) Alkyl amines react with nitrous acid to produce alcohols

(4) Aryl amines react with nitrous acid to produce phenols

Sol. Answer (4)

Aryl amines react with nitrous acid to form diazonium salt.

95. Acetamide is treated with the following reagents separately. Which one of these would yield methyl amine?

(1) PCl_5 (2) $NaOH\text{-}Br_2$

(3) Sodalime (4) Hot conc. H_2SO_4

Sol. Answer (2)

Hofmann-Bromide reaction.

96. Which of the following reactions will *not* result in the formation of carbon-carbon bonds?

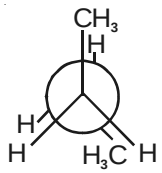
(1) Friedel-Crafts acylation (2) Reimer-Tieman reaction

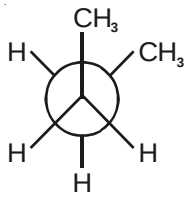
(3) Cannizzaro reaction (4) Wurtz reaction

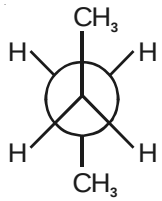
Sol. Answer (3)

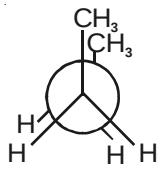
Cannizzaro reaction involves disproportionation.

97. In the following the most stable conformation of *n*-butane is

(1) 

(2) 

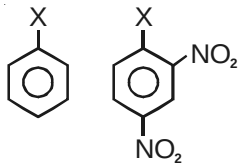
(3) 

(4) 

Sol. Answer (3)

Anti-staggered conformation is most stable.

98. The correct order of increasing reactivity of C-X bond towards nucleophile in the following compound is



$(CH_3)_3C\text{–}X$ $(CH_3)_2CH\text{–}X$

(I) (II) (III) (IV)

(1) III < II < I < IV (2) I < II < IV < III

(3) II < III < I < IV (4) IV < III < I < II

Sol. Answer (2)

Based on carbocation stability.

Alkyhalides (3° > 2°) are more reactive than aryl halides towards nucleophilic substitution.

99. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is

(1) CH_3COCl (2) CH_3COOCH_3

(3) CH_3CONH_2 (4) $CH_3COOCOCH_3$

Sol. Answer (1)

Cl^- is a weakest base, therefore good leaving group.

100. A solution of sucrose (molar mass = 342 g mol^{-1}) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of the solution obtained will be (K_f for water = 1.86 K kg mol^{-1})

(1) –0.570°C (2) –0.372°C

(3) –0.520°C (4) +0.372°C

Sol. Answer (2)

$\Delta T_f = K_f m$

$\Delta T_f = T_o - T_s$

101. Virus envelope is known as

(1) Core (2) Capsid

(3) Virion (4) Nucleoprotein

Sol. Answer (2)

Proteinaceous coat is capsid.

102. Some hyperthermophilic organisms that grow in highly acidic (pH2) habitats belong to the two groups

(1) Liverworts and yeasts (2) Eubacteria and archaea

(3) Cyanobacteria and diatoms (4) Protists and mosses

Sol. Answer (2)

Eubacteria like BGA (*Synechococcus*, *Phormidium)* and Thermoacidophiles (Archaebacteria).

103. Infectious proteins are present in

(1) Satellite viruses (2) Gemini viruses

(3) Prions (4) Viroids

Sol. Answer (3)

Infectious proteins are present in prions. Prions contain only the protein coat of the virus and are responsible for diseases in human beings. Example, prions cause Kuru's disease, CJD, Scrapie and Bovine spongiform encephalopathy.

104. Male and female gametophytes are independent and free-living in

(1) *Sphagnum* (2) Mustard

(3) Castor (4) *Pinus*

Sol. Answer (1)

Gametophytes (♂ and ♀) are highly reduced in gymnosperms and angiosperms.

105. Single-celled eukaryotes are included in

(1) Monera (2) Protista

(3) Fungi (4) Archaea

Sol. Answer (2)

Single celled eukaryotes are included in Protista.

106. One example of animals having a single opening to the outside that serves both as mouth as well as anus is

(1) *Fasciola* (2) *Octopus*

(3) *Asterias* (4) *Ascidia*

Sol. Answer (1)

Fasciola belongs to phylum platyhelminthes. These worms have incomplete alimentary canal, there is a single opening both for ingestion and egestion. This is also called as blind sac body plan. Whereas, in *Octopus*, *Asterias*, the alimentary canal is complete.

107. Which one of the following statements about all the four of *Spongilla*, Leech, Dolphin and Penguin is *correct* ?

(1) All are bilaterally symmetrical

(2) Penguin is homoiothermic while the remaining three are poikilothermic

(3) Leech is a fresh water form while all others are marine

(4) *Spongilla* has special collared cells called choanocytes, not found in the remaining three

Sol. Answer (4)

Spongilla belongs to phylum porifera, in which the characteristic cells are choanocytes, these are absent in Leech, Dolphin and Penguin.

108. Which one of the following kinds of animals are *triploblastic*?

(1) Corals (2) Flat worms

(3) Sponges (4) Ctenophores

Sol. Answer (2)

Flatworms are triploblastic and acoelomate. Whereas, sponges have cell aggregate type of body plan and ctenophores and corals are diploblastic.

109. Which one of the following statements about certain given animals is *correct* ?

(1) Flat worms (Platyhelminthes) are coelomates

(2) Round worms (Aschelminthes) are pseudocoelomates

(3) Molluses are acoelomates

(4) Insects are pseudocoelomates

Sol. Answer (2)

Roundworms are (Aschelminthes) and pseudocoelomate. Whereas, flatworms are acoelomate, molluscs and insects are coelomate.

110. The plasma membrane consists mainly of

(1) Proteins embedded in a carbohydrate bilayer

(2) Phospholipids embedded in a protein bilayer

(3) Proteins embedded in a phospholipid bilayer

(4) Proteins embedded in a polymer of glucose molecules

Sol. Answer (3)

Explained by fluid mosaic model.

111. Which one of the following structures between two adjacent cells is an effective transport pathway?

(1) Plasmalemma (2) Plasmodesmata

(3) Plastoquinones (4) Endoplasmic reticulum

Sol. Answer (2)

Plasmodesmata is a category of gap junction in plants.

112. Which one of the following has its own DNA?

(1) Peroxisome (2) Mitochondria

(3) Dictyosome (4) Lysosome

Sol. Answer (2)

Semiautonomous organelle due to ds circular DNA and 70 S ribosomes.

113. The main arena of various types of activities of a cell is

(1) Nucleus (2) Plasma membrane

(3) Mitochondrian (4) Cytoplasm

Sol. Answer (4)

Centre of all vital or metabolic activities.

114. During mitosis ER and nucleolus begin to disappear at

(1) Early prophase (2) Late prophase

(3) Early metaphase (4) Late metaphase

Sol. Answer (1)

Disappearance begins in early prophase and these are not observed in late prophase.

115. Algae have cell wall made up of

(1) Cellulose, hemicellulose and pectins

(2) Cellulose, galactans and mannans

(3) Hemicellulose, pectins and proteins

(4) Pectins, cellulose and proteins

Sol. Answer (2)

116. Membrane-bound organelles are *absent* in

(1) *Plasmodium* (2) *Saccharomyces*

(3) *Streptococcus* (4) *Chlamydomonas*

Sol. Answer (3)

No membrane bound organelles in prokaryotes.

117. The kind of epithelium which forms the inner walls of blood vessels is

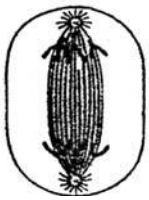
(1) Squamous epithelium (2) Cuboidal epithelium

(3) Columnar epithelium (4) Ciliated columnar epithelium

Sol. Answer (1)

Blood vessels are lined with simple squamous epithelium. This epithelium is present, where diffusion and filtration takes place.

118. Which stages of cell division do the following figures A and B represent respectively?



A

Fig. A

B

Fig. B

(1) Prophase — Anaphase

(2) Metaphase — Telophase

(3) Telophase — Metaphase

(4) Late Anaphase — Prophase

Sol. Answer (4)

Centrioles separation in prophase and chromatids at both poles in anaphase.

119. Which one of the following cannot be explained on the basis of Mendel's Law of Dominance?

(1) Factors occur in pairs

(2) The discrete unit controlling a particular character is called a factor

(3) Out of one pair of factors one is dominant, and the other recessive

(4) Alleles do not show any blending and both the characters recover as such in F_2 generation

Sol. Answer (4)

No mixing of alleles.

120. The genotype of a plant showing the dominant phenotype can be determined by

(1) Back cross (2) Test cross

(3) Dihybrid cross (4) Pedigree analysis

Sol. Answer (2)

Test cross is preferred to determine genotype of F_1.

121. The one aspect which is *not* a salient feature of genetic code, is its being

(1) Specific
(2) Degenerate
(3) Ambiguous
(4) Universal

Sol. Answer (3)

Codons are nonambiguous except GUG.

122. Satellite DNA is useful tool in

(1) Genetic engineering
(2) Organ transplantation
(3) Sex determination
(4) Forensic science

Sol. Answer (4)

Satellite DNA regions like VNTR/RFLP are basis of DNA fingerprinting.

123. Which one of the following *does* not follow the central dogma of molecular biology?

(1) HIV
(2) Pea
(3) *Mucor*
(4) *Chlamydomonas*

Sol. Answer (1)

HIV belongs to Retrovirus group which show reverse central dogma or reverse transcription.

124. ABO blood groups in humans are controlled by the gene *I*. It has three alleles–I^A, I^B and *i*. Since there are three different alleles, six different genotypes are possible. How many phenotypes can occur?

(1) Two
(2) Three
(3) One
(4) Four

Sol. Answer (4)

ABO blood group system is an example of multiple alleles but we will inherit only two alleles of a genes. So, the total number of phenotypes will be four.

125. Select the *correct* statement from the ones given below with respect to dihybrid cross

(1) Tightly linked genes on the same chromosome show very few recombinations
(2) Tightly linked genes on the same chromosome show higher recombinations
(3) Genes far apart on the same chromosome show very few recombinations
(4) Genes loosely linked on the same chromosome show similar recombinations as the tightly linked ones

Sol. Answer (1)

About 1.3% recombination in *Drosophila* w.r.t. body colour and eye colour genes.

126. Select the *two correct* statements out of the four (a–d) given below about lac operon.

(a) Glucose or galactose may bind with the repressor and inactivate it
(b) In the absence of lactose the repressor binds with the operator region
(c) The z-gene codes for permease
(d) This was elucidated by Francois Jacob and Jacque Monod

The correct statement are

(1) (a) and (b)
(2) (b) and (c)
(3) (a) and (c)
(4) (b) and (d)

Sol. Answer (4)

Lactose binds repressor protein and exerts negative control.

127. Which one of the following symbols and its representation, used in human pedigree analysis is *correct*?

(1) ◆ = male affected
(2)  = mating between relatives
(3) ○ = unaffected male
(4) □ = unaffected female

Sol. Answer (2)

(1) Unspecified sex.

(3) Unaffected female.

(4) Unaffected male.

128. Darwin's finches are a good example of

(1) Convergent evolution
(2) Industrial melanism
(3) Connecting link
(4) Adaptive radiation

Sol. Answer (4)

Darwin's finches are good example of adaptive radiation. It is an evolutionary process starting from a point in a geographical area, giving rise to new species depending upon habitat. Main Darwin finch was in South America, some flew to Galapagas islands and some variations got selected and gave rise to new species.

129. The scutellum observed in a grain of wheat or maize is comparable to which part of the seed in other monocotyledons?

(1) Plumule
(2) Cotyledon
(3) Endosperm
(4) Aleurone layer

Sol. Answer (2)

Single shield-shaped cotyledon in monocots.

130. Which one of the following is *not* a micronutrient?

(1) Boron
(2) Molybdenum
(3) Magnesium
(4) Zinc

Sol. Answer (3)

Mg is macronutrient.

131. An element playing important role in nitrogen fixation is

(1) Zinc
(2) Molybdenum
(3) Copper
(4) Manganese

Sol. Answer (2)

Component of nitrogenase enzyme.

132. Which one of the following is *not* a lateral meristem?

(1) Intercalary meristem
(2) Intrafascicular cambium
(3) Interfascicular cambium
(4) Phellogen

Sol. Answer (1)

Apical and intercalary meristems are primary meristems.

133. C_4 plants are more efficient in photosynthesis than C_3 plants due to

(1) Lower rate of photorespiration
(2) Higher leaf area
(3) Presence of larger number of chloroplasts in the leaf cells
(4) Presence of thin cuticle

Sol. Answer (3)

Photorespiration does not occur in C_4 plants. Oxygenase activity of Rubisco is nil due to CO_2 conc. effect in bundle sheath cells.

134. In unilocular ovary with a single ovule the placentation is

(1) Axile
(2) Marginal
(3) Basal
(4) Free Central

Sol. Answer (3)

Advanced type of placentation with single ovule in Asteraceae and Poaceae.

135. The chief water conducting elements of xylem in gymnosperms are

(1) Tracheids
(2) Vessels
(3) Fibers
(4) Transfusion tissue

Sol. Answer (1)

Vessels are absent in pteridophytes and gymnosperms.

136. The technical term used for the androecium in a flower of China rose (*Hibiscus rosasinensis*) is

(1) Polyadelphous
(2) Monadelphous
(3) Diadelphous
(4) Polyandrous

Sol. Answer (2)

China rose family shows cohesion of stamens by union of filaments into single bundle, known as monadelphous.

137. Ovary is half-inferior in the flowers of

(1) Cucumber
(2) Guava
(3) Plum
(4) Brinjal

Sol. Answer (3)

Perigynous flower in rose and plum family.

138. Heartwood differs from sapwood in

(1) Being susceptible to pests and pathogens

(2) Presence of rays and fibres

(3) Absence of vessels and parenchyma

(4) Having dead and non-conducting elements

Sol. Answer (4)

Non-functional wood due to tylose formation and deposition of secondary metabolites.

139. Keel is characteristic of the flowers of

(1) Bean (2) Gulmohur

(3) *Cassia* (4) *Calotropis*

Sol. Answer (1)

Anterior shortest petal in Fabaceae

140. One of the free-living anaerobic nitrogen-fixer is

(1) *Azotobacter* (2) *Beijernickia*

(3) *Rhodospirillum* (4) *Rhizobium*

Sol. Answer (3)

Others are aerobic nitrogen fixers.

141. PGA as the first CO_2 fixation product was discovered in photosynthesis of

(1) Alga (2) Bryophyte

(3) Gymnosperm (4) Angiosperm

Sol. Answer (1)

Chlorella and *Scenedesmus.*

142. The energy releasing metabolic process in which substrate is oxidised without an external electron acceptor is called

(1) Photorespiration (2) Glycolysis

(3) Fermentation (4) Aerobic respiration

Sol. Answer (3)

$NADH_2$ produced during glycolysis in used in reduction of pyruvate in fermentation

143. Photoperiodism was first characterised in

(1) Cotton (2) Tobacco

(3) Potato (4) Tomato

Sol. Answer (2)

Maryland mammoth variety of tobacco.

144. Listed below are four respiratory capacities (a - c) and four jumbled respiratory volumes of a normal human adult

Respiratory capacities	**Respiratory volumes**
(a) Residual volume	2500 mL
(b) Vital capacity	3500 mL
(c) Inspiratory reserve volume	1200 mL
(d) Inspiratory capacity	4500 mL

Which one of the following is the **correct** matching of two capacities and volumes?

(1) (a) 4500 mL, (b) 3500 mL
(2) (b) 2500 mL, (c) 4500 mL
(3) (c) 1200 mL, (d) 2500 mL
(4) (d) 3500 mL, (a) 1200 mL

Sol. Answer (4)

Inspiratory capacity is TV + IRV = 3500 ml and residual volume is 1200 ml

145. What is **true** about RBCs in humans?

(1) They do not carry CO_2 at all
(2) They carry about 20-25 percent of CO_2
(3) They transport 99.5 percent of O_2
(4) They transport about 80 percent oxygen only and the rest 20 percent of it is transported in dissolved state in blood plasma

Sol. Answer (2)

About 97 percent of O_2 is transported by RBCs in the blood. The remaining 3 percent of O_2 is carried in dissolved state through the plasma. Nearly 20-25 percent of CO_2 is transported by RBCs, whereas, 70 percent of it is carried as bicarbonates.

146. If due to some injury the chordae tendinae of the tricuspid valve of the human heart is partially non-functional, what will be the immediate effect?

(1) The flow of blood into the pulmonary artery will be reduced
(2) The flow of blood into the aorta will be slowed down
(3) The pacemaker will stop working
(4) The blood will tend to flow back into the left atrium

Sol. Answer (1)

If due to injury the chordae tendinae of the tricuspid valves of human heart is partially non-functional, the flow of blood into the pulmonary artery is reduced due to backflow of blood into right atrium

147. Which one of the following statements in regard to the excretion by the human kidneys is **correct**?

(1) Ascending limb of Loop of Henle is impermeable to electrolytes
(2) Descending limb of Loop of Henle is impermeable to water
(3) Distal convoluted tubule is incapable of reabsorbing HCO_3
(4) Nearly 99 percent of the glomerular filtrate is reabsorbed by the renal tubules

Sol. Answer (4)

A comparison of the volume of filtrate formed per day (180 litre) with urine released (1.5 litre), suggests that nearly 99 percent of the filtrate is reabsorbed by the renal tubules

148. Low Ca^{++} in the body fluid may be the cause of

(1) Gout (2) Tetany

(3) Anaemia (4) Angina pectoris

Sol. Answer (2)

Tetany is rapid spasms (wild contraction) in muscle due to low Ca^{2+} in the body fluid

149. If for some reason our goblet cells are non-functional this will adversely affect

(1) Smooth movement of food down the intestine

(2) Production of somatostatin

(3) Secretion of sebum from the sebaceous glands

(4) Maturation of sperms

Sol. Answer (1)

Goblet cells present in intestine secrete mucous. Mucous will help in smooth movement of food down the intestine.

150. The nerve centres which control the body temperature and the urge for eating are contained in

(1) Thalamus (2) Hypothalamus

(3) Pons (4) Cerebellum

Sol. Answer (2)

Hypothalamus is the thermoregulatory centre. It also contains hunger and thirst centre.

151. Vasa efferentia are the ductules leading from

(1) Epididymis to urethra

(2) Testicular lobules to rete testis

(3) Rete testis to vas deferens

(4) Vas deferens to epididymis

Sol. Answer (3)

Vasa efferentia are ducts which carry the sperms outside the testis *i.e.,* from rete testis to vas deferens.

152. The first movements of the foetus and appearance of hair on its head are usually observed during which month of pregnancy?

(1) Third month (2) Fourth month

(3) Fifth month (4) Sixth month

Sol. Answer (3)

The first movement of the foetus and appearance of hair are observed during fifth month of pregnancy

153. Cu ions released from copper- releasing Intra Uterine Devices (IUDs)

(1) Prevent ovulation
(2) Make uterus unsuitable for implantation
(3) Increase phagocytosis sperms
(4) Suppress sperm motility

Sol. Answer (4)

The copper ions released from copper releasing IUDs, suppress sperms motility and the fertilising capacity of the sperms.

154. Carrier ions like Na^+ facilitate the absorption of substances like

(1) Fructose and some amino acids
(2) Amino acids and glucose
(3) Glucose and fatty acids
(4) Fatty acids and glycerol

Sol. Answer (1)

Substance like fructose and some amino acids are absorbed with help of the carrier ions like Na^+. This mechanism is called the facilitated transport.

155. Which one of the following pairs is **incorrectly** matched?

(1) Insulin–Diabetes mellitus (disease)
(2) Glucagon – Beta cells (source)
(3) Somatostatin – Delta cells (source)
(4) Corpus luteum – Relaxin (secretion)

Sol. Answer (2)

Glucose hormone is secreted by alpha cells of pancreas.

156. The principal nitrogenous excretory compound in humans is synthesised

(1) In the liver but eliminated mostly through kidneys
(2) In kidneys but eliminated mostly through liver
(3) In kidneys as well as eliminated by kidneys
(4) In liver and also eliminated by the same through bile

Sol. Answer (1)

The principal nitrogenous compound in humans is urea, synthesized in liver and eliminated by kidneys.

157. Injury to adrenal cortex is not likely to affect the secretion of which one of the following?

(1) Cortisol
(2) Aldosterone
(3) Both Androstenedione and Dehydroepiandrosterone
(4) Adrenaline

Sol. Answer (4)

If the adrenal cortex is injured it will not affect the secretion of adrenaline, because it is secreted by adrenal medulla.

158. Which one of the following statements about human sperm is **correct**?

(1) Acrosome serves no particular function

(2) Acrosome has a conical pointed structure used for piercing and penetrating the egg resulting in fertilization

(3) The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilization

(4) Acrosome serves as a sensory structure leading the sperm towards the ovum

Sol. Answer (3)

Acrosome is a caplike structure present in sperm head. It is modified golgi apparatus and secretes sperm lysins, these are enzymatic in nature.

159. Coiling of garden pea tendrils around any support is an example of

(1) Thermotaxis (2) Thigmotaxis

(3) Thigmonasty (4) Thigmotropism

Sol. Answer (4)

Paratonic growth movement due to touch stimulus.

160. Apomictic embryos in *citrus* arise from

(1) Diploid egg (2) Synergids

(3) Maternal sporophytic tissue in ovule (4) Antipodal cells

Sol. Answer (3)

Sporophytic budding or adventitive embryony in *Citrus*.

161. Wind pollinated flowers are

(1) Small, producing nectar and dry pollen

(2) Small, brightly coloured, producing large number of pollen grains

(3) Small, producing large number of dry pollen grains

(4) Large, producing abundant nectar and pollen

Sol. Answer (3)

Colourless, odourless and nectarless flowers in anemophily.

162. Phototropic curvature is the result of uneven distribution of

(1) Auxin (2) Gibberellin

(3) Phytochrome (4) Cytokinins

Sol. Answer (1)

Cell elongation on darker side.

163. Transfer of pollen grains from the anther to the stigma of another flower of the same plant is called

(1) Autogamy (2) Xenogamy

(3) Geitonogamy (4) Karyogamy

Sol. Answer (3)

Genetically self and functionally cross pollination.

164. Seminal plasma in human males is rich in

(1) Ribose and potassium
(2) Fructose and calcium
(3) Glucose and calcium
(4) DNA and testosterone

Sol. Answer (2)

Seminal plasma in humans is secretion of accessory glands, rich in fruclose, calcium and some enzymes.

165. Sertoli cells are found in

(1) Pancreas and secrete cholecystokinin
(2) Ovaries and secrete progesterone
(3) Adrenal cortex and secrete adrenaline
(4) Seminiferous tubules and provide nutrition of germ cells

Sol. Answer (4)

Sertoli cells are also called as nurse cells present in seminiferous tubules, they provide nourishment to the developing sperms.

166. The part of Fallopian tube closest to the ovary is

(1) Ampulla
(2) Isthmus
(3) Infundibulum
(4) Cervix

Sol. Answer (3)

The part of fallopian tube closest to the ovary is fimbriated funnel. It is to take up the developing ovum from abdominal cavity released by ovaries.

167. *In vitro* fertilisation is a technique that involves transfer of which one of the following into the fallopian tube?

(1) Zygote only
(2) Embryo only, upto 8 cell stage
(3) Either zygote or early embryo upto 8 cell stage
(4) Embryo of 32 cell stage

Sol. Answer (3)

ZIFT is an example IVF in this the zygote or early embryo's upto 8 blastomeres are transferred into the fallopian tube. If the embryo is more than 8 blastomeres then it is transferred into uterus called as IUT.

168. The permissible use of the technique amniocentesis is for

(1) Detecting any genetic abnormality
(2) Detecting sex of the unborn foetus
(3) Artificial insemination
(4) Transfer of embryo into the uterus of a surrogate mother

Sol. Answer (1)

Amniocentesis is prenatal diagnostic technique for detecting any genetic disorder. The misuse of amniocentesis is to detect the sex of the foetus.

169. The signals for parturition originate from

(1) Fully developed foetus only

(2) Placenta only

(3) Placenta as well as fully developed foet

(4) Oxytocin released from maternal pituita

Sol. Answer (3)

The signals for parturition originates from the foetus and placenta, leading to mild uterine contractions called as foetal ejection reflex.

170. The biomass available for consumption by the herbivores and the decomposers is called

(1) Gross primary productivity

(2) Net primary productivity

(3) Secondary productivity

(4) Standing crop

Sol. Answer (2)

Stored biomass which is transferred from one trophic level to another trophic level is NPP.

171. Which one of the following is one of the characteristics of a biological community?

(1) Sex-ratio (2) Stratification

(3) Natality (4) Mortality

Sol. Answer (2)

Others are population characteristics. Stratification is structural component of biological community.

172. Which one of the following is an example *ex-situ* conservation?

(1) National park (2) Wildlife sanctuary

(3) Seed bank (4) Sacred groves

Sol. Answer (3)

Others are *in-situ* /on site conservation strategies, except seed bank.

173. A renewable exhaustible natural resource is

(1) Forest (2) Coal

(3) Petroleum (4) Minerals

Sol. Answer (1)

Coal and petroleum — Non-renewable and exhaustible.

Minerals — Renewable and inexhaustible.

174. The two gases making highest relative contribution to the greenhouse gases are

(1) CO_2 and N_2O (2) CO_2 and CH_4

(3) CH_4 and N_2O (4) CFC_5 and N_2O

Sol. Answer (2)

CO_2 — 60% global warming/greenhouse effect.

CH_4 — 20% global warming/greenhouse effect.

175. Select the **correct** statement from the following

(1) Activated sludge-sediment in settlement tanks of sewage treatment plant is a rich source of aerobic bacteria

(2) Biogas is produced by the activity of aerobic bacteria on animal waste

(3) *Methanobacterium* is an aerobic bacterium found in rumen of cattle

(4) Biogas, commonly called gobar gas, is *pure* methane

Sol. Answer (1)

Methanobacteria are anaerobic.

176. Which two of the following changes (a–d) usually tend to occur inthe plain dwellers when they move to high altitudes (3,500 m or more)?

(a) Increase in red blood cell size

(b) Increase in red blood cell production

(c) Increased breathing rate

(d) Increase in thrombocyte count

Changes occurring are

(1) (a) and (b) (2) (b) and (c)

(3) (c) and (d) (4) (a) and (d)

Sol. Answer (2)

When a person moves to higher altitudes the pO_2 and total atmospheric pressure decreases. Hypoxia stimulates the JG-cells of the kidneys to release erythropoietin hormone which stimulates erythropoesis in bone marrow causing polycythemia. Hypoxia will also increasing breathing rate. Initially, the size of RBCs will also increase, but will increase in number of RBC the size of RBCs becomes normal.

177. dB is a standard abbreviation used for the quantitative expression of

(1) A certain pesticide (2) The density of bacteria in a medium

(3) A particular pollutant (4) The dominant *Bacillus* in a culture

Sol. Answer (3)

Decibel (dB) is unit of noise pollution measurement.

178. Study the four statements (a–d) given below and select the two **correct** ones outo of them

(a) A lion eating a deer and a sparrow feeding on grain are ecologically similar in being consumers

(b) Predator star fish *Pisaster* helps in maintaining species diversity of some invertebrates

(c) Predators ultimately lead to the extinction of prey species

(d) Production of chemicals such as nicotine, strychnine by the plants are metabolic disorders

The two correct statements are:

(1) (a) and (b) (2) (b) and (c)

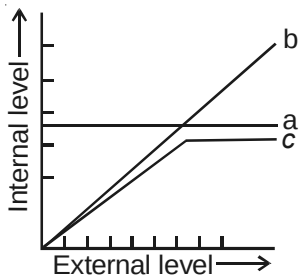
(3) (c) and (d) (4) (a) and (d)

Sol. Answer (1)

Carnivores (Lion) and herbivores (sparrow) are consumers.

Pisaster controls prey population and reduces competition among prey species.

179. The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do a, b and c represent respectively?



	(a)	(b)	(c)
(1)	Regulator	Conformer	Partial regulator
(2)	Conformer	Regulator	Partial regulator
(3)	Regulator	Partial regulator	Conformer
(4)	Partial regulator	Regulator	Conformer

Sol. Answer (1)

Regulators — Mammals and Birds

Conformer — All plants and 99% animals

180. Widal test is used for the diagnosis of

(1) Typhoid (2) Malaria

(3) Pneumonia (4) Tubercolosis

Sol. Answer (1)

The test for typhoid is widal test.

181. Ringworm in humans is caused by

(1) Viruses (2) Bacteria

(3) Fungi (4) Nematodes

Sol. Answer (3)

Ringworm in humans is called by fungi.

182. Which one of the following is **not** used in organic farming?

(1) Snail (2) *Glomus*

(3) Earthworm (4) *Oscillatoria*

Sol. Answer (1)

Glomus — Endomycorrhiza

Oscillatoria — BGA

Earthworm

All are biofertilizers and help in organic farming.

183. A common biocontrol agent for the control of plant diseases is

(1) *Trichoderma* (2) Baculovirus

(3) *Bacillus thuringiensis* (4) *Glomus*

Sol. Answer (1)

Trichoderma — Effective biocontrol agent for several plant pathogens.

184. The common nitrogen-fixer in paddy fields is

(1) *Frankia* (2) *Rhizobium*

(3) *Azospirillum* (4) *Oscillatoria*

Sol. Answer (3)

Azospirillum as N_2-fixer in graminaceous plants root.

185. Consider the following four statements (a–d) regarding kidney transplant and select the **two correct** ones out of these.

a. Even if a kidney transplant is proper the recipient may need to take immunosuppressants for a long time

b. The cell-mediated immune response is responsible for the graft rejection

c. The B-lymphocytes are responsible for rejection of the graft

d. The acceptance or rejection of a kidney transplant depends on specific interferons

The two **correct** statements are

(1) a & b (2) b & c

(3) c & d (4) a & c

Sol. Answer (1)

Kidney transplant is allograft. As no two individuals have same HLA alleles or MHC proteins, except identical twins the person requires immunosuppressant drug like cyclosporin throughout his life. CMI, *i.e.*, the T-cell mediated immunity is responsible for graft rejection.

186. Which one of the following statements is **correct** with respect to AIDS?

(1) The causative HIV retrovirus enters helper T-lymphocytes thus reducing their numbers

(2) The HIV can be transmitted through eating food together with an infected person

(3) Drug addicts are least susceptible to HIV infection

(4) AIDS patients are being fully cured cent per cent with proper care and nutrition

Sol. Answer (1)

AIDS virus mounts a direct attack on T_4-cells. They are macrophages and T_H-cells. Macrophages are HIV factory. The number of helper T-cells is depleted.

187. Select the **correct** statement from the ones given below

(1) Cocaine is given to patients after surgery as it stimulates recovery

(2) Barbiturates when given to criminals make them tell the truth

(3) Morphine is often given to persons who have undergone surgery as a pain killer

(4) Chewing tobacco lowers blood pressure and heart rate

Sol. Answer (3)

Morphine is a narcotic drug. It is a good sedative, as well as a pain killer, given to patients after surgery.

188. Toxic agents present in food which interfere with thyroxine synthesis lead to the development of

(1) Thyrotoxicosis
(2) Toxic goitre
(3) Cretinism
(4) Simple goitre

Sol. Answer (4)

Toxic agents in food which interfere with thyroxine synthesis will lead to simple goitre.

Thyrotoxicosis and toxic goitre are under the category of hyperthyroidism.

189. The second maturation division of the mammalian ovum occurs

(1) In the Graafian follicle following the first maturation division
(2) Shortly after ovulation before the ovum makes entry into the Fallopian tube
(3) Until after the ovum has been penetrated by a sperm
(4) Until the nucleus of the sperm has fused with that of the ovum

Sol. Answer (3)

The second maturation division of the mammalian ovum occurs that is completed after the sperm has penetrated the ovum.

190. Which one of the following statements about morula in humans is **correct**?

(1) It has more cytoplasm and more DNA than an uncleaved zygote
(2) It has almost equal quantity of cytoplasm as an uncleaved zygote but much more DNA
(3) It has far **less** cytoplasm as well as **less** DNA than in an uncleaved zygote
(4) It has more or less equal quantity of cytoplasm and DNA as in uncleaved zygote

Sol. Answer (2)

Cleavage divisions are mitotic divisions, in which the single-celled zygote is converted into a multicellular morula. But during cleavage divisions there is no growth of resultant daughter cells/blastomeres. So, the DNA content will increase, but there is no increase or insignificant increase in amount of protoplasm.

191. Stirred-tank bioreactors have been designed for

(1) Availability of oxygen throughout the process
(2) Addition of preservatives to the product
(3) Purification of the product
(4) Ensuring anaerobic conditions in the culture vessel

Sol. Answer (1)

The stirrer used in stirred tank bioreactor is to mix oxygen in the contents.

192. Breeding of crops with high levels of minerals, vitamins and proteins is called

(1) Micropropagation
(2) Somatic hybridisation
(3) Biofortification
(4) Biomagnification

Sol. Answer (3)

Breeding for improved nutritional quality is the objective of biofortification.

193. DNA or RNA segment tagged with a radioactive molecule is called

(1) Plasmid
(2) Vector
(3) Probe
(4) Clone

Sol. Answer (3)

DNA/RNA segment tagged with radioactive molecule is called probe.

194. Which one of the following is used as vector for cloning genes into higher organisms?

(1) Retrovirus
(2) Baculovirus
(3) *Salmonella typhimurium*
(4) *Rhizopus nigricans*

Sol. Answer (1)

Retroviruses disarmed of its pathogenic qualities are used as vectors.

195. The genetically-modified (GM) brinjal in India has been developed for

(1) Drought-resistance
(2) Insect-resistance
(3) Enhancing shelf life
(4) Enhancing mineral content

Sol. Answer (2)

GM-brinjal has been developed for insect resistance. It is actually Bt-brinjal with Bt toxin gene for the production of Bt toxins.

196. Genetic engineering has been successfully used for producing

(1) Animals like bulls for farm work as they have super power
(2) Transgenic mice for testing safety of polio vaccine before use in humans
(3) Transgenic models for studying new treatments for certain cardiac diseases
(4) Transgenic Cow-Rosie which produces high fat milk for making ghee

Sol. Answer (2)

Transgenic animals are being produced as they can act as models for chemical safety testing and vaccine safety testing.

197. Restriction endonucleases are enzymes which

(1) Remove nucleotides from the ends of the DNA molecule
(2) Make cuts at specific positions within the DNA molecule
(3) Recognize a specific nucleotide sequence for binding of DNA ligase
(4) Restrict the action of the enzyme DNA polymerase

Sol. Answer (2)

Restriction endonucleases cuts the DNA at specific position within the DNA molecule.

198. Some of the characteristics of Bt cotton are

(1) High yield and resistance to bollworms
(2) Long fibre and resistance to aphids
(3) Medium yield, long fibre and resistance to beetle pests
(4) High yield and production of toxic protein crystals which kill dipteran pests

Sol. Answer (1)

Bt-cotton, shows resistance to cotton bollworms. The proteins encoded by cryIIAb and cryIAc are used to control cotton bollworms not dipterans. Dipterans include mosquitoes and flies they do not attack cotton plant.

199. An improved variety of transgenic basmati rice

(1) Give high yield but has no characteristic aroma

(2) Does not require chemical fertilizers and growth hormones

(3) Gives high yield and is rich in vitamin A

(4) Is completely resistant to all insect pests and diseases of paddy

Sol. Answer (3)

Transgenic basmati rice, called as golden rice is nutritionally enriched in vitamin A.

200. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?

(1) 5′ CACGTA 3′; 3′ CTCAGT 5′

(2) 5′ CGTTCG 3′; 3′ ATGGTA 5′

(3) 5′ GATATG 3′; 3′ CTACTA 5′

(4) 5′ GAATTC 3′; 3′ CTTAAG 5′

Sol. Answer (4)

In DNA palindromic seuqnce is a sequence of base pairs which would read the same, provided that the orientation of reading is kept the same.

Example: 5′ GAATTC 3′

3′ CTTAAG 5′