SOLUTIONS

TEST SERIES-NEET [(4+1)(4+1)(+10)]

FULL SYLLABUS TEST - 06

TEST CODE : FT - 06

PART - I : PHYSICS

1. **(2)** Introducing a converging lens in the path of parallel beam does not introduce any extra path differences in a parallel beam. Rather it gives a more intense pattern on the screen.
2. **(3)**
3. **(2)** When a bar magnet cut perpendicular to its axis into two equal parts then m′ = m and length $\ell' = \frac{\ell}{2}$

$$\therefore M' = m'\ell' = m\frac{\ell}{2} = \frac{M}{2}$$

4. **(3)** $R = \frac{\rho \ell_1}{A_1}$, now $\ell_2 = 2\ell_1$

$$A_2 = \pi(r_2)^2 = \pi(2r_1)^2 = 4\pi r_1^2 = 4A_1$$

$$\therefore \quad R_2 = \frac{\rho(2\ell_1)}{4A_1} = \frac{\rho\ell_1}{2A} = \frac{R}{2}$$

$\therefore$ Resistance is halved, but specific resistance remains the same.

5. **(2)** Fundamental frequency for first resonant length

$$\nu = \frac{v}{4\ell_1} = \frac{v}{4\times 18} \text{ (in winter)}$$

Fundamental frequency for second resonant length

$$\nu' = \frac{3v'}{4\ell_2} = \frac{3v'}{4x} \text{ (in summer)}$$

According to questions,

$$\therefore \quad \frac{v}{4\times 18} = \frac{3v'}{4\times x} \Rightarrow x = 3\times 18 \times \frac{v'}{v}$$

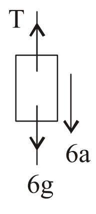
$$\therefore \quad x = 54\times\frac{v'}{v}\text{cm}$$

v' > v because velocity of sound is greater in summer as compared to winter ($v \propto \sqrt{T}$)

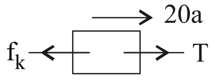
$\therefore \quad x > 54\,\text{cm}$

6. **(3)** FBD for 6 kg block

$6a = 6g - T$ ...(i)



FBD for 20 kg block



$T - f_k = 20\,a$

$T - \mu(20)g = 20a$ ...(ii)

comparing (i) and (ii)

$\Rightarrow 6g - 6a = 20a + 20\,\mu g$

$\Rightarrow 6g - 20\times 0.04g = 26a$

$$a = \frac{10(6-0.8)}{26} = 2\text{m}/\text{s}^2$$

7. **(3)** Here, $N = 100$
$R = 9$ cm $= 9\times 10^{-2}\ m$, and $I = 0.4\ A$

$$\text{Now, } B = \frac{\mu_0 NI}{2R} = \frac{2\pi\times 10^{-7}\times 100\times 0.4}{9\times 10^{-2}}$$

$$= \frac{2\times 3.14\times 0.4}{9}\times 10^{-3}$$

$= 0.279\times 10^{-3}$ T $= 2.79\times 10^{-4}$ T

8. **(1)**
9. **(4)**
10. **(2)**
11. **(2)** Given, mass of the block, $m = 200$ g $= 200\times 10^{-3}$ Kg
Radius of the circular groove, $r = 20$ cm
Time taken to complete one round, $T = 40$ s
Here, normal force will provide the necessary centripetal force.

$$N = m\omega^2 r = 200\times 10^{-3}\times\left(\frac{2\pi}{40}\right)^2\times 0.2 = 9.859\times 10^{-4}\text{N.}$$

12. **(3)** $(W+X).(W+Y) = W+(X.Y)$
13. **(2)** Given, mass of oxygen, m = 40 g

$\Delta T = 60°C$

Now, molar mass of oxygen molecule, M = 32 g/mol

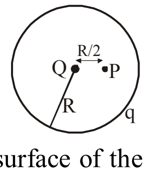
$$\therefore \text{ Number of moles, } n = \frac{m}{M} = \frac{40}{32} = 1.25\text{ mol}$$

The molar specific heat of O_2, $C_V = \frac{5}{2}R$

Now, the amount of heat required, $\Delta Q = nC_v\Delta T$

$$= 1.25\times\frac{5}{2}R\times 60 = 1.56\text{ kJ}$$

14. **(3)** Electric potential due to charge Q placed at the centre of the spherical shell at point P is



$$V_1 = \frac{1}{4\pi\varepsilon_o}\frac{Q}{R/2} = \frac{1}{4\pi\varepsilon_o}\frac{2Q}{R}$$

Electric potential due to charge q on the surface of the spherical shell at any point inside the shell is

$$V_2 = \frac{1}{4\pi\varepsilon_o}\frac{q}{R}$$

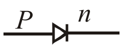
$\therefore$ The net electric potential at point P is

$$V = V_1 + V_2 = \frac{1}{4\pi\varepsilon_o}\frac{2Q}{R} + \frac{1}{4\pi\varepsilon_o}\frac{q}{R}$$

15. **(4)** When v || B, F = 0, then path is a straight line. If $v \perp B$, $F = Bqv$, so path is a circle. while v makes some angle θ with *B*, then $F = Bqv\sin\theta$ so path is helical.

16. **(2)** According to law of equipartition of energy, the energy associated with each degree of freedom is $\frac{1}{2}$RT per mole.

CH_4 is tetrahedron molecule.
Degree of freedom due to rotation = 3
Degree of freedom due to translation = 3

17. **(1)** 

For forward bias, p-side must be at higher potential than *n*-side. $\Delta V = (+)Ve$.

18. **(1)** $\frac{1}{C_{eq}} = \frac{1}{10} + \frac{1}{15} + \frac{1}{20} = \frac{6+4+3}{60}$ $\quad \therefore C_{eq} = \frac{60}{13}\mu F$

So, $Q = C_{eq}V = \frac{60}{13} \times 13\mu C = 60\mu C$

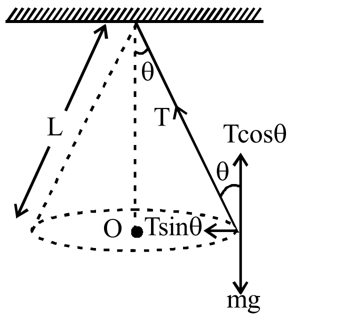
In series, charge across each capacitor is same and is equal to net charge.

So, $Q_{15\mu F} = 60\mu C$

19. **(4)** Speed (v) = $\frac{ds}{dt} = \frac{d}{dt}\left\{(2.5)t^2\right\}$ [$\because$ s = (2.5) t^2 given]

v = 5t
At t = 5, v = 5t = 5 × 5 = 25 m/s.

20. **(3)** The situation is as shown in the figure



For vertical equilibrium of stone,

T cos θ = mg

or $\quad T = \frac{mg}{\cos\theta}$ ...(i)

As, $\quad Y = \frac{TL}{A\Delta L}$

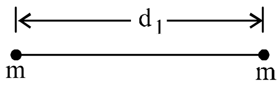
$\Rightarrow \quad \Delta L = \frac{TL}{AY}$

$= \frac{mgL}{\cos\theta(\pi D^2/4)Y}$ [using Eq. (i)]

$= \frac{4mgL}{\pi D^2 Y \cos\theta}$

21. **(1)** $N\phi = LI$

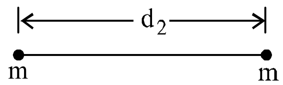
$\therefore \quad \phi = \frac{LI}{N} = \frac{8\times10^{-3}\times5\times10^{-3}}{400} = 10^{-7} = \frac{\mu_0}{4\pi}$ Wb

22. **(2)** 

Gravitational force,

$$F_1 = \frac{Gm.m}{d_1^2} = \frac{Gm^2}{d_1^2}$$

Similarly,



Gravitational force,

$$F_2 = \frac{Gm^2}{d_2^2}$$

$$\therefore \quad \frac{F_1}{F_2} = \left(\frac{d_2}{d_1}\right)^2$$

$$\therefore \quad F_2 = F_1\left(\frac{d_1}{d_2}\right)^2$$

23. **(3)** Projection speed is v.

$$R_1 = \frac{v^2\sin(90°)}{g}; R_2 = \frac{v^2\sin(60°)}{g}$$

$$\therefore \quad \frac{R_1}{R_2} = \frac{2}{\sqrt{3}}$$

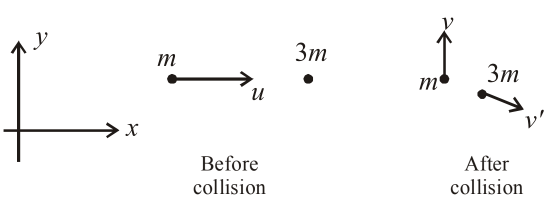
24. **(3)** At Brewster's angle, only the reflected light is plane polarised, but transmitted light is partially polarised.

25. **(1)** (A) → (2) ; (B) → (3) ; (C) → (1)

26. **(3)** From conservation of linear momentum

$$mu\hat{i} + 0 = mv\hat{j} + 3m\vec{v}'$$

$$\vec{v}' = \frac{u}{3}\hat{i} - \frac{v}{3}\hat{j}$$



From kinetic energy conservation,

$$\frac{1}{2}mu^2 = \frac{1}{2}mv^2 + \frac{1}{2}(3m)\left(\left(\frac{u}{3}\right)^2 + \left(\frac{v}{3}\right)^2\right)$$

or, $mu^2 = mv^2 + \frac{mu^2}{3} + \frac{mv^2}{3}$ $\quad \therefore v = \frac{u}{\sqrt{2}}$

27. **(1)** ${}_0^1n \longrightarrow {}_1^1H + {}_{-1}e^0 + \bar{\nu} + Q$

The mass defect during the process

$\Delta m = m_n - m_H - m_e$

$= 1.6725 \times 10^{-27} - (1.6725 \times 10^{-27} + 9 \times 10^{-31} kg)$

$= -9 \times 10^{-31}$ kg

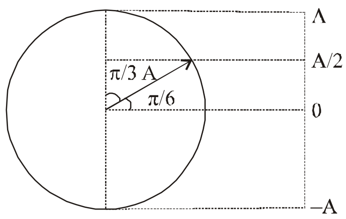
The energy released during the process

$Q = -B.E. = \Delta mc^2$

$= 9 \times 10^{-31} \times 9 \times 10^{16} = 81 \times 10^{-15}$ joules

$= \frac{81 \times 10^{-15}}{1.6 \times 10^{-19}} = 0.511$ MeV

28. **(4)**



Let time from 0 to A/2 is t_1
and from A/2 to A is t_2
From the standard equation of SHM,
$x = A_0 \sin(\omega t)$

$\Rightarrow \frac{A}{2} = A\sin(\omega t_1)$

$\Rightarrow \omega t_1 = \sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$ ...(i)

then $\omega t_1 = \pi/6$
Using $x = A_0 \sin\omega t$ again
$A = A\sin\omega(t_1 + t_2)$

$\omega(t_1 + t_2) = \sin^{-1}(1) = \frac{\pi}{2}$

Using (i)

$\omega t_2 = \frac{\pi}{2} - \frac{\pi}{6} = \frac{\pi}{3}$ ...(ii)

Dividing equation (i) by (ii) we get

$\frac{t_1}{t_2} = \frac{1}{2}$

$\Rightarrow t_2 = 2t_1 = 2 \times 2 = 4$ sec

29. **(2)** Given, radius of mercury drop, $r = 10^{-3}$ m
Initial surface energy E_1 = surface tension × Area
$E_1 = 0.45 \times 4\pi r^2 = 0.45 \times 4\pi(10^{-3})^2$
Initial volume = n × final volume

$\frac{4}{3}\pi(10^{-3})^3 = 125 \times \frac{4\pi}{3}R_{new}^3$

$\therefore \quad 10^{-3} = 5R_{new} \therefore R_{new} = \frac{10^{-3}}{5}$ m

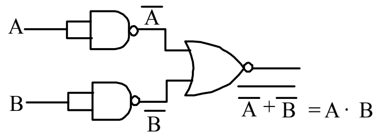
So, final surface energy, $E_2 = 0.45 \times 125 \times 4\pi\left(\frac{10^{-3}}{5}\right)^2$

Increase in energy = $E_2 - E_1$
Increase in energy = $0.45 \times 4\pi \times (10^{-3})^2\left[\frac{125}{25} - 1\right]$

$= 4 \times 0.45 \times 4\pi \times 10^{-6} = 2.26 \times 10^{-5}$ J

30. **(2)** The equivalent circuit is AND gate.

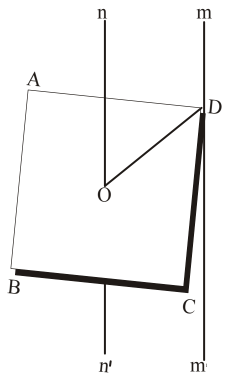
Output $y = \overline{\overline{A} + \overline{B}} = A.B$



31. **(4)** In a non-uniform magnetic field both torque and net force acts on the dipole. If magnetic field were uniform, net force on dipole would be zero.

32. **(4)** $I_{nn'} = \frac{1}{12}M(a^2 + a^2) = \frac{Ma^2}{6}$

Also, $DO = \frac{DB}{2} = \frac{\sqrt{2}a}{2} = \frac{a}{\sqrt{2}}$



By parallel axes theorem, moment of inertia of plate about an axis through one of its corners.

$I_{mm'} = I_{nn'} + M\left(\frac{a}{\sqrt{2}}\right)^2 = \frac{Ma^2}{6} + \frac{Ma^2}{2}$

$= \frac{Ma^2 + 3Ma^2}{6} = \frac{2}{3}Ma^2$

33. **(3)** $\vec{E}$ and $\vec{B}$ are mutually perpendicular to each other and are in phase i.e., they become a zero and minimum at the same place and at the same time.

34. **(2)** Given, $y = 0.3\sin(0.157x)\cos(200\pi t)$
So $k = 0.157$ and $\omega = 200\pi$

or f = 100 Hz, $v = \frac{\omega}{k} = \frac{200\pi}{0.157} = 4000$ m/s

Now, using $f = \frac{nv}{2l} = \frac{4v}{2l} = \frac{2v}{l}$

$\therefore l = \frac{2v}{f} = \frac{2 \times 4000}{100} = 80m$

35. **(4)**

36. **(1)** $H = I^2Rt$. Here $R_1 = \rho\frac{\ell}{\pi r^2}$ and

$R_2 = \rho\frac{\ell}{\pi(2r)^2}$ That is, $R_1 = 4R_2$. Hence, $\frac{H_1}{H_2} = 4$

37. **(1)** Curve (B) represents adiabatic
Adiabatic ⇒ PV^γ
Curve (A) represents isothermal
T = constant
PV = constant

38. **(2)** Graphs in option (3) position-time and option (1) velocity-position are corresponding to velocity-time graph option (4) and its distance-time graph is as given below. Hence distance-time graph option (2) is incorrect.

39. **(1)** **40.** **(1)**

41. **(3)** Given, $x(t) = 20\cos\omega t$

$x(t) = 20\cos\frac{2\pi}{T}.t$ ...(i) $\left(\because \omega = \frac{2\pi}{T}\right)$

Given, T = 4s and t = 1s

Substituting the given values in Eq.

(i), we get

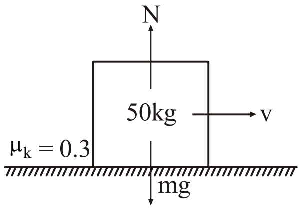
$\therefore \quad x(t) = 20\cos\frac{2\pi}{4}.1 = 0$

42. **(2)** $\xleftarrow[\text{wavelength } (\lambda)]{\text{Infra-red > Ultraviolet > X-ray > } \gamma\text{-ray}}$

43. **(2)** Unit of $\left(\frac{R}{\sqrt{X_L X_C}}\right) = \frac{Ohm}{\sqrt{Ohm^2}} = \frac{Ohm}{Ohm}$ i.e. it is unit less

So, $\left[\frac{R}{\sqrt{X_L X_C}}\right]$ is dimensionless.

44. **(2)**



$F_k = \mu_k N = 0.3 \times 50 \times 9.8 = 147$ N $\quad [\because N = mg]$

45. **(2)** The radius of nucelus is given by $R = R_0 A^{1/3}$

Volume, $V = \frac{4}{3}\pi R^3 = \frac{4}{3}\pi R_0^3 A$

Mass = m × A

Density, $(\rho) = \frac{Mass}{Volume} = \frac{m \times A}{\frac{4}{3}\pi R_0^3 A} = \frac{m}{\frac{4}{3}\pi R_0^3}, \rho \propto A^0$

Here m = no. of protons or neutrons

So density is indepoendent of A.

46. **(4)** The average power in the circuit

$<P> = V_{rms} \times I_{rms} \cos\phi$ where $\cos\phi$ = power factor

$V_{rms} = \frac{\frac{1}{\sqrt{2}}}{\sqrt{2}} = \frac{1}{2}$ volt ; $I_{rms} = \frac{\frac{1}{\sqrt{2}}}{\sqrt{2}} = \left(\frac{1}{2}\right) A$

$<P> = \frac{1}{2} \times \frac{1}{2} \times \cos\frac{\pi}{3} = \frac{1}{8} W$

47. **(1)** Here ice melts due to water.

Let the amount of ice melts = m_{ice}

$m_w s_w \Delta\theta = m_{ice} L_{ice}$

$\therefore m_{ice} = \frac{m_w s_w \Delta\theta}{L_{ice}}$

$= \frac{0.2 \times 4200 \times 25}{3.4 \times 10^5} = 0.0617$ kg = 61.7 g

48. **(3)**

49. **(1)** Electric field lines start from positive charge and end at negative charge so they do not form closed loops.

50. **(2)** $[h] = [\lambda\sqrt{2mE}] = [\lambda P] = [L][M.LT^{-1}] = [ML^2T^{-1}]$

PART - II : CHEMISTRY

51. **(4)** Statements III and IV are correct, while the other statements are incorrect.

Their corrected forms are as follow

I. The shape of the orbitals is given by Azimuthal quantum number.

II. In an atom, all electrons travel with the different velocity.

52. **(4)** This is Reimer-Tiemann reaction and the electrophile is dichlorocarbene.

$HCCl_3 + NaOH \longrightarrow Cl-\ddot{C}-Cl + NaCl + H_2O$

dichlorocarbene

53. **(1)** Crystallization of sucrose solution. Entropy is a measure of randomness during the crystallisation of sucrose solution liquid state is changing into solid state hence entropy decreases.

54. **(2)** $CH_3-C(=O)-CH_2CH_2CH_3$

Pentan–2–one

$CH_3-CH_2-C(=O)-CH_2CH_3$

Pentan–3–one

Iodoform test is given by ketones containing

$CH_3-C(=O)-$ group.

55. **(4)** On moving left to right in a period, acidic character of oxides increases and basic character of oxides decreases. So, the order of acidic nature of oxide is

$N_2O_3 > CO_2 > B_2O_3 > BeO > Li_2O$

56. **(3)** Assertion is correct but Reason is incorrect. Chain isomers have same molecular formula but different chains so minimum four carbon atom are required.

57. **(2)** $\underset{\text{Acetamide}}{CH_3CONH_2} \xrightarrow{4NaOH + Br_2}$

$\underset{\text{Methylamine}}{CH_3NH_2} + Na_2CO_3 + 2\,NaBr + 2H_2O$

58. **(2)** Structure (2) is more stable because here negative charge is dispersed to the maximum extent as it is present on the carbon atom bearing an elecron-withdrawing (–NO_2) group

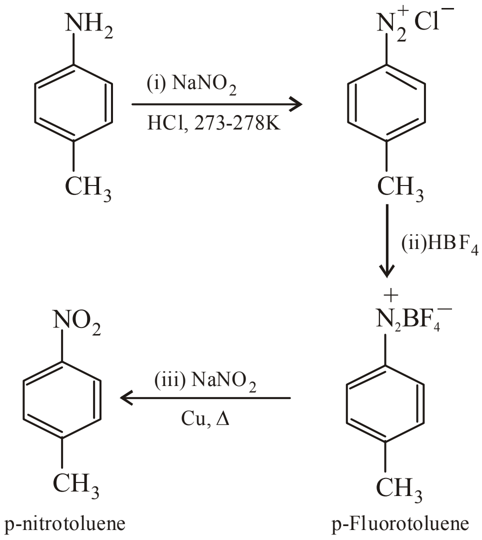
59. **(3)** Acetic acid reacts with PCl_5 to form acetyl chloride

$\underset{\text{acetic acid}}{CH_3COOH} + PCl_5 \rightarrow \underset{\text{acetyl chloride}}{CH_3COCl} + POCl_3 + HCl$

60. **(4)** An anomeric carbon is that which is developed by intramolecular reaction between carbonyl group and —OH group of the same molecule. Thus it should be C_1 in glucose and C_2 in fructose.

61. (1)

62. (4)



63. (3) $n_{(H_2O)} = \frac{6g}{18.0g} = \frac{1}{3}$

Number of H_2O molecules $= \frac{1}{3}N_A$.

$\Rightarrow$ Total number of atoms in $H_2O = 3 \times \frac{1}{3}N_A = N_A$.

$n_{(H_2)} = \frac{1g}{2.0g} = \frac{1}{2}$

Number of H_2 molecules$= \frac{1}{2}N_A$.

$\Rightarrow$ Total number of atoms in $H_2 = 2 \times \frac{1}{2}N_A = N_A$

64. (3) The primary structure of protein is associated with the linear sequence of amino acids in the protein. Primary structure of protein is unaffected by physical 'or' chemical changes.

65. (3) Formaldehyde cannot produce iodoform, as only those compound which contains either $CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-$ group or $CH_3-\underset{\displaystyle O}{\underset{||}{C}}-$ group on reaction with potassium iodide and sodium hypochlorite yield iodoform.

66. (4) Xanthate test $\Rightarrow$ alcoholic – OH group, Schiff's reagent $\Rightarrow$ – CHO

Azo-Dye test $\Rightarrow$ 1° aromatic amines, Iodoform test $\Rightarrow$ Methyl ketones

67. (4) K_2SO_4 cannot be used in the iodine-clock reaction as it does not play any role in that reaction.
HCl gives H^+, $Na_2S_2O_3$ gives $S_2O_3^-$ for monitoring the progless and KI gives I^- ions.

68. (4) The minimum oxidation state in transition metal is equal to the number of electrons in 4*s* shell and the maximum oxidation state is equal to the sum of the 4*s* and 3*d* electrons.
Ti = [Ar] $3d^2 4s^2$
Hence minimum oxidation state is +2 and maximum oxidation state is +4. Thus the common oxidation states of Ti are +2, +3 and +4

69. (1) $\dot{N}=O$ and $O=Cl^{\oplus}-O^{\ominus}$ have odd electrons.

70. (4) $R\,COCl + AlCl_3 \longrightarrow R-\overset{\displaystyle O}{\overset{||}{C^+}} + AlCl_4^-$
Electrophile

71. (1) Due to the inert pair effect, thallium exists in more than one oxidation state. Also, for thallium + 1 oxidation state is more stable than +3 oxidation state.

72. (2) A – (r), B – (q), C – (s), D – (p)

73. (2) $\frac{\left(t_{1/2}\right)_1}{\left(t_{1/2}\right)_2} = \left(\frac{(a_2)}{(a_1)}\right)^{n-1} \Rightarrow \left(\frac{5}{50}\right) = \left(\frac{10^{-2}}{10^{-1}}\right)^{n-1}$;

$(10^{-1}) = (10^{-1})^{n-1}$
$\therefore n = 2$

74. (2) 200g of 20% urea contain 40g urea in 200g solution
400g of 40% urea contain 160g urea in 400g solution.
Total amount of solution = 600g
Total amount of urea in solution = 200g
Hence,

Weight % of urea in solution $= \frac{200}{600} \times 100 = 33.33\%$

75. (3) Statement I is correct but statement II is incorrect.
The correct form of II is:
During isothermal expansion of an ideal gas, heat enters or leaves the system to keep temperature constant.

76. (2) With cold dilute alkaline $KMnO_4$ (Baeyer's reagent), alkenes give addition products and the purple colour of $KMnO_4$ disappears.

77. (1) Conductivity (K) = Number of ions dissolved in unit volume of the solution.
Thus, upon dilution, the number of ions per unit volume decreases because of which conductivity decreases.
Thus, Assertion is correct but Reason is not correct.

78. (1)

79. (2) $\bar{\upsilon} = R_H \times Z^2 \times \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

For paschen series longest wavelength

$n_1 = 3$

$n_2 = 4$

$$\bar{\upsilon} = R_H \times (3)^2 \times \left(\frac{1}{(3)^2} - \frac{1}{(4)^2}\right)$$

$$\bar{\upsilon} = R_H \times \frac{9 \times 7}{9 \times 16}$$

$$\bar{\upsilon} = R_H \times \frac{7}{16}$$

$$\frac{1}{\lambda} = R_H \times \frac{7}{16}$$

or, $\lambda = \frac{16}{7 \times R_H} = x$ ...(i)

for Lyman series of hydrogen spectrum.

$$\bar{\upsilon} = R_H \times Z^2 \times \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

$$\bar{\upsilon} = R_H \times (1)^2 \times \left[\frac{1}{1^2} - \frac{1}{2^2}\right]$$

$$\bar{\upsilon} = R_H \times \frac{3}{4}$$

$\lambda = \frac{4}{3R_H}$ ...(ii)

By equating equation (i) and (ii) we get

$$\lambda = \frac{7x}{12}$$

80. (4) x and y are obtained by experiment only.

81. (2) A – (r), B – (p), C – (s), D – (q)

82. (4) $\Delta T_f = iK_f m$

As $m = 0.1$ molal for all given solutions, thus, lower the value of i, lower will be the depression in freezing point (ΔT_f) and higher will be the freezing point of the solution.

For $Al_2(SO_4)_3$; $i = 5$

For $BaCl_2$; $i = 3$

For $AlCl_3$; $i = 4$

For NH_4Cl ; $i = 2$

Thus, 0.1 molal NH_4Cl will have highest freezing point.

83. (4) The reaction $P_4 + 8\,SOCl_2 \rightarrow 4\,PCl_3 + 2S_2Cl_2 + 4SO_2$ involves change of oxidation state of P from 0 to +3 and that of S from + 4 to + 2.

Thus, it is a redox reaction but not a disproportionation reaction.

84. (3) A – (s), B – (q), C – (p), D – (r)

85. (3) The secondary valency of a central metal atom/ion in a complex represents the number of neutral or negatively charged groups called ligands.

The primary valency represents the oxidation state of the metal.

86. (2) Only alkyl aryl ethers e.g., $C_6H_5OCH_3$ undergoes electrophilic substitution reactions.

87. (2) The type of delocalization involving σ electrons of C-H bond of an alkyl group with the π electrons of benzene or vacant orbital is called hyper conjugation.

88. (4) Lassaigne test

$$Na_2S \xrightarrow{(CH_3COO)_2Pb} \underset{\text{Black}}{PbS\downarrow} + 2\,CH_3COONa$$

89. (2) A – (r), B – (p), C – (s), D – (q)

90. (1)

The Nernst equation is shown below:

$$E_{cell} = E^{\circ}_{cell} - \frac{2.303RT}{nF} \log \frac{[P]}{[R]}$$

$$\Delta G = -nFE_{cell},\ \Delta G^{\circ} = -nFE^{\circ}_{cell}$$

$$\Rightarrow \Delta G = \Delta G^{\circ} + 2.303RT \log \frac{[P]}{[R]}$$

91. (3) A – (r), B – (s), C – (p), D – (q)

92. (2) Dehydrohalogenation of an alkyl halide gives an alkene.

93. (1) Due to inert pair effect, the stability of +1 state in group 13 elements increases down the group.

Opposite trend is observed for +3 state stability.

94. (4) In $\left[Ni(NH_3)_2 Cl_2\right]$, Ni^{2+} is in sp^3 hybridisation, thus tetrahedral in shape. Hence the four ligands are not different to exhibit optical isomerism. In tetrahedral geometry all the positions are adjacent to one another, therefore, geometrical isomerism is not possible.

95. (3) Statement I is correct but statement II is incorrect.

96. (2) Both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

Bond order

$$= \frac{1}{2}\left[\left(\begin{matrix}\text{no. of } e^- \text{in} \\ \text{bonding M.O.}\end{matrix}\right)\right] - \left[\left(\begin{matrix}\text{no. of } e^- \text{in} \\ \text{bonding M.O.}\end{matrix}\right)\right]$$

Bond order zero indicates that the bond does not exist.

97. (4) HNO_2 is a weak acid and $NaNO_2$ is salt of that weak acid and strong base (NaOH).

98. (1)

99. (3) For the exothermic reaction the energy of products is always less than the reactants. If E_a is the energy of activation for the forward reaction, the energy of activation for backward reaction is $E_a + \Delta H$

100. (4) The ions with unpaired electrons are coloured and those with paired electrons are colourless.

$\underset{(\text{No. of } e^- \text{s} = 28)}{Zn^{2+}} = 1s^2, 2s^2p^6, 3s^2p^6d^{10}$

$\underset{(\text{No. of } e^- \text{s} = 21)}{Cr^{3+}} = 1s^2, 2s^2p^6, 3s^2p^6d^3$

Ni^{2+} $= 1s^2, 2s^2p^6, 3s^2 p^6 d^8$
(No. of e^-s = 26)

Thus Zn^{2+}, Cr^{3+} and Ni^{2+} have zero, 3 and 2 unpaired electrons respectively.

PART - III : BOTANY

101. (3) Class is the taxonomic category containing least similar organisms.

102. (1)

103. (4)

104. (2) In 1971, T.O. Diener discovered a new infectious agent that was smaller than viruses and caused potato spindle tuber disease. It was found to be a free RNA; it lacked the protein coat that is found in viruses, hence the name viroid. The RNA of the viroid was of low molecular weight.

105. (2) In monohybrid cross, 25% pure dominant trait (TT) and 25% pure recessive trait (tt) shown in F_2 generation. Therefore, total 50% pure true breeding in F_2 generation.

106. (3)

107. (4) A – IV; B – III; C – I; D – II

108. (1) Both Statement I and Statement II are true.

109. (1)

110. (1) Cyclosporin A is produced from *Trichoderma polysporum* (a fungus).

111. (1) I^Ai, I^Bi – Dominant-recessive relationship
I^AI^B – Co-dominance
I^A, I^B and i – Three different allelic forms of gene (multiple allelism)

112. (3) Exponential growth occurs when there is no environmental resistance.

113. (1) A – II, B – I, C – III, D – IV

114. (1) C_4 pathway is advantageous over C_3 pathway in plants as it occurs in relatively low CO_2 concentration.

115. (4)

116. (1) Differentiation of cells can be observed in part C.

117. (1) Rudolf Virchow (1855) explained that cells divide and new cells are formed from pre-existing cells. Schleiden and Schwann proposed that all living organisms are composed of cells and products of cells. This cell theory given by Schleiden and Schwann did not explain how new cells are formed. So, Rudolf Virchow modified this theory to new one.

118. (4)

119. (3) Most of the bacterial cell envelope consists of a tightly bound three layered structure.

120. (2) Both leaves X and Y have increased their area by 100 cm^2.

121. (4)

122. (3)

123. (1) Statements B, D and E are correct.
Statements A and C are incorrect
Stem develops from plumule of a seed and not spore.
The region of stem where leaves are borne are nodes.

124. (3) The 'Rivet popper hypothesis' is given by Paul Ehrlich.

125. (4)

126. (2)

127. (1) Statement A, C and D are incorrect about Klinefelter's syndrome as they are associated with Down's syndrome.

128. (4)

129. (3) A – IV, B – I, C – II, D – III

130. (2)

131. (1) Ethylene (C_2H_4) help in initiation of sprouting of potato tubers.

132. (1) Stem tendrils develop from axillary buds and help plants in climbing.

133. (3)

134. (2)

135. (4) A – II, B – I, C – III, D – IV

136. (2) Inclusion bodies of blue-green, purple and green photosynthetic bacteria are gas vacuoles.

137. (3) A – III; B – I; C – IV; D – II

138. (3) A – IV, B – I, C – II, D – III

139. (3) In incomplete dominance, F_1 hybrids are not related to either of the parents but exhibited a blending of characters of two parents. E.g. dog flower (*Antirrhinum sp*).

140. (3) The given diagram shows the floral diagram of family Brassicaceae.
The floral formula of the family Brassicaceae is $K_{2+2}\, C_4\, A_{2+4}\, \underline{G}_{(2)}$. So, the correct option is (3).

141. (3)

142. (4) All the statements are correct about vascular bundles.

143. (2)

144. (2)

145. (3) Western Ghats have a very high degree of species richness and endemism.

146. (1) There were 7 characters of the pea plant which were selected by Mendel for the experiments. The characters which were chosen by Mendel for his study were stem height, flower colour, flower position, pod shape, pod colour, seed shape, seed colour. All these characters belong to different chromosomes in the pea plant.

147. (1) A – IV, B – III, C – II, D – I

148. (4)

149. (2)

150. (1) In cell membrane, lipids are arranged in a bilayer.

PART - IV : ZOOLOGY

151. (1) The correct sequence of catalytic cycle of an enzyme action is: $E \rightarrow A \rightarrow D \rightarrow C \rightarrow B$.

152. (4) The frog excretes urea and thus is a ureotelic animal. The organisms which can tolerate a narrow range of temperature are called stenothermal organisms. Frogs body temperature varies with the temperature of the environment. Such animals are called cold blooded or poikilotherms.

153. (2)

154. (3)

155. (2)
156. (2) The frog never drinks water but absorb it through the skin.
157. (2) A – II, B – III, C – I, D – IV
158. (4)
159. (2) Flying squirrel and flying phalanger show convergent evolution.
160. (3) The first triploblastic animals are the members of the phylum Platyhelminthes.
161. (2) A – II, B – IV, C – I, D – III
162. (3)
163. (4) A – III, B – IV, C – I, D – II
164. (2)
165. (3) A – II, B – IV, C – I, D – III
166. (2) A – II, B – I, C – III, D – IV
167. (4) Aschelminthes are called roundworms because their thread like body is circular in cross section.
168. (3)
169. (3)
170. (4) Exonucleases remove nucleotides from the ends of the DNA.
171. (4)
172. (1)
173 (3)
174. (1) Dengue and chikungunya are vector-borne diseases.
175. (2)
176. (1) Medulla oblongata of brain control respiration, cardiovascular reflexes and gastric secretions.
177. (3) A – IV, B – III, C – II, D – I
178. (1)
179. (4) A – II; B – III; C – I; D – IV
180. (2)
181. (4)
182. (1) A – III, B – II, C – IV, D – I
183. (4)
184. (3) Glycosuria denotes presence of glucose in the urine. Gout is due to deposition of uric acid crystals in the joint. Renal calculi are precipitates of calcium phosphate produced in the pelvis of the kidney. Glomerular nephritis is the inflammatory condition of glomerulus characterised by proteinuria and haematuria.
185. (1)
186. (1)
187. (4) A – III, B – IV, C – I, D – II
188. (3)
189. (1) Colostrum is a yellowish fluid.
190. (1)
191. (4) Most of Bt toxins are insect-group specific.
192. (4)
193. (1) The structures marked in the given figure of mammary gland are A–Mammary lobe, B–Mammary duct, C–Ampulla, and D–Lactiferous duct. The mammary gland is a gland located in the breasts of females that is responsible for lactation. Mammary glands only produce milk after childbirth. Mammary lobe (A) contains clusters of cells called alveoli which secrete milk which is stored in the cavities of alveoli.
194. (3) A – III, B – IV, C – I, D – II
195. (4) A – IV; B – I; C – II; D – III
196. (3) A – III, B – IV, C – I, D – II
197. (3)
198. (4) A – III, B – IV, C – I, D – II
199. (2)
200. (1)