DATE : 24/07/2016

Test Booklet Code

AA

Aakash
Medical | IIT-JEE | Foundations
(Divisions of Aakash Educational Services Pvt. Ltd.)

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Time : 3 hrs.

Answers & Solutions

Max. Marks : 720

for

NEET (UG) Phase-II_2016

Important Instructions :

1. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
2. Use **Blue / Black Ballpoint Pen only** for writing particulars on this page/marking responses.
3. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
4. The CODE for this Booklet is **AA**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
5. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
6. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case**.
7. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
8. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.

1. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length?

(1) $\frac{\sqrt{hG}}{c^{3/2}}$ (2) $\frac{\sqrt{hG}}{c^{5/2}}$

(3) $\sqrt{\frac{hc}{G}}$ (4) $\sqrt{\frac{Gc}{h^{3/2}}}$

Answer (1)

Sol. $L \propto h^a c^b G^c$

$[L]^1 = [M^1L^2T^{-1}]^a [LT^{-1}]^b [M^{-1}L^3T^{-2}]^c$

Solving,

$$a = \frac{1}{2},\ c = \frac{1}{2},\ b = -\frac{3}{2}$$

$$\Rightarrow\ L = \frac{\sqrt{hG}}{c^{3/2}}$$

2. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

(1) $\frac{a-f}{1+b}$ (2) $\frac{a+f}{2(b-1)}$

(3) $\frac{a+f}{2(1+b)}$ (4) $\frac{f-a}{2(1+b)}$

Answer (4)

Sol. $v_P = \frac{dx_P}{dt} = a + 2bt$

$v_Q = \frac{dx_Q}{dt} = f - 2t$

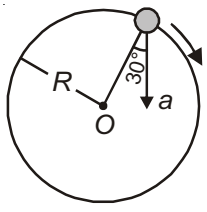
$v_P = v_Q$

$\Rightarrow\ a + 2bt = f - 2t$

$2t + 2bt = f - a$

$$\Rightarrow\ t = \frac{f-a}{2(b+1)}$$

3. In the given figure, a = 15 m/s^2 represents the total acceleration of a particle moving in the clockwise direction in a circle of radius R = 2.5 m at a given instant of time. The speed of the particle is



(1) 4.5 m/s (2) 5.0 m/s

(3) 5.7 m/s (4) 6.2 m/s

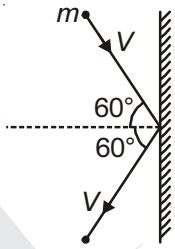
Answer (3)

Sol. $a\cos 30° = \frac{v^2}{r}$

$$\Rightarrow\ 15\frac{\sqrt{3}}{2} = \frac{v^2}{2.5}$$

$\Rightarrow\ v$ = 5.7 m/s

4. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be



(1) mV (2) $2mV$

(3) $\frac{mV}{2}$ (4) $\frac{mV}{3}$

Answer (1)

Sol. $|\vec{J}| = |\vec{P}_2 - \vec{P}_1| = 2mV\cos\theta = mV$

5. A bullet of mass 10 g moving horizontally with a velocity of 400 ms^{-1} strikes a wood block of mass 2 kg which is suspended by light inextensible string of length 5 m. As a result, the centre of gravity of the block found to rise a vertical distance of 10 cm. The speed of the bullet after it emerges out horizontally from the block will be

(1) 100 ms^{-1} (2) 80 ms^{-1}

(3) 120 ms^{-1} (4) 160 ms^{-1}

Answer (3)

Sol. Apply conservation of linear momentum.

CM rises through height h, so its velocity after collision = $\sqrt{2gh}$

$0.01\times400 = 2\times\sqrt{2gh} + 0.01\times v$

$\Rightarrow\ v$ = 120 m/s

6. Two identical balls A and B having velocities of 0.5 m/s and –0.3 m/s respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be

(1) –0.5 m/s and 0.3 m/s

(2) 0.5 m/s and –0.3 m/s

(3) –0.3 m/s and 0.5 m/s

(4) 0.3 m/s and 0.5 m/s

Answer (2)

Sol. They will exchange their velocity, so

v_B = 0.5 m/s and v_A = –0.3 m/s

7. A particle moves from a point $(-2\hat{i}+5\hat{j})$ to $(4\hat{j}+3\hat{k})$ when a force of $(4\hat{i}+3\hat{j})$ N is applied. How much work has been done by the force?

(1) 8 J (2) 11 J

(3) 5 J (4) 2 J

Answer (3)

Sol. $\vec{s}=\vec{r}_2-\vec{r}_1=(4\hat{j}+3\hat{k})-(-2\hat{i}+5\hat{j})$

$=2\hat{i}-\hat{j}+3\hat{k}$

$\vec{F}=4\hat{i}+3\hat{j}$

$W=\vec{F}\cdot\vec{s}=8-3=5$ J

8. Two rotating bodies A and B of masses m and $2m$ with moments of inertia I_A and I_B ($I_B > I_A$) have equal kinetic energy of rotation. If L_A and L_B be their angular momenta respectively, then

(1) $L_A=\frac{L_B}{2}$ (2) $L_A = 2L_B$

(3) $L_B > L_A$ (4) $L_A > L_B$

Answer (3)

Sol. $E=\frac{L^2}{2I}$

$\Rightarrow E_A = E_B$

$\Rightarrow \frac{L_A^2}{2I_A}=\frac{L_B^2}{2I_B}$

$I_B > I_A \Rightarrow L_B > L_A$

9. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation (E_{sphere} / $E_{cylinder}$) will be

(1) 2 : 3

(2) 1 : 5

(3) 1 : 4

(4) 3 : 1

Answer (2)

Sol. $\frac{E_{sphere}}{E_{cylinder}}=\frac{\frac{1}{2}\left(\frac{2}{5}mR^2\right)\omega^2}{\frac{1}{2}\left(\frac{1}{2}mR^2\right)(2\omega)^2}=\frac{1}{5}$

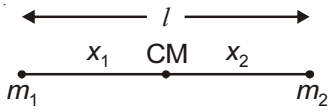
10. A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

(1) $\frac{m_1m_2}{m_1+m_2}l^2$ (2) $\frac{m_1+m_2}{m_1m_2}l^2$

(3) $(m_1 + m_2)l^2$ (4) $\sqrt{m_1m_2}l^2$

Answer (1)

Sol.

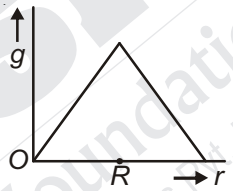


$x_1=\frac{m_2l}{m_1+m_2}$ and $x_2=\frac{m_1l}{m_1+m_2}$

$I=m_1x_1^2+m_2x_2^2=\frac{m_1m_2}{m_1+m_2}l^2$

11. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

(1)



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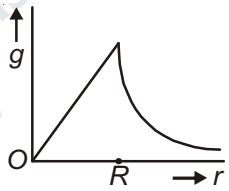

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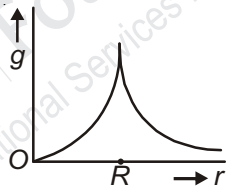
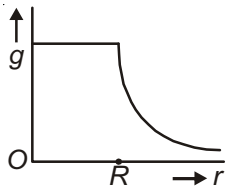


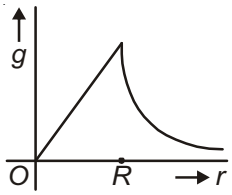
(4)



Answer (2)

Sol. $g_{in}=\frac{GMr}{R^3} \Rightarrow g_{in} \propto r$

$g_{out}=\frac{GM}{r^2} \Rightarrow g_{out} \propto \frac{1}{r^2}$



12. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the earth's surface, is

(1) $\frac{mg_0R^2}{2(R+h)}$ (2) $-\frac{mg_0R^2}{2(R+h)}$

(3) $\frac{2mg_0R^2}{R+h}$ (4) $-\frac{2mg_0R^2}{R+h}$

Answer (2)

Sol. Total energy = $-\frac{GMm}{2r}$

Here, $r = R + h$ and $GM = g_0R^2$

$\Rightarrow \quad E = -\frac{mg_0R^2}{2(R+h)}$

13. A rectangular film of liquid is extended from (4 cm × 2 cm) to (5 cm × 4 cm). If the work done is 3×10^{-4} J, the value of the surface tension of the liquid is

(1) 0.250 Nm^{-1}

(2) 0.125 Nm^{-1}

(3) 0.2 Nm^{-1}

(4) 8.0 Nm^{-1}

Answer (2)

Sol. $W = 2(A_f - A_i)T$

$\Rightarrow \quad T = \frac{W}{(A_f - A_i)\times 2}$

$= \frac{3\times10^{-4}\text{ J}}{2[5\times4\times10^{-4} - 4\times2\times10^{-4}]}$

$= 0.125\ Nm^{-1}$

14. Three liquids of densities ρ_1, ρ_2 and ρ_3 (with $\rho_1 > \rho_2 > \rho_3$), having the same value of surface tension T, rise to the same height in three identical capillaries. The angles of contact θ_1, θ_2 and θ_3 obey

(1) $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$

(2) $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

(3) $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$

(4) $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$

Answer (2)

Sol. $h = \frac{2T\cos\theta}{r\rho g}$

$\Rightarrow \quad r \propto \cos\theta$ (as T, h and r are constants)

$\rho \uparrow \quad \Rightarrow \quad \theta \downarrow$

$\theta_1 < \theta_2 < \theta_3$

Its rise so $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

15. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100°C, while the other one is at 0°C. If the two bodies are brought into contact, then assuming no heat loss, the final common temperature is

(1) 50°C

(2) More than 50°C

(3) Less than 50°C but greater than 0°C

(4) 0°C

Answer (2)

Sol. Loss of heat by hot body = Gain of heat by cold body

$T_{c_1}\Delta\theta_1 = T_{c_2}\Delta\theta_2$

$T_{c_1} > T_{c_2} \quad \Rightarrow \quad \Delta\theta_1 < \Delta\theta_2$

16. A body cools from a temperature $3T$ to $2T$ in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be

(1) $\frac{7}{4}T$

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

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

(4) T

Answer (2)

Sol. $\frac{T_1 - T_2}{\Delta t} = K\left(\frac{T_1 + T_2}{2} - T_0\right)$

$\frac{3T - 2T}{10} = K(2.5T - T)$

$\Rightarrow \quad \frac{T}{10} = K(1.5)T$

$K = \frac{1}{15}$

Now, $\frac{T - x}{10} = K\left(\frac{T + x}{2} - T\right)$

Solving $x = \frac{3T}{2}$

17. One mole of an ideal monatomic gas undergoes a process described by the equation PV^3 = constant. The heat capacity of the gas during this process is

(1) $\frac{3}{2}R$ (2) $\frac{5}{2}R$

(3) $2R$ (4) R

Answer (4)

Sol. PV^3 = constant polytropic process with $n = 3$

$$C = C_v + \frac{R}{1-n}$$

$$= \frac{R}{r-1} + \frac{R}{1-n}$$

$$= \frac{R}{\frac{5}{3}-1} + \frac{R}{1-3} = R$$

18. The temperature inside a refrigerator is t_2 °C and the room temperature is t_1 °C. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be

(1) $\frac{t_1}{t_1 - t_2}$ (2) $\frac{t_1 + 273}{t_1 - t_2}$

(3) $\frac{t_2 + 273}{t_1 - t_2}$ (4) $\frac{t_1 + t_2}{t_1 + 273}$

Answer (2)

Sol. $K = \frac{Q_2}{W} = \frac{1}{\frac{t_1}{t_2} - 1}$

$$Q_2 = \frac{t_2 W}{t_1 - t_2}$$

$$Q_1 = Q_2 + W = \frac{t_2 W}{t_1 - t_2} + W$$

$$= \frac{t_1 W}{t_1 - t_2} = \frac{t_1 + 273}{t_1 - t_2}$$

19. A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas?

(1) $\frac{P}{(kT)}$ (2) $\frac{Pm}{(kT)}$

(3) $\frac{P}{(kTV)}$ (4) mkT

Answer (2)

Sol. $\frac{P}{\rho} = \frac{kT}{m}$

$$\rho = \frac{Pm}{kT}$$

20. A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass m is increased by 1 kg, the time period of oscillations becomes 5 s. The value of m in kg is

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

(3) $\frac{16}{9}$ (4) $\frac{9}{16}$

Answer (4)

Sol. $T_1 = 3 = 2\pi\sqrt{\frac{m}{K}}$

Then, $T_2 = 5 = 2\pi\sqrt{\frac{m+1}{K}}$

Dividing, $\frac{3}{5} = \sqrt{\frac{m}{m+1}}$

$$\frac{9}{25} = \frac{m}{m+1}$$

$$9m + 9 = 25m$$

$$16m = 9$$

$$m = \frac{9}{16}$$

21. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be

(1) L (2) $2L$

(3) $\frac{L}{2}$ (4) $4L$

Answer (2)

Sol. $\frac{3V}{2L_1} = \frac{3V}{4L}$

$\Rightarrow L_1 = 2L$

22. Three sound waves of equal amplitudes have frequencies $(n-1)$, n, $(n+1)$. They superimpose to give beats. The number of beats produced per second will be

(1) 1

(2) 4

(3) 3

(4) 2

Answer (4)

Sol. $(n-1)$ and $(n+1)$ suppose to form frequency n

n and n will be at resonance

$n-1$ and $n \rightarrow$ produce 1 beat

$n+1$ and $n \rightarrow$ produce 1 beat

Number of beats formed are '2'.

23. An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5 N/C. It experiences a torque equal to 4 N m. The charge on the dipole, if the dipole length is 2 cm, is

(1) 8 mC

(2) 2 mC

(3) 5 mC

(4) 7 μC

Answer (2)

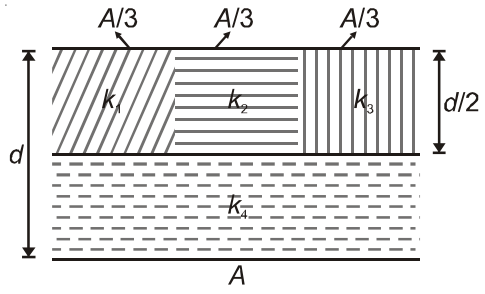
Sol. $\tau = PE \sin\theta$

$$\Rightarrow \tau = qlE \sin\theta$$

$$\Rightarrow q = \frac{\tau}{lE \sin\theta}$$

$$= \frac{4}{2\times10^{-2}\times0.5\times2\times10^{5}} = 2 \text{ mC}$$

24. A parallel-plate capacitor of area A, plate separation d and capacitance C is filled with four dielectric materials having dielectric constants k_1, k_2, k_3 and k_4 as shown in the figure below. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by



(1) $k = k_1 + k_2 + k_3 + 3k_4$

(2) $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$

(3) $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$

(4) $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$

Answer (3)

Sol. k_1, k_2 and k_3 are in parallel so Arithmetic mean.

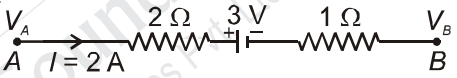
$$k_{eq} = \frac{k_1 + k_2 + k_3}{3}$$

k_{eq} is in series with k_4. So harmonic mean.

$$\Rightarrow \frac{2}{k} = \frac{1}{k_{eq}} + \frac{1}{k_4}$$

$$\Rightarrow \frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$$

25. The potential difference $(V_A - V_B)$ between the points A and B in the given figure is

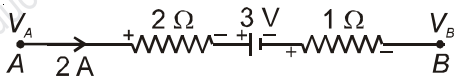


(1) –3 V (2) +3 V

(3) +6 V (4) +9 V

Answer (4)

Sol.



$V_A - V_B = (2 \times 2) + 3 + (2 \times 1)$

$= 4 + 3 + 2$

$= 9$ V

26. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is

(1) 230 Ω (2) 46 Ω

(3) 26 Ω (4) 13 Ω

Answer (3)

Sol. $I = \frac{P}{V} = \frac{500}{100} = 5$ A

Voltage across resistance R will be $230 - 100 = 130$ V

$$R = \frac{130}{5} = 26\ \Omega$$

27. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be

(1) nB (2) n^2B

(3) $2nB$ (4) $2n^2B$

Answer (2)

Sol. $B = \frac{\mu_0 I}{2r}$, when made n turns radius becomes r'

$$n \times 2\pi r' = 2\pi r \Rightarrow r' = \frac{r}{n}$$

Now, $B' = \frac{\mu_0 nI}{2r'} = n^2 \frac{\mu_0 I}{2r} = n^2 B$

28. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is

(1) $\frac{W}{\sqrt{3}}$ (2) $\sqrt{3}W$

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

Answer (2)

Sol. $W = PE(\cos\theta_1 - \cos\theta_2)$

$W = PE(\cos 0 - \cos 60°)$

$= \frac{PE}{2}$

$\Rightarrow PE = 2W$

$\tau = PE \sin\theta = 2W \sin 60° = \sqrt{3}W$

29. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T. If the value of e/m is 1.76×10^{11} C/kg, the frequency of revolution of the electron is

(1) 1 GHz (2) 100 MHz

(3) 62.8 MHz (4) 6.28 MHz

Answer (1)

Sol. $f = \frac{qB}{2\pi m} = \frac{1.76 \times 10^{11} \times 3.57 \times 10^{-2}}{2 \times 3.14}$

$= 10^9$ Hz = 1 GHz

30. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication?

(1) R = 20 Ω, L = 1.5 H, C = 35 μF

(2) R = 25 Ω, L = 2.5 H, C = 45 μF

(3) R = 15 Ω, L = 3.5 H, C = 30 μF

(4) R = 25 Ω, L = 1.5 H, C = 45 μF

Answer (3)

Sol. Better tuning means low bandwidth = $\frac{R}{L}$

31. A uniform magnetic field is restricted within a region of radius r. The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius $R > r$ encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure below. Then the e.m.f. generated is

(1) Zero in loop 1 and zero in loop 2

(2) $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 1 and $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 2

(3) $-\frac{d\vec{B}}{dt}\pi R^2$ in loop 1 and zero in loop 2

(4) $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 1 and zero in loop 2

Answer (4)

Sol. Magnetic flux linked with area of loop 1 is πr^2

So emf in loop 1 is $-\frac{d\vec{B}}{dt}\pi r^2$.

Magnetic flux linked with area of loop 2 is zero

So emf in loop 2 = 0

32. The potential differences across the resistance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is

(1) 0.4 (2) 0.5

(3) 0.8 (4) 1.0

Answer (3)

Sol. $\cos\phi = \frac{R}{z} = \frac{V_R}{V} = \frac{80}{\sqrt{80^2 + (100-40)^2}}$

$= \frac{80}{100} = 0.8$

33. A 100 Ω resistance and a capacitor of 100 Ω reactance are connected in series across a 220 V source. When the capacitor is 50% charged, the peak value of the displacement current is

(1) 2.2 A (2) 11 A

(3) 4.4 A (4) $11\sqrt{2}$ A

Answer (1)

Sol. R = 100 Ω, X_c = 100 Ω

$I_{max} = \frac{200\text{ V}}{100} = \frac{220\text{ V}}{100\ \Omega} = 2.2\text{ A}$

34. Two identical glass (μ_g = 3/2) equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water (μ_w = 4/3). The focal length of the combination is

(1) $f/3$ (2) f

(3) $4f/3$ (4) $3f/4$

Answer (4)

Sol. $\frac{1}{f} = (\mu_g - 1)\frac{2}{R} = \frac{1}{R}, \left(\mu_g = \frac{3}{2}\right), R = f$

$\frac{1}{f_1} = -(\mu_w - 1)\frac{2}{R} = \frac{-2}{3R} = \frac{-2}{3f}$

$\frac{1}{f_{eq}} = \frac{1}{f} + \frac{1}{f} + \frac{1}{f_1} = \frac{1}{R} + \frac{1}{R} - \frac{2}{3R}$

$\frac{1}{f_{eq}} = \frac{1}{f} + \frac{1}{f} = \frac{2}{3f}$

$\frac{1}{f_{eq}} = \frac{2}{f} - \frac{2}{3f}$

$\frac{1}{f_{eq}} = \frac{4}{3f}$

$f_{eq} = \frac{3f}{4}$

35. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is

(1) 8

(2) 10

(3) 12

(4) 16

Answer (3)

Sol. $d = (d_1 + d_2)\,\mu$

$= 1.5(5 + 3) = 12$ cm

36. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio

$\frac{I_{max} - I_{min}}{I_{max} + I_{min}}$

will be

(1) $\frac{\sqrt{n}}{n+1}$

(2) $\frac{2\sqrt{n}}{n+1}$

(3) $\frac{\sqrt{n}}{(n+1)^2}$

(4) $\frac{2\sqrt{n}}{(n+1)^2}$

Answer (2)

Sol. $\frac{I_1}{I_2} = n$

$I_{max} = \left(\sqrt{I_1} + \sqrt{I_2}\right)^2 = \left(\sqrt{n} + 1\right)^2 I_2$

$I_{min} = \left(\sqrt{I_1} - \sqrt{I_2}\right)^2 = \left(\sqrt{n} - 1\right)^2 I_2$

$\frac{I_{max} - I_{min}}{I_{max} + I_{min}} = \frac{4\sqrt{n}}{2(n+1)} = \frac{2\sqrt{n}}{n+1}$

37. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be

(1) Convex, +2.25 diopter

(2) Concave, –0.25 diopter

(3) Concave, –0.2 diopter

(4) Convex, +0.15 diopter

Answer (2)

Sol. Maximum distance of distinct vision = 400 cm. So image of object at infinity is to be formed at 400 cm.

Use lens formula

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

$$\frac{1}{-400}-\frac{1}{\infty}=\frac{1}{f}$$

$P = -0.25$ D

38. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

(1) 0.10 cm

(2) 0.25 cm

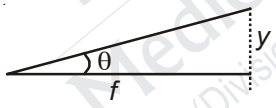
(3) 0.20 cm

(4) 0.15 cm

Answer (4)

Sol. $\theta = \frac{\lambda}{a} = \frac{y}{f}$

$$y = \frac{f\lambda}{a}$$



39. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X-ray tube. The cutoff wavelength (λ_0) of the emitted X-ray is

(1) $\lambda_0 = \frac{2mc\lambda^2}{h}$

(2) $\lambda_0 = \frac{2h}{mc}$

(3) $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$

(4) $\lambda_0 = \lambda$

Answer (1)

Sol. Momentum $P = \frac{h}{\lambda} \Rightarrow E = \frac{p^2}{2m} \Rightarrow \frac{h^2}{2m\lambda^2} = \frac{hc}{\lambda_0}$

$$\Rightarrow \lambda_0 = \frac{hc}{h^2}2m\lambda^2$$

$$= \frac{2mc\lambda^2}{h}$$

40. Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative to C is

(1) +3 V

(2) +4 V

(3) –1 V

(4) –3 V

Answer (4)

Sol. $E_{max} = E - \phi$

$2 \text{ eV} = 5 \text{ eV} - \phi \quad \Rightarrow \quad \phi = 3 \text{ eV}$

Now $eV_0 = E' - \phi$

$= 6 \text{ eV} - 3 \text{ eV} = 3 \text{ eV}$

So stopping potential is –3V.

41. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ. When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be

(1) $\frac{16}{25}\lambda$

(2) $\frac{9}{16}\lambda$

(3) $\frac{20}{7}\lambda$

(4) $\frac{20}{13}\lambda$

Answer (3)

Sol. $\lambda = \dfrac{1}{R\left(\dfrac{1}{2^2}-\dfrac{1}{3^2}\right)}$

$\lambda' = \dfrac{1}{R\left(\dfrac{1}{3^2}-\dfrac{1}{4^2}\right)}$

$\dfrac{\lambda'}{\lambda} = \dfrac{\left(\dfrac{1}{2^2}-\dfrac{1}{3^2}\right)}{\left(\dfrac{1}{3^2}-\dfrac{1}{4^2}\right)} \Rightarrow \lambda' = \dfrac{20\lambda}{7}$

42. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is

(1) 15

(2) 30

(3) 45

(4) 60

Answer (4)

Sol. Number of active nuclei falls from

60% to 15%

So sample becomes $\frac{1}{4}$th

$= \frac{1}{2^2}$th

So number of half-lives = 2

Time t = 2 × 30 = 60 minute

43. For CE transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 4 V. If the current amplification factor of the transistor is 100 and the base resistance is 1 kΩ, then the input signal voltage is

(1) 10 mV

(2) 20 mV

(3) 30 mV

(4) 15 mV

Answer (2)

Sol. R_c = 2 kΩ V_0 = 4 V

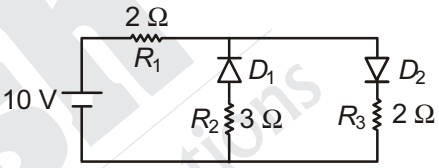
$I_C = \dfrac{4V}{R_C} = \dfrac{4V}{2k\Omega}$ = 2 mA

$\beta = \dfrac{I_C}{I_B} = 100$

$\Rightarrow I_B = \dfrac{I_C}{100} = 2\times10^{-5}$ A

$V_{in} = I_B R_i$ = 2 × 10^{-5} × 1 kΩ = 20 mV

44. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be



(1) 2.5 A

(2) 10.0 A

(3) 1.43 A

(4) 3.13 A

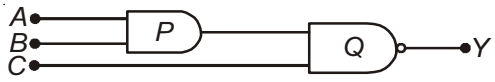
Answer (1)

Sol. D_1 is reverse biased

D_2 is forward biased

$I = \dfrac{10\text{ V}}{(2+2)\Omega}$ = 2.5 A

45. What is the output Y in the following circuit, when all the three inputs A, B, C are first 0 and then 1?



(1) 0, 1

(2) 0, 0

(3) 1, 0

(4) 1, 1

Answer (3)

Sol. Output $Y = \overline{(A\cdot B)\cdot C} = \bar{A}+\bar{B}+\bar{C}$

When A, B, C are 0 → Y = 1

When A, B, C are 1 → Y = 0

46. Which one of the following compounds shows the presence of intramolecular hydrogen bond?

(1) H_2O_2

(2) HCN

(3) Cellulose

(4) Concentrated acetic acid

Answer (3)

Sol. Fact.

47. The molar conductivity of a 0.5 mol/dm^3 solution of $AgNO_3$ with electrolytic conductivity of 5.76×10^{-3} S cm^{-1} at 298 K

(1) 2.88 S cm^2/mol (2) 11.52 S cm^2/mol

(3) 0.086 S cm^2/mol (4) 28.8 S cm^2/mol

Answer (2)

Sol. $\wedge_m = \frac{\kappa \times 1000}{M} = \frac{5.76 \times 10^{-3} \times 1000}{0.5}$

$= 11.52$ S cm^2/mol

48. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

(1) Rate is proportional to the surface coverage

(2) Rate is inversely proportional to the surface coverage

(3) Rate is independent of the surface coverage

(4) Rate of decomposition is very slow

Answer (1)

Sol. Rate is proportion to the surface coverage

49. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below :

I. (NaCl) = 52

II. ($BaCl_2$) = 0.69

III. ($MgSO_4$) = 0.22

The **correct** order of their coagulating power is

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

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

Answer (3)

Sol. Coagulating power $\propto \frac{1}{\text{Coagulation value}}$

50. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 amperes is

(1) 55 minutes (2) 110 minutes

(3) 220 minutes (4) 330 minutes

Answer (2)

Sol. For 1 mole Cl_2, 2 F electricity is required

$\therefore$ For 0.1 mole Cl_2, 0.2 F electricity will be required

$\therefore$ $Q = I \times t$

or, $t = \frac{Q}{I} = \frac{0.2 \times 96500}{3 \times 60} \approx 110$ min.

51. How many electrons can fit in the orbital for which n = 3 and l = 1?

(1) 2 (2) 6

(3) 10 (4) 14

Answer (1)

Sol. An orbital can accommodate maximum of 2 electrons with anti-parallel spins.

52. For a sample of perfect gas when its pressure is changed isothermally from p_i to p_f, the entropy change is given by

(1) $\Delta S = nR\ln\left(\frac{p_f}{p_i}\right)$ (2) $\Delta S = nR\ln\left(\frac{p_i}{p_f}\right)$

(3) $\Delta S = nRT\ln\left(\frac{p_f}{p_i}\right)$ (4) $\Delta S = RT\ln\left(\frac{p_i}{p_f}\right)$

Answer (2)

Sol. $\Delta S = nR\ln\left(\frac{p_i}{p_f}\right)$

53. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

(1) 0 (2) 1

(3) 2 (4) 3

Answer (4)

Sol. $Ba(OH)_2 \longrightarrow Ba^{2(+)} + 2OH^{(-)}$

$\therefore$ van't Hoff factor = 1 + 2 = 3

54. The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0.10 M aqueous pyridine solution (K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is

(1) 0.0060% (2) 0.013%

(3) 0.77% (4) 1.6%

Answer (2)

Sol. $C_5H_5N + H_2O \rightleftharpoons C_5H_5N^{\oplus}H + OH^{\ominus}$

t = 0 C

t = eq. $C(1-\alpha)$ $C\alpha$ $C\alpha$

$\therefore \quad K_b = \frac{C\alpha^2}{1-\alpha} \approx C\alpha^2$

$\therefore \quad \alpha = \sqrt{\frac{K_b}{C}} = \sqrt{\frac{1.7\times10^{-9}}{0.1}}$

$= 1.3 \times 10^{-4}$

$\therefore \quad \% \ \alpha = 1.3 \times 10^{-4} \times 100 = 0.013\%$

55. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are

(1) 4 and 2 (2) 6 and 6

(3) 8 and 4 (4) 4 and 8

Answer (3)

Sol. In CaF_2, $Ca^{2(+)}$ has fcc arrangement and $F^{(-)}$ ions are present in all tetrahedral voids.

$\therefore$ Co-ordination numbers for $Ca^{2(+)}$ and $F^{(-)}$ ions are 8 and 4.

56. If the E°_{cell} for a given reaction has a negative value, which of the following gives the **correct** relationships for the values of ΔG° and K_{eq}?

(1) $\Delta G^{\circ} > 0; \ K_{eq} < 1$ (2) $\Delta G^{\circ} > 0; \ K_{eq} > 1$

(3) $\Delta G^{\circ} < 0; \ K_{eq} > 1$ (4) $\Delta G^{\circ} < 0; \ K_{eq} < 1$

Answer (1)

Sol. $\because \quad E^{o}_{cell} = -ve$

$\therefore \quad \Delta G^{\circ} = +ve \ \& \ K_{eq} = -ve$

i.e., $\Delta G^{\circ} > 0 \ \& \ K_{eq} < 1$

57. Which one of the following is **incorrect** for ideal solution?

(1) $\Delta H_{mix} = 0$

(2) $\Delta U_{mix} = 0$

(3) $\Delta P = P_{obs} - P_{calculated \ by \ Raoult's \ law} = 0$

(4) $\Delta G_{mix} = 0$

Answer (4)

Sol. ΔG_{mix} for ideal solution is positive.

58. The solubility of AgCl(s) with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be

(1) 1.26×10^{-5} M

(2) 1.6×10^{-9} M

(3) 1.6×10^{-11} M

(4) Zero

Answer (2)

Sol. $\underset{S}{AgCl(s)} \quad \underset{S}{Ag^{\oplus}(aq)} + \underset{S}{Cl^{(-)}(aq)}$

$NaCl \quad \underset{0.1\,M}{Na^{\oplus}(aq)} + \underset{0.1\,M}{Cl^{(-)}(aq)}$

$\therefore \quad K_{sp(AgCl)} = S(S + 0.1)$

$\because \quad S << 0.1$

$\therefore \quad S + 0.1 \approx 0.1$

$\therefore \quad 1.6 \times 10^{-10} = S \times 0.1$

$\therefore \quad S = 1.6 \times 10^{-9}$ M

59. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are

(1) 40, 30 (2) 60, 40

(3) 20, 30 (4) 30, 20

Answer (1)

Sol. For XY_2,

$\because \quad 0.1$ mole $XY_2 \equiv 10$ g

$\therefore \quad 1$ mole $XY_2 \equiv 100$ g

and $X + 2Y = 100 \quad \ldots(i)$

For X_3Y_2,

$\because \quad 0.05$ mole $X_3Y_2 \equiv 9$ g

$\therefore \quad 1$ mole $X_3Y_2 \equiv 180$ g

and $3X + 2Y = 180 \quad \ldots(ii)$

On solving,

$X = 40$

and $Y = 30$

60. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charge on electron = 1.60×10^{-19} C)

(1) 6×10^{23} (2) 6×10^{20}

(3) 3.75×10^{20} (4) 7.48×10^{23}

Answer (3)

Sol. $Q = I \times t$

$= 1\ A \times 60\ s$

$= 60\ C$

$\therefore$ No. of electrons $= \dfrac{60}{1.602\times10^{-19}}$

$= 3.75 \times 10^{20}$

61. Boric acid is an acid because its molecule

(1) Contains replaceable H^+ ion

(2) Gives up a proton

(3) Accepts OH^- from water releasing proton

(4) Combines with proton from water molecule

Answer (3)

Sol. Boric acid is an acid because its molecule accepts $OH^{(-)}$ from water releasing proton.

$B(OH)_3 + H_2O \longrightarrow [B(OH)_4]^{(-)}(aq) + H^{(+)}(aq)$

62. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of

(1) $K_3[AlF_3H_3]$ (2) $K_3[AlF_6]$

(3) AlH_3 (4) $K[AlF_3H]$

Answer (2)

Sol. Fact.

63. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because

(1) Zinc is lighter than iron

(2) Zinc has lower melting point than iron

(3) Zinc has lower negative electrode potential than iron

(4) Zinc has higher negative electrode potential than iron

Answer (4)

Sol. $E^\circ_{Zn^{2(+)}/Zn} = -0.76\ V$

$E^\circ_{Fe^{2(+)}/Fe} = -0.44\ V$

64. The suspension of slaked lime in water is known as

(1) Limewater

(2) Quicklime

(3) Milk of lime

(4) Aqueous solution of slaked lime

Answer (3)

Sol. Fact.

65. The hybridizations of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are

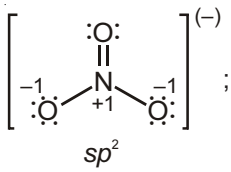
(1) *sp*, sp^3 and sp^2

(2) sp^2, sp^3 and *sp*

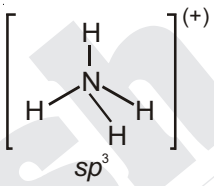
(3) *sp*, sp^2 and sp^3

(4) sp^2, *sp* and sp^3

Answer (3)

Sol. $[:O = \overset{+1}{\underset{sp}{N}} = O:]^{(+)}$;  ;

sp^2



sp^3

66. Which of the following fluoro-compounds is most likely to behave as a Lewis base?

(1) BF_3 (2) PF_3

(3) CF_4 (4) SiF_4

Answer (2)

Sol. In PF_3, P has a lone pair of electrons.

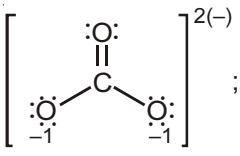
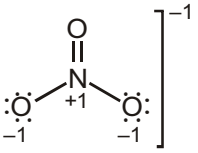
67. Which of the following pairs of ions is isoelectronic and isostructural?

(1) CO_3^{2-}, NO_3^- (2) ClO_3^-, CO_3^{2-}

(3) SO_3^{2-}, NO_3^- (4) ClO_3^-, SO_3^{2-}

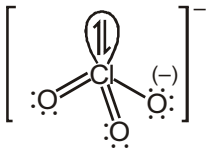
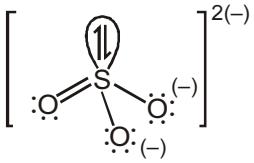
Answer (1 & 4)

Sol. Option (1) :

 ; 

Both have 32 electrons with trigonal planar structure.

Option (4) :

 ; 

Both have 42 electrons with pyramidal structure.

68. In context with beryllium, which one of the following statements is **incorrect**?

(1) It is rendered passive by nitric acid

(2) It forms Be_2C

(3) Its salts rarely hydrolyze

(4) Its hydride is electron-deficient and polymeric

Answer (3)

Sol. Salts of beryllium is readily hydrolysed due to presence of vacant p-orbital.

69. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the folllowing reactions does not show oxidizing behaviour?

(1) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$

(2) $3S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$

(3) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$

(4) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

Answer (4)

Sol. $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

In this reaction there is no change in oxidation state of any atom.

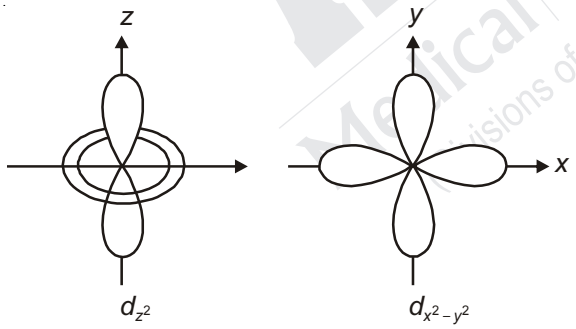
70. Which of the following pairs of *d*-orbitals will have electron density along the axes?

(1) d_{z^2}, d_{xz} (2) d_{xz}, d_{yz}

(3) $d_{z^2}, d_{x^2-y^2}$ (4) $d_{xy}, d_{x^2-y^2}$

Answer (3)

Sol.



71. The **correct** geometry and hybridization for XeF_4 are

(1) Octahedral, sp^3d^2

(2) Trigonal bipyramidal, sp^3d

(3) Planar triangle, sp^3d^3

(4) Square planar, sp^3d^2

Answer (1)

Sol. XeF_4, has octahedral geometry where hybridisation of Xe is sp^3d^2.

72. Among the following, which one is a **wrong** statement?

(1) PH_5 and $BiCl_5$ do not exist

(2) $p\pi$-$d\pi$ bonds are present in SO_2

(3) SeF_4 and CH_4 have same shape

(4) I_3^+ has bent geometry

Answer (3)

Sol. Shape of SeF_4 would be see saw whereas that of CH_4 would be tetrahedral.

73. The **correct** increasing order of trans-effect of the following species is

(1) $NH_3 > CN^- > Br^- > C_6H_5^-$

(2) $CN^- > C_6H_5^- > Br^- > NH_3$

(3) $Br^- > CN^- > NH_3 > C_6H_5^-$

(4) $CN^- > Br^- > C_6H_5^- > NH_3$

Answer (2)

Sol. Fact.

74. Which one of the following statements related to lanthanons is **incorrect**?

(1) Europium shows +2 oxidation state

(2) The basicity decreases as the ionic radius decreases from Pr to Lu

(3) All the lanthanons are much more reactive than aluminium

(4) Ce(+4) solutions are widely used as oxidizing agent in volumetric analysis

Answer (3)

Sol. Fact.

75. Jahn-Teller effect is not observed in high spin complexes of

(1) d^7 (2) d^8

(3) d^4 (4) d^9

Answer (2)

Sol. Fact.

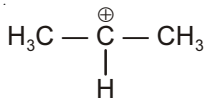
76. Which of the following can be used as the halide component for Friedel Crafts reaction?

(1) Chlorobenzene (2) Bromobenzene

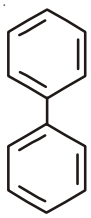
(3) Chloroethene (4) Isopropyl chloride

Answer (4)

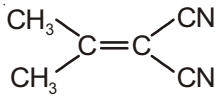
Sol. Isopropyl chloride would form stable carbocation

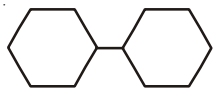


77. In which of the following molecules, all atoms are coplanar?

(1) 

(2) 

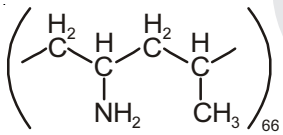
(3) 

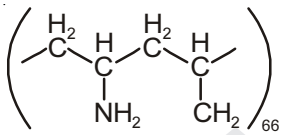
(4) 

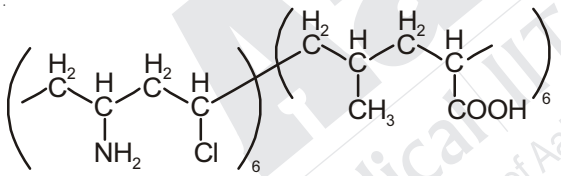
Answer (1)

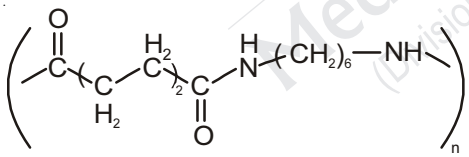
Sol. Biphenyl is a planar system, where all the carbon atoms and H-atoms are in same plane.

78. Which one of the following structures represents nylon 6,6 polymer?

(1) 

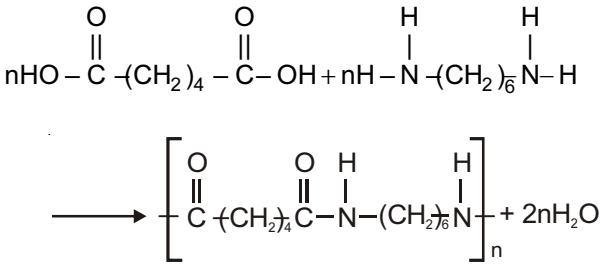
(2) 

(3) 

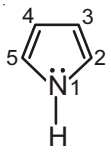
(4) 

Answer (4)

Sol. Nylon-6,6 is the co-polymer of adipic acid and hexamethylene diamine.



79. In pyrrole



the electron density is maximum on

(1) 2 and 3

(2) 3 and 4

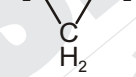
(3) 2 and 4

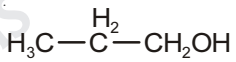
(4) 2 and 5

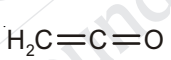
Answer (4)

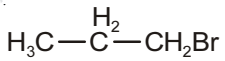
Sol. At 2 and 5 negative charge is more stable.

80. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination or direct only elimination reaction?

(1) 

(2) 

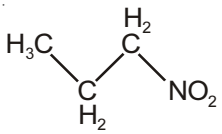
(3) 

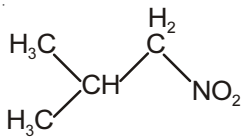
(4) 

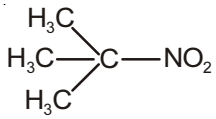
Answer (3)

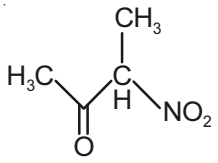
Sol. $H_2C=C=O$, has only two carbon atom, cannot be converted into propene as the conditions are given.

81. Which one of the following nitro-compounds does not react with nitrous acid?

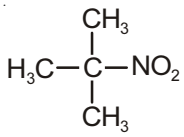
(1) 

(2) 

(3) 

(4) 

Answer (3)

Sol. 

No acidic H-atom on the carbon atom having NO_2-group.

82. The central dogma of molecular genetics states that the genetic information flows from

(1) Amino acids → Proteins → DNA

(2) DNA → Carbohydrates → Proteins

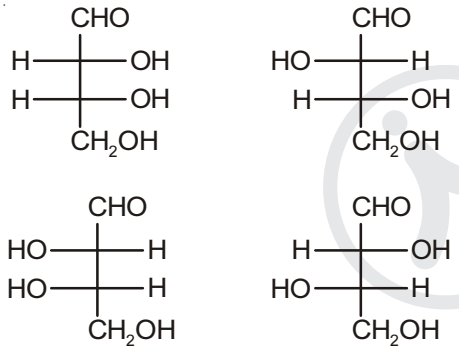
(3) DNA → RNA → Proteins

(4) DNA → RNA → Carbohydrates

Answer (3)

Sol. Fact.

83. The correct corresponding order of names of four aldoses with configuration given below



respectively, is

(1) L-erythrose, L-threose, L-erythrose, D-threose

(2) D-threose, D-erythrose, L-threose, L-erythrose

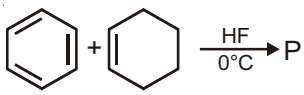
(3) L-erythrose, L-threose, D-erythrose, D-threose

(4) D-erythrose, D-threose, L-erythrose, L-threose

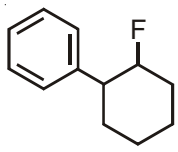
Answer (4)

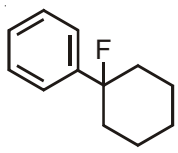
Sol. Fact.

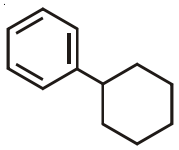
84. In the given reaction

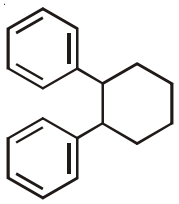


the product P is

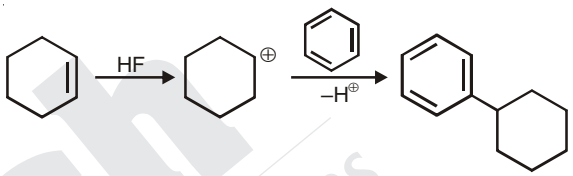
(1) 

(2) 

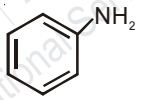
(3) 

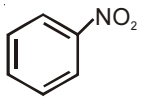
(4) 

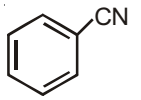
Answer (3)

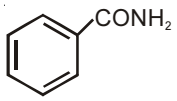
Sol. 

85. A given nitrogen-containing aromatic compound A reacts with Sn/HCl, followed by HNO_2 to give an unstable compound B. B, on treatment with phenol, forms a beautiful coloured compound C with the molecular formula $C_{12}H_{10}N_2O$. The structure of compound A is

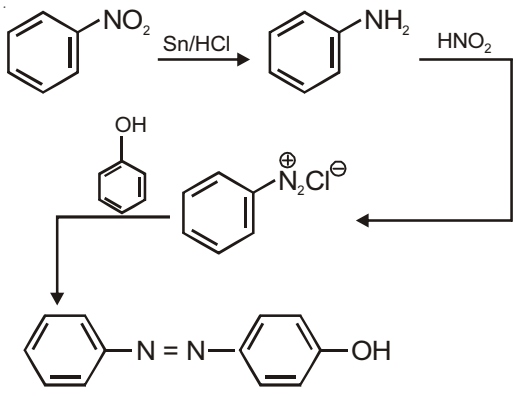
(1) 

(2) 

(3) 

(4) 

Answer (2)

Sol. 

86. Consider the reaction

$CH_3CH_2CH_2Br + NaCN \rightarrow CH_3CH_2CH_2CN + NaBr$

This reaction will be the fastest in

(1) Ethanol

(2) Methanol

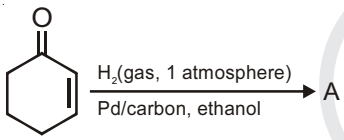
(3) N, N′-dimethylformamide (DMF)

(4) Water

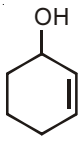
Answer (3)

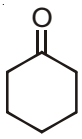
Sol. ∵ The reaction is S_N2, most suitable solvent should be polar aprotic i.e., DMF.

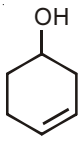
87. The correct structure of the product A formed in the reaction

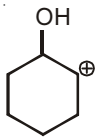


is

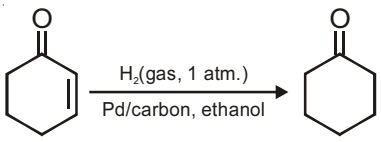
(1) 

(2) 

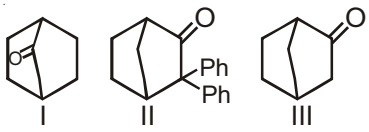
(3) 

(4) 

Answer (2)

Sol. 

88. Which among the given molecules can exhibit tautomerism?



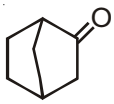
(1) III only

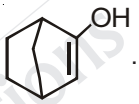
(2) Both I and III

(3) Both I and II

(4) Both II and III

Answer (1)

Sol. Bridge-head carbocation is unstable, therefore, tautomerism will be shown only by 

and the enolic form would be 

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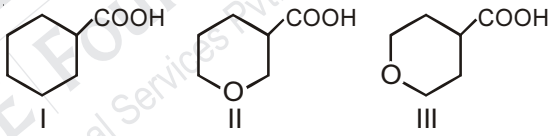
89. The **correct** order of strengths of the carboxylic acids



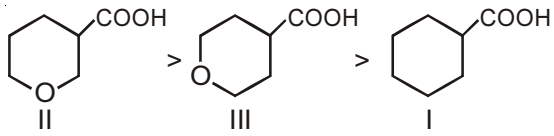
is

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

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

Answer (2)

Sol. On the basis of –I effect, the correct acidic strength would be



90. The compound that will react most readily with gaseous bromine has the formula

(1) C_3H_6 (2) C_2H_2

(3) C_4H_{10} (4) C_2H_4

Answer (1)

Sol. In gas phase allylic substitution takes place.

91. Which one of the following is **wrong** for fungi?
(1) They are eukaryotic
(2) All fungi possess a purely cellulosic cell wall
(3) They are heterotrophic
(4) They are both unicellular and multicellular

Answer (2)

Sol. Cell wall of fungi is made up of chitin and polysaccharides.

92. Methanogens belong to
(1) Eubacteria
(2) Archaebacteria
(3) Dinoflagellates
(4) Slime moulds

Answer (2)

Sol. Methanogens, halophiles and thermoacidophiles are archaebacteria.

93. Select the **wrong** statement.
(1) The walls of diatoms are easily destructible
(2) 'Diatomaceous earth' is formed by the cell walls of diatoms
(3) Diatoms are chief producers in the oceans
(4) Diatoms are microscopic and float passively in water

Answer (1)

Sol. The cell walls of diatoms are embedded with silica and thus the walls are indestructible.

94. The label of a herbarium sheet **does not** carry information on
(1) Date of collection
(2) Name of collector
(3) Local names
(4) Height of the plant

Answer (4)

Sol. The herbarium sheets carry a label providing information about date and place of collection, english, local and botanical names, family, collector's name.

95. Conifers are adapted to tolerate extreme environmental conditions because of
(1) Broad hardy leaves
(2) Superficial stomata
(3) Thick cuticle
(4) Presence of vessels

Answer (3)

Sol. In conifers, the needle like leaves, thick cuticle and sunken stomata help to reduce water loss.

96. Which one of the following statements is **wrong**?
(1) Algae increase the level of dissolved oxygen in the immediate environment
(2) Algin is obtained from red algae, and carrageenan from brown algae
(3) Agar-agar is obtained from *Gelidium* and *Gracilaria*
(4) *Laminaria* and *Sargassum* are used as food

Answer (2)

Sol. Algin is obtained from brown algae, and carrageenin from red algae.

97. The term 'polyadelphous' is related to
(1) Gynoecium (2) Androecium
(3) Corolla (4) Calyx

Answer (2)

Sol. The stamens may be united into one bundle (monoadelphous), or two bundles (diadelphous) or into more than two bundles (polyadelphous).

98. How many plants among *Indigofera*, *Sesbania*, *Salvia*, *Allium*, *Aloe*, mustard, groundnut, radish, gram and turnip have stamens with different lengths in their flowers?
(1) Three (2) Four
(3) Five (4) Six

Answer (2)

Sol. Brassicaceae, $A_{2+4} \rightarrow$ Mustard, Radish, Turnip
Lamiaceae, $A_{2+2} \rightarrow$ *Salvia*

99. Radial symmetry is found in the flowers of
(1) *Brassica* (2) *Trifolium*
(3) *Pisum* (4) *Cassia*

Answer (1)

Sol. Radial or actinomorphic symmetry is found in flowers like mustard, *Datura,* Chilli.

100. Free-central placentation is found in
(1) *Dianthus* (2) *Argemone*
(3) *Brassica* (4) *Citrus*

Answer (1)

Sol. *Dianthus, Primrose* – Free central placentation.
Argemone – Parietal placentation.
Citrus – Axile placentation.

101. Cortex is the region found between
(1) Epidermis and stele
(2) Pericycle and endodermis
(3) Endodermis and pith
(4) Endodermis and vascular bundle

Answer (1)

Sol. Cortex is the region present between epidermis and stele.

102. The balloon-shaped structures called tyloses
(1) Originate in the lumen of vessels
(2) Characterize the sapwood
(3) Are extensions of xylem parenchyma cells into vessels
(4) Are linked to the ascent of sap through xylem vessels

Answer (3)

Sol. Tyloses are balloon - shaped structures in xylem vessels developed by xylem parenchyma cells.

103. A non-proteinaceous enzyme is
(1) Lysozyme (2) Ribozyme
(3) Ligase (4) Deoxyribonuclease

Answer (2)

Sol. Ribozyme is RNA acting like an enzyme or biocatalyst.

104. Select the **mismatch.**
(1) Gas vacuoles – Green bacteria
(2) Large central vacuoles – Animal cells
(3) Protists – Eukaryotes
(4) Methanogens – Prokaryotes

Answer (2)

Sol. Large central vacuole is present in plant cells.

105. Select the **wrong** statement
(1) Bacterial cell wall is made up of peptidoglycan
(2) Pili and fimbriae are mainly involved in motility of bacterial cells
(3) Cyanobacteria lack flagellated cells
(4) *Mycoplasma* is a wall-less microorganism

Answer (2)

Sol. Pili and fimbriae are surface structures of the bacteria that do not play a role in motility.

106. A cell organelle containing hydrolytic enzymes is
(1) Lysosome (2) Microsome
(3) Ribosome (4) Mesosome

Answer (1)

Sol. The isolated lysosomal vesicles have been found to be very rich in almost all types of hydrolytic enzymes.

107. During cell growth, DNA synthesis takes place in
(1) S phase (2) G_1 phase
(3) G_2 phase (4) M phase

Answer (1)

Sol. DNA replication occurs in S-phase of cell cycle.

108. Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins?
(1) Glucose-6-phosphate
(2) Fructose 1,6-bisphosphate
(3) Pyruvic acid
(4) Acetyl CoA

Answer (4)

Sol. Acetyl CoA is common to fat, carbohydrate and protein catabolism.

109. A few drops of sap were collected by cutting across a plant stem by a suitable method. The sap was tested chemically. Which one of the following test results indicates that it is phloem sap?
(1) Acidic (2) Alkaline
(3) Low refractive index (4) Absence of sugar

Answer (2)

Sol. Alkaline pH (7.8 – 8.0) is present in phloem sap where as xylem sap is acidic.

110. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots?
(1) IAA and gibberellin
(2) Auxin and cytokinin
(3) Auxin and abscisic acid
(4) Gibberellin and abscisic acid

Answer (2)

Sol. Auxins and cytokinin induce development of root and shoot in a culture medium (respectively).

111. Phytochrome is a
(1) Flavoprotein (2) Glycoprotein
(3) Lipoprotein (4) Chromoprotein

Answer (4)

Sol. Photochrome is a blue-green pigment which absorb red and far red light. It is a coloured protein i.e. chromoprotein.

112. Which is essential for the growth of root tip?
(1) Zn (2) Fe
(3) Ca (4) Mn

Answer (3)

Sol. Calcium is required by dividing and differentiating cells.

113. The process which makes major difference between C_3 and C_4 plants is
(1) Glycolysis (2) Calvin cycle
(3) Photorespiration (4) Respiration

Answer (3)

Sol. Photorespiration is present in C_3 plants but absent in C_4 plants.

114. Which one of the following statements is **not** correct?
(1) Offspring produced by the asexual reproduction are called clone
(2) Microscopic, motile asexual reproductive structures are called zoospores
(3) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem
(4) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes

Answer (3)

Sol. In potato, banana and ginger, the plantlets arise from the nodes present on modified stem.

115. Which one of the following generates new genetic combinations leading to variation?
(1) Vegetative reproduction
(2) Parthenogenesis
(3) Sexual reproduction
(4) Nucellar polyembryony

Answer (3)

Sol. Sexual reproduction generates new genetic recombination leading to variations.

116. Match **Column-I** with **Column-II** and select the correct option using the codes given below

	Column-I	**Column-II**
a.	Pistils fused together	(i) Gametogenesis
b.	Formation of gametes	(ii) Pistillate
c.	Hyphae of higher Ascomycetes	(iii) Syncarpous
d.	Unisexual female flower	(iv) Dikaryotic

Codes :

	a	b	c	d
(1)	(iv)	(iii)	(i)	(ii)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(iii)	(i)	(iv)	(ii)

Answer (4)

Sol.
- Syncarpous – Pistils fused together.
- Gametogenesis – Formation of gamete.
- Dikaryotic hyphae – Hyphae of ascomycetes
- Pistillate flower – Unisexual female flower.

117. In majority of angiosperms
(1) Egg has a filiform apparatus
(2) There are numerous antipodal cells
(3) Reduction division occurs in the megaspore mother cells
(4) A small central cell is present in the embryo sac

Answer (3)

Sol. Megaspore Mother Cell (MMC) undergoes meiosis to form megaspore.

118. Pollination in water hyacinth and water lily is brought about by the agency of
(1) Water (2) Insects or wind
(3) Birds (4) Bats

Answer (2)

Sol. Water hyacinth and water lily are aquatic plants pollinated by insect or wind.

119. The ovule of an angiosperm is technically equivalent to
(1) Megasporangium
(2) Megasporophyll
(3) Megaspore mother cell
(4) Megaspore

Answer (1)

Sol. Integumented and stalked megasporangium is called ovule.

120. Taylor conducted the experiments to prove semiconservative mode of chromosome replication on
(1) *Vinca rosea*
(2) *Vicia faba*
(3) *Drosophila melanogaster*
(4) *E. coli*

Answer (2)

Sol. Semiconservative mode of chromosome replication was proved by Taylor in *Vicia faba*.

121. The mechanism that causes a gene to move from one linkage group to another is called
(1) Inversion (2) Duplication
(3) Translocation (4) Crossing-over

Answer (3)

Sol. Translocation is a phenomenon of transfer of a gene segment between non-homologus chromosome, *i.e.,* different linkage group.

122. The equivalent of a structural gene is

(1) Muton (2) Cistron

(3) Operon (4) Recon

Answer (2)

Sol. Cistron is a segment of DNA coding for a polypeptide.

Eukaryotic structural gene is monocistronic whereas prokaryotic structural gene is polycistronic.

123. A true breeding plant is

(1) One that is able to breed on its own

(2) Produced due to cross-pollination among unrelated plants

(3) Near homozygous and produces offspring of its own kind

(4) Always homozygous recessive in its genetic constitution

Answer (3)

Sol. True breeding line is one that, having undergone continuous self pollination, shows the stable trait inheritance and expression for several generations. It is both homozygous recessive as well as dominant in genetic constitution.

124. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria?

(1) 5 S rRNA (2) 18 S rRNA

(3) 23 S rRNA (4) 5.8 S rRNA

Answer (3)

Sol. 23S rRNA is a component of larger subunit of ribosome and it act as peptidyl transferase (ribozyme).

125. Stirred-tank bioreactors have been designed for

(1) Purification of product

(2) Addition of preservatives to the product

(3) Availability of oxygen throughout the process

(4) Ensuring anaerobic conditions in the culture vessel

Answer (3)

Sol. Stirred-tank bioreactor is provided with stirrer for availability of oxygen throughout the process.

126. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using

(1) *Eco RI* (2) *Taq* polymerase

(3) Polymerase III (4) Ligase

Answer (4)

Sol. In DNA recombinant technology, linking of foreign DNA and plasmid is made possible by DNA ligase which is also called "molecular glue".

127. Which of the following is **not** a component of downstream processing?

(1) Separation

(2) Purification

(3) Preservation

(4) Expression

Answer (4)

Sol. After the completion of biosynthetic pathway, downstreaming processing includes all the steps involved in isolation, purification and preservation of products. All the steps before the completion of pathway are included in upstreaming processing *i.e.,* expression of genetic material.

128. Which of the following restriction enzymes produces blunt ends?

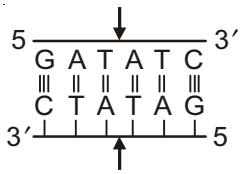
(1) *Sal I* (2) *Eco* RV

(3) *Xho* I (4) *Hind* III

Answer (2)

Sol. *Eco* RV cuts the DNA in the centre of restriction sites forming blunt ends.

The pallindromic sequence for *Eco* RV is



129. Which kind of therapy was given in 1990 to a four-year-old girl with adenosine deaminase (ADA) deficiency?

(1) Gene therapy

(2) Chemotherapy

(3) Immunotherapy

(4) Radiation therapy

Answer (1)

Sol. Gene therapy was given in 1990 to a four year old girl child with ADA deficiency.

130. How many hot spots of biodiversity in the world have been identified till date by Norman Myers?

(1) 17 (2) 25

(3) 34 (4) 43

Answer (3)

Sol. Today the number of hotspots identified by ecologists is 34 covering an area less than 2% of land surface with about 20% of human population living there.

131. The primary producers of the deep-sea hydrothermal vent ecosystem are

(1) Green algae

(2) Chemosynthetic bacteria

(3) Blue-green algae

(4) Coral reefs

Answer (2)

Sol. The primary producers of the deep sea hydrothermal vent ecosystem are *Archaebacteria*, they have chemosynthetic mode of nutrition.

132. Which of the following is **correct** for *r*-selected species?

(1) Large number of progeny with small size

(2) Large number of progeny with large size

(3) Small number of progeny with small size

(4) Small number of progeny with large size

Answer (1)

Sol. *r*-selected species ⇒ species whose population growth is function of biotic potential (*r*). They have large number of progeny with small size.

133. If '+' sign is assigned to beneficial interaction, '–' sign to detrimental and '0' sign to neutral interaction, then the population interaction represented by '+' '–' refers to

(1) Mutualism (2) Amensalism

(3) Commensalism (4) Parasitism

Answer (4)

Sol. **Parasitism** ⇒ Parasite is benefitted (+) but host is harmed (–) so it is a (+, –) type of population interaction.

134. Which of the following is **correctly** matched?

(1) Aerenchyma – *Opuntia*

(2) Age pyramid – Biome

(3) *Parthenium hysterophorus* – Threat to biodiversity

(4) Stratification – Population

Answer (3)

Sol. *Parthenium hysterophorus* is an exotic or alien species which causes extinction of native (or) indegenous species.

135. Red list contains data or information on

(1) All economically important plants

(2) Plants whose products are in international trade

(3) Threatened species

(4) Marine vertebrates only

Answer (3)

Sol. IUCN [International Union Conservation of Nature and Natural Resources] (or) WCU [World Conservation Union] maintains red list which is a catalogue for threatened species.

136. Which of the following sets of diseases is caused by bacteria?

(1) Cholera and tetanus (2) Typhoid and smallpox

(3) Tetanus and mumps (4) Herpes and influenza

Answer (1)

Sol. Cholera is caused by a bacterium *Vibrio cholerae* and tetanus is caused by a bacterium *Clostridium tetani.*

137. Match **Column-I** with **Column-II** for housefly classification and select the correct option using the codes given below:

	Column-I		**Column-II**
a.	Family	(i)	Diptera
b.	Order	(ii)	Arthropoda
c.	Class	(iii)	Muscidae
d.	Phylum	(iv)	Insecta

Codes:

	a	b	c	d
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iv)	(ii)	(i)	(iii)

Answer (1)

Sol. Housefly belongs to

(i) Phylum - Arthropoda

(ii) Class - Insecta

(iii) Order - Diptera

(iv) Family - Muscidae

138. Choose the **correct** statement.

(1) All mammals are viviparous

(2) All cyclostomes do not possess jaws and paired fins.

(3) All reptiles have a three-chambered heart.

(4) All pisces have gills covered by an operculum.

Answer (2)

Sol. Cyclostomes belong to the division agnatha. They are jawless vertebrates without paired fins.

139. Study the four statements (A–D) given below and select the two **correct** ones out of them:

A. Definition of biological species was given by Ernst Mayr.

B. Photoperiod does not affect reproduction in plants.

C. Binomial nomenclature system was given by R.H. Whittaker.

D. In unicellular organisms, reproduction is synonymous with growth.

The two **correct** statements are

(1) B and C (2) C and D

(3) A and D (4) A and B

Answer (3)

Sol. Photoperiod affect reproduction in plants.

Bionomial nomenclature system was given by *Carolus Linnaeus*

140. In male cockroaches, sperms are stored in which part of the reproductive system?

(1) Seminal vesicles

(2) Mushroom glands

(3) Testes

(4) Vas deferens

Answer (1)

Sol. In male cockroach, sperms are stored in seminal vesicle.

141. Smooth muscles are

(1) Involuntary, fusiform, non-striated

(2) Voluntary, multinucleate, cylindrical

(3) Involuntary, cylindrical, striated

(4) Voluntary, spindle-shaped, uninucleate

Answer (1)

Sol. Smooth muscles are involuntary, fusiform, nonstriated muscles.

142. Oxidative phosphorylation is

(1) Formation of ATP by transfer of phosphate group from a substrate to ADP

(2) Oxidation of phosphate group in ATP

(3) Addition of phosphate group to ATP

(4) Formation of ATP by energy released from electrons removed during substrate oxidation

Answer (4)

Sol. Oxidative phosphorylation uses energy of oxidation-reduction of substrate to generate ATP.

143. Which of the following is the least likely to be involved in stabilizing the three-dimensional folding of most proteins?

(1) Hydrogen bonds

(2) Electrostatic interaction

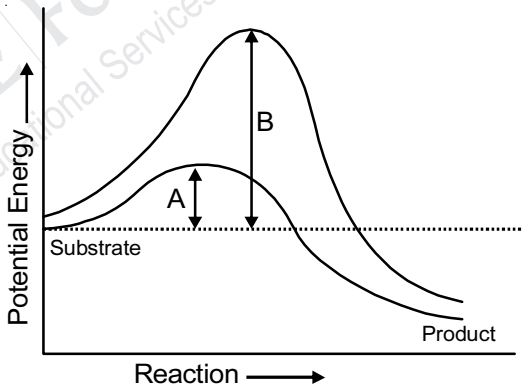
(3) Hydrophobic interaction

(4) Ester bonds

Answer (4)

Sol. Ester bond is formed between sugar and phosphate in a nucleotide.

144. Which of the following describes the given graph **correctly**?



(1) Endothermic reaction with energy A in presence of enzyme and B in absence of enzyme

(2) Exothermic reaction with energy A in presence of enzyme and B in absence of enzyme

(3) Endothermic reaction with energy A in absence of enzyme and B in presence of enzyme

(4) Exothermic reaction with energy A in absence of enzyme and B in presence of enzyme

Answer (2)

Sol. Potential energy of substrate is more than the product. So it is an exothermic reaction. 'A' represents the activation energy in the presence of enzyme while 'B' in the absence of enzyme *i.e.*, enzyme lowers down the activation energy.

145. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?

(1) G_1 / S (2) G_2 / M

(3) M (4) Both G_2 / M and M

Answer (1)

Sol. G_1 / S check point of cell cycle is a major check point.

146. Match the stages of meiosis of Column-I to their characteristic features in Column-II and select the correct option using the codes given below:

	Column-I		**Column-II**
a.	Pachytene	(i)	Pairing of homologous chromosomes
b.	Metaphase I	(ii)	Terminalization of chiasmata
c.	Diakinesis	(iii)	Crossing-over takes place
d.	Zygotene	(iv)	Chromosomes align at equatorial plate

Codes

	a	**b**	**c**	**d**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(i)	(iv)	(ii)	(iii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

Answer (1)

Sol. Pachytene - Stage of crossing over

Metaphase-I - Chromosome align at equatorial plate

Diakinesis - Terminalisation of chiasmata

Zygotene - Pairing of homologous chromosome

147. Which hormones do stimulate the production of pancreatic juice and bicarbonate?

(1) Angiotensin and epinephrine

(2) Gastrin and insulin

(3) Cholecystokinin and secretin

(4) Insulin and glucagon

Answer (3)

Sol. Cholecystokinin and secretin both hormones increase the secretion of pancreatic juice.

148. The partial pressure of oxygen in the alveoli of the lungs is

(1) Equal to that in the blood

(2) More than that in the blood

(3) Less than that in the blood

(4) Less than that of carbon dioxide

Answer (2)

Sol. Partial pressure of oxygen in alveoli of lungs is 104 mm of Hg that is more than that of blood in pulmonary artery (40 mm of Hg).

149. Choose the **correct** statements.

(1) Nociceptors respond to changes in pressure

(2) Meissner's corpuscles are thermoreceptors

(3) Photoreceptors in the human eye are depolarised during darkness and become hyperpolarized in response to the light stimulus

(4) Receptors do not produce graded potentials

Answer (3)

Sol. Photoreceptors (Rod cells) in human eye are depolarised during darkness and become hyperpolarised in response to the light stimulus.

150. Graves' disease is caused due to

(1) Hyposecretion of thyroid gland

(2) Hypersecretion of thyroid gland

(3) Hyposecretion of adrenal gland

(4) Hypersecretion of adrenal gland

Answer (2)

Sol. Grave's disease is due to the hypersecretion of thyroid gland.

151. Name the ion responsible for unmasking of active sites for myosin for cross-bridge activity during muscle contraction.

(1) Calcium (2) Magnesium

(3) Sodium (4) Potassium

Answer (1)

Sol. Calcium ions bind with TpC unit of troponin which is responsible for unmasking of active sites for myosin for crossbridge activity during muscles contraction.

152. Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.

(1) Erythrocytes (2) Leucocytes

(3) Neutrophils (4) Thrombocytes

Answer (4)

Sol. Deduction in thrombocytes (platelets) can cause clotting disorder, leading to excessive loss of blood from the body.

153. Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilization.

(1) Insulin (2) Glucagon

(3) Secretin (4) Gastrin

Answer (1)

Sol. Insulin is a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilisation so it decreases the blood glucose level.

154. Osteoporosis, an age-related disease of skeletal system, may occur due to

(1) Immune disorder affecting neuromuscular junction leading to fatigue

(2) High concentration of Ca^{++} and Na^{+}

(3) Decreased level of estrogen

(4) Accumulation of uric acid leading to inflammation of joints

Answer (3)

Sol. Osteoporosis in aged female after menopause is due to decreased level of estrogen.

155. Serum differs from blood in

(1) Lacking globulins

(2) Lacking albumins

(3) Lacking clotting factors

(4) Lacking antibodies

Answer (3)

Sol. Serum is plasma without clotting factors. It never clot.

156. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because

(1) There is a negative pressure in the lungs

(2) There is a negative intrapleural pressure pulling at the lung walls

(3) There is a positive intrapleural pressure

(4) Pressure in the lungs is higher than the atmospheric pressure

Answer (2)

Sol. Lungs do not collapse between breaths and some air always remains in the lung which can never be expelled because there is a negative intrapleural pressure pulling at the lung walls.

157. The posterior pituitary gland is **not** a 'true' endocrine gland because

(1) It is provided with a duct

(2) It only stores and releases hormones

(3) It is under the regulation of hypothalamus

(4) It secretes enzymes

Answer (2)

Sol. Posterior pituitary gland is not a true endocrine gland because it only stores and releases hormones.

158. The part of nephron involved in active reabsorption of sodium is

(1) Distal convoluted tubule

(2) Proximal convoluted tubule

(3) Bowman's capsule

(4) Descending limb of Henle's loop

Answer (2)

Sol. Proximal convoluted tubule is involved in active reabsorption of sodium.

159. Which of the following is hormone releasing IUD?

(1) LNG-20 (2) Multiload-375

(3) Lippes loop (4) Cu7

Answer (1)

Sol. LNG-20 (Levonorgestrel) is a hormone releasing IUDs.

160. Which of the following is **incorrect** regarding vasectomy?

(1) No sperm occurs in seminal fluid

(2) No sperm occurs in epididymis

(3) Vasa deferentia is cut and tied

(4) Irreversible sterility

Answer (2)

Sol. In vasectomy, sperms occur in epididymis. In this, vas deferens are cut so sperms are not present in semen.

161. Embryo with more than 16 blastomeres formed due to *in-vitro* fertilization is transferred into

(1) Uterus (2) Fallopian tube

(3) Fimbriae (4) Cervix

Answer (1)

Sol. In intrauterine transfer (IUT), embryo more than 8 blastomeres formed due to *in-vitro* fertilization is transferred in uterus.

162. Which of the following depicts the **correct** pathway of transport of sperms?

(1) Rete testis $\rightarrow$ Efferent ductules $\rightarrow$ Epididymis $\rightarrow$ Vas deferens

(2) Rete testis $\rightarrow$ Epididymis $\rightarrow$ Efferent ductules $\rightarrow$ Vas deferens

(3) Rete testis $\rightarrow$ Vas deferens $\rightarrow$ Efferent ductules $\rightarrow$ Epididymis

(4) Efferent ductules $\rightarrow$ Rete testis $\rightarrow$ Vas deferens $\rightarrow$ Epididymis

Answer (1)

Sol. Pathway of transport of sperms in human male is

Rete testis → Efferent ductules (Vasa efferentia) → Epididymis → Vas deferens.

163. Match **Column-I** with **Column-II** and select the correct option using the codes given below:

	Column-I	**Column-II**
a.	Mons pubis	(i) Embryo formation
b.	Antrum	(ii) Sperm
c.	Trophectoderm	(iii) Female external genitalia
d.	Nebenkern	(iv) Graafian follicle

Codes:

	a	**b**	**c**	**d**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(i)	(iv)	(iii)	(ii)

Answer (2)

Sol. **Correct** matching is:

(a) Mons pubis - Female external genitalia

(b) Antrum - Graafian follicle

(c) Trophoectoderm - Embryo formation

(d) Nebenkern - Sperm

164. Several hormones like hCG, hPL, estrogen, progesterone are produced by

(1) Ovary

(2) Placenta

(3) Fallopian tube

(4) Pituitary

Answer (2)

Sol. Hormones secreted by placenta are hCG, hPL, estrogen and progesterone.

165. If a colour-blind man marries a woman who is homozygous for normal colour vision, the probability of their son being colour-blind is

(1) 0

(2) 0.5

(3) 0.75

(4) 1

Answer (1)

Sol. Colourblindness is X-linked recessive disease and shows criss-cross inheritance.

X^cY (Colour-blind man) × XX (Normal vision woman)

↓

Progeny

	X^c	Y
X	X^cX	XY
X	X^cX	XY

100% - carrier daughters (Phenotypically normal)

100% - Normal son

166. Genetic drift operates in

(1) Small isolated population

(2) Large isolated population

(3) Non-reproductive population

(4) Slow reproductive population

Answer (1)

Sol. Genetic drift operates in small isolated inbreeding population.

167. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by

(1) p^2

(2) $2pq$

(3) pq

(4) q^2

Answer (2)

Sol. In Hardy Weinberg equation,

p^2 = Homozygous dominant individuals

$2pq$ = Heterozygous individuals

q^2 = Homozygous recessive individuals

168. The chronological order of human evolution from early to the recent is

(1) *Australopithecus* → *Ramapithecus* → *Homo habilis* → *Homo erectus*

(2) *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*

(3) *Ramapithecus* → *Homo habilis* → *Australopithecus* → *Homo erectus*

(4) *Australopithecus* → *Homo habilis* → *Ramapithecus* → *Homo erectus*

Answer (2)

Sol. The chronological order of human evolution from early to the recent is

Ramapithecus → *Australopithecus* → *Homo habilis* → *Homo erectus*

169. Which of the following is the **correct** sequence of events in the origin of life?

(i) Formation of protobionts

(ii) Synthesis of organic monomers

(iii) Synthesis of organic polymers

(iv) Formation of DNA-based genetic systems

(1) (i) (ii) (iii) (iv)

(2) (i) (iii) (ii) (iv)

(3) (ii) (iii) (i) (iv)

(4) (ii) (iii) (iv) (i)

Answer (3)

Sol. Correct sequence of events in the origin of life is

Synthesis of organic monomers
↓
Synthesis of organic polymers
↓
Formation of protobionts
↓
Formation of DNA-based genetic systems

170. A molecule that can act as a genetic material must fulfill the traits given below, **except**

(1) It should be able to express itself in the form of 'Mendelian characters'

(2) It should be able to generate its replica

(3) It should be unstable structurally and chemically

(4) It should provide the scope for slow changes that are required for evolution

Answer (3)

Sol. A molecule which is unstable structurally and chemically cannot act as a genetic material.

171. DNA-dependent RNA polymerase catalyzes transcription on one strand of the DNA which is called the

(1) Template strand (2) Coding strand

(3) Alpha strand (4) Antistrand

Answer (1)

Sol. The DNA-dependent RNA polymerase catalyze the polymerisation in only one direction that is $5' \rightarrow 3'$, the strand with polarity $5' \rightarrow 3'$ act as template and is called as template strand.

172. Interspecific hybridization is the mating of

(1) Animals within same breed without having common ancestors

(2) Two different related species

(3) Superior males and females of different breeds

(4) More closely related individuals within same breed for 4–6 generations

Answer (2)

Sol. Interspecific hybridization is mating of animals of two different related species.

173. Which of the following is **correct** regarding AIDS causative agent HIV?

(1) HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase

(2) HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase

(3) HIV is unenveloped retrovirus

(4) HIV does not escape but attacks the acquired immune response

Answer (2)

Sol. Causative agent of AIDS is HIV which is enveloped virus that contains two identical molecules of ssRNA and two molecules of reverse transcriptase.

174. Among the following edible fishes, which one is a marine fish having rich source of omega-3 fatty acids?

(1) Mystus (2) Mangur

(3) Mrigala (4) Mackerel

Answer (4)

Sol. Mackerel is a marine fish having rich source of omega-3 fatty acids.

175. Match **Column-I** with **Column-II** and select the correct option using the codes given below :

	Column-I		**Column-II**
a.	Citric acid	(i)	*Trichoderma*
b.	Cyclosporin A	(ii)	*Clostridium*
c.	Statins	(iii)	*Aspergillus*
d.	Butyric acid	(iv)	*Monascus*

Codes :

	a	b	c	d
(1)	(iii)	(i)	(ii)	(iv)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(i)	(iv)	(ii)	(iii)
(4)	(iii)	(iv)	(i)	(ii)

Answer (2)

Sol.

Microbe		**Product**
Aspergillus niger	-	Citric acid
Trichoderma polysporum	-	Cyclosporin-A
Monascus purpureus	-	Statins
Clostridium butylicum	-	Butyric acid

176. Biochemical Oxygen Demand (BOD) may **not** be a good index for pollution for water bodies receiving effluents from

(1) Domestic sewage (2) Dairy industry

(3) Petroleum industry (4) Sugar industry

Answer (3)

Sol. Biochemical oxygen demand (BOD) is not a good index for pollution for water bodies receiving effluents from petroleum industry as the generated waste is mostly non-biodegradable in nature.

177. The principle of competitive exclusion was stated by

(1) C. Darwin (2) G. F. Gause

(3) MacArthur (4) Verhulst and Pearl

Answer (2)

Sol. The principle of competitive exclusion was stated by G. F. Gause.

178. Which of the following National Parks is home to the famous musk deer or hangul?

(1) Keibul Lamjao National Park, Manipur

(2) Bandhavgarh National Park, Madhya Pradesh

(3) Eaglenest Wildlife Sanctuary, Arunachal Pradesh

(4) Dachigam National Park, Jammu & Kashmir

Answer (4)

Sol. Conservation of Musk deer or Hangul.

179. A lake which is rich in organic waste may result in

(1) Increased population of aquatic organisms due to minerals

(2) Drying of the lake due to algal bloom

(3) Increased population of fish due to lots of nutrients

(4) Mortality of fish due to lack of oxygen

Answer (4)

Sol. Micro-organisms involved in biodegradation of organic matter consume oxygen as a result there is a sharp decline in oxygen causing mortality of fish and other aquatic creatures.

180. The highest DDT concentration in aquatic food chain shall occur in

(1) Phytoplankton

(2) Seagull

(3) Crab

(4) Eel

Answer (2)

Sol. Maximum DDT concentration occurs in fish eating birds like *seagull* due to biomagnification. This happens because a toxic substance accumulated by an organism cannot be metabolised or excreted, thus passed to higher trophic level.

❑ ❑ ❑