MELUHA INTERNATIONAL SCHOOL
HYDERABAD

SR MPC | **MAINS MODEL – GT1** | **Date: 19-05-2020**
Time: 3 Hours | **Max Marks : 300**

MATHS
SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its
answer, out of which **ONLY ONE** option can be correct.
Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

01. Let any double ordinate PNP' of the hyperbola $\frac{x^2}{25}-\frac{y^2}{16}=1$ be produced on both sides to meet the asymptotes in Q and Q'. Then $PQ.P'Q$ is equal to

A) 25 B) 16 C) 41 D) none of these

02. The unequal real numbers x_1, x_2, x_3 satisfying the equation $x^3 - x^2 + \beta x + \gamma = 0$ are in A.P. then which of the following is **incorrect** ?

A) $\beta \in \left(-\infty, \frac{-1}{3}\right]$ B) $\beta \in \left(-\infty, \frac{1}{3}\right)$ C) $\gamma \in \left(\frac{-1}{27}, \infty\right)$ D) $\gamma \in \left[\frac{-1}{27}, \infty\right)$

03. If the curve $3\sin y + 12\sin^3 x = a$ does not intersect the line $y = 3x$, then

A) $a \in (-\infty, -9) \cup (9, \infty)$ B) $a \in [-9, 9]$

C) $a \in \{-9, 9\}$ D) None of these

04. If $I = \int_8^{15} \frac{dx}{(x-3)\sqrt{x+1}}$, then I equals

A) $\frac{1}{2}\log\frac{5}{3}$ B) $2\log\frac{1}{3}$ C) $\frac{1}{2}\log\frac{1}{5}$ D) $2\log\frac{5}{3}$

05. Let $a = \cos\alpha\,\vec{i} + \sin\alpha\,\vec{j}$, $b = \cos\beta\,\vec{i} - \sin\beta\,\vec{j}$, $c = \cos r\,\vec{i} + \sin r\,\vec{j}$, $d = \cos\delta\,\vec{i} - \sin\delta\,\vec{j}$. If $2a + 6b + 7c - 9d = \bar{0}$, then

A) $3\cos(\alpha+\delta) = 5\cos(\beta+r)$ B) $3\cos(\alpha+\delta) = 7\cos(\beta+r)$

C) $\cos(\alpha+\delta) + \cos(\beta+r) = 0$ D) $\sin(\alpha+\delta) + \sin(\beta+r) = 0$

06. $f(x_1x_2) = f(x_1)f(x_2) \forall x_1, x_2 \in R$ where $y = f(x)$ is a differentiable function, then which of the following must be true ?

A) $f(1) = 0$ B) $f(0) = 0$ C) $[f(x)]^2 = [f(-x)]^2$ D) $f(x) = f(-x)$

07. The plane $2x+5y-4z-6=0$ and the line $\frac{x-1}{3}=\frac{y-2}{4}=\frac{z+2}{3}$, then equation of image of the given line with respect to the given plane is

A) $\frac{x+2}{79}=\frac{y+2}{40}=\frac{z+5}{-247}$ B) $\frac{x+2}{79}=\frac{y+2}{40}=\frac{z+5}{247}$

C) $\frac{x+1}{2}=\frac{y-2}{5}=\frac{z+2}{-4}$ D) $\frac{x+2}{2}=\frac{y+2}{5}=\frac{z+5}{4}$

08. let $z=\frac{-1+\sqrt{3}i}{2}$, where $i=\sqrt{-1}$ and $r,s\in\{1,2,3\}$. The number of ordered pairs (r, s) such that two vectors $(-z)^r\hat{i}+z^{3s}\hat{j}\ \&\ z^r\hat{i}+\hat{j}+z^r\hat{k}$ are perpendicular is __

A)1 B)3 C)4 D)6

09. The total number of distinct $x\in[0,1]$ for which $\int_0^x\frac{e^t}{t+1}dt=\frac{(x+1)^2}{4}$ is____

A)2 B)1 C)4 D)3

10. $a_n=\int_0^{\frac{\pi}{2}}\frac{1-\cos 2nx}{1-\cos x}dx$, then $f(x)=\begin{vmatrix}a_1 & a_2 & a_3\\ a_4 & a_5 & a_6\\ a_7 & a_8 & a_9\end{vmatrix}\forall x\in R;$, then $f(1)=$ __

A) 0 B) 2 C) 1 D) 3

11. If $\frac{4}{6x^2-10xy-9x+15y}=\frac{7}{5y^2-7yz-10y+14z}=\frac{7}{21z^2-9zx+7z-3x}$; $x,y,z\in R$, then $\left|\frac{2x+1}{2x-3}+\frac{2y+3}{y-2}+\frac{3z+8}{3z+1}\right|=$_____

A) 0 B) 18 C) 4 D) 6

12. Locus of the point from where 3 normals are drawn to the parabola $y^2=4x$ such that two of them are perpendicular is

A) $y^2=(x-1)$ B) $y^2=(x-3)$ C) $y^2=(x+3)$ D) $y^2=(x+1)$

13. "If Suman is hardworking then he will be a sportsman". Negation of this statement is

A) Suman is not hardworking or he will be a sportsman

B) Sumn is hardworking and he will not be a sportsman

C) Suman is hardworking and he will be a sportsman

D) If Suman will be a sportsman then he is hardworking

14. If A & B are subsets of universal set $\cup$ such that $n(\cup)=800, n(A)=300,\ n(B)=400$ and $n(A\cap B)=100$. Then number of elements in the sets $A'\cap B'$ is

A) 200 B) 400 C) 600 D) 800

15. Sum of the first 3 terms common to the two arithmetic sequences ; (1, 4, 7, 10, 13....) and (3, 8, 13, 18,.....) is

A) 81 B) 80 C) 27 D) 84

16. A function f is continuous for all x. (and not everywhere zero) such that $f^2(x)=\int_0^x f(t).\frac{\cos t}{2+\sin t}.dt$, then $f(x)$ is equal to

A) $\frac{1}{2}\ln\left(\frac{x+\cos x}{2}\right)$ B) $\frac{1}{2}\ln\left(\frac{3}{2+\cos x}\right)$ C) $\frac{1}{2}\ln\left(\frac{2+\sin x}{2}\right)$ D) $\frac{\cos x+\sin x}{2+\sin x}$

17. ${}^{10}C_0.{}^{20}C_{10}-{}^{10}C_1.{}^{18}C_{10}+{}^{10}C_2.{}^{16}C_{10}-{}^{10}C_3.{}^{14}C_{10}+.....=$

A) 0 B) 1 C) 2^{10} D) 3^{10}

18. If $H_n = 1+\frac{1}{2}+\frac{1}{3}+.....+\frac{1}{n}$, then the value of $S_n = 1+\frac{3}{2}+\frac{5}{3}+.....+\frac{99}{50}$ is

A) $H_{50}+50$ B) $100-H_{50}$ C) $49+H_{50}$ D) $H_{50}+100$

19. Number of common points (x, y) to the curve $7y+4x-15=0$ and the curve passing through (2, 1) and satisfying the differential equation $2xydx+\left(x^2+3y^2\right)dy=0$ is

A) 1 B) 2 C) 3 D) 4

20. Minimum area of the region bounded by the curves $y^2=64x$ and a line with non zero slope passing through (16, 0) is

A) $\frac{512}{3}$ B) $\frac{129}{3}$ C) $\frac{8}{3}$ D) $\frac{2048}{3}$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
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21. Consider a pyramid OPQRS lying in 1st octant with base OPQR where O, P, Q, R are (0,0,0), (4,0,0), (6,0,4) & (0,0,4) respectively. 'S' is a point 4 units above the base such that its exactly above M (i.e. $SM \perp \text{base}$) where $OM+PM+QM+RM$ is minimum. Then, plane containing O, R & S is $x-\lambda y=0$, then $\lambda =$

22. A circle with centre (3, 0) has radius "r". As "r" varies no. of common tangents to the circle and the parabola $y^2=4x$ is denoted by f(r). Then $\sum_{r=1}^{10} f(r) = \_\_\_; r \in N$

23. Equation of chord of minimum length passing through (1, 2) of circle $x^2+y^2-4x-2y-4=0$ is $ax+by+c=0$ then $\left[\left|\frac{c}{b}\right|\right]$ is equal to [.] denotes G.I.F

24. if $C_k = {}^6C_k$, then the value of $\sum_{k=1}^{6} k^3.\left(\frac{C_k}{C_{k-1}}\right)^2$ is

25. Variance of the 100 consecutive numbers 121, 122, 123, ...,220 is

PHYSICS

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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answer, out of which **ONLY ONE** option can be correct.
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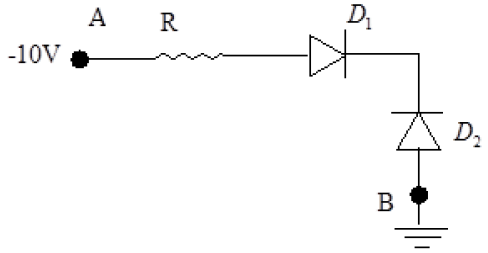
26. A plane electromagnetic wave is propagating along the direction $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$,with its polarization along the direction $\hat{k}$.The correct from of the magnetic field of the wave would be (here B_0 is an appropriate constant, k_o is propagation constant.

(A) $\vec{B} = B_0 \frac{\hat{i}-\hat{j}}{\sqrt{2}} \cos\left(wt - \vec{k_o}.\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}} \right) \right)$ (B) $\vec{B} = B_0 \frac{\hat{i}+\hat{j}}{\sqrt{2}} \cos\left(wt - \vec{k_o}.\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}} \right) \right)$

(C) $\vec{B} = B_0 \hat{k} \cos\left(wt - \vec{k}_o \frac{\hat{i}+\hat{j}}{\sqrt{2}} \right)$ (D) $\vec{B} = B_0 \frac{\hat{j}-\hat{i}}{\sqrt{2}} \cos\left(wt + \vec{k_o}.\frac{\hat{i}+\hat{j}}{\sqrt{2}} \right)$

27. The activity of a radioacitve sample falls from $700\,s^{-1}$ to $500\,s^{-1}$ in 30 minutes .Its half-life is close to:
(A) 66 min (B) 52 min (C) 72 min (D) 62 min

28. In the figure assuming the diodes to be ideal



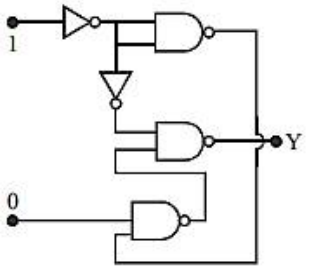
(A) D_1 is forward biased and D_2 is reverse biased and hence current flows from A to B

(B) D_2 is forward biased and D_1 is reverse biased and hence no current flows from B to A and vice versa.

(C) D_1 and D_2 are both forward biased and hence current flows from A to B

(D) D_1 and D_2 are both reverse biased and hence no current flows from A to B vice versa.

29. In the given circuit m value of Y is:
(A) Will not execute
(B) 0
(C) Toggles between 0 and 1
(D) 1



30. Consider sunlight incident on a slit of width $10^4 A^0$. The image seen through the slit shall
(A) be a fine sharp slit white in colour at the centre
(B) a bright slit white at the centre diffusing to zero intensities at the edge.
(C) a bright slit white at the centre diffusing to region of different colours
(D) only be a diffused slit white in colour

31. Identify **correct statement** in the following related to Polarisation and Polaroid
A) when un polarised light is made to incident on glass slab at Brewster angle, both reflected and refracted are completly plane polarised
B) Polarisation confirms longitudinal behaviour of EM waves
C) Polaroid cannot control the intenisty in sunglasses and window panes
D) Polaroid is used in 3D movie cameras.

32. Equation of a plane progressive sound wave is given by $y = 0.6\sin 2\pi\left(t - \frac{x}{2}\right)$. On reflection from a denser medium its amplitude becomes $\frac{2}{3}$ of the amplitude of incident wave. The equation of the reflected wave is

(A) $Y = 0.6\sin 2\pi\left(t + \frac{x}{2}\right)$ (B) $Y = -0.4\sin 2\pi\left(t + \frac{x}{2}\right)$

(C) $Y = 0.4\sin 2\pi\left(t + \frac{x}{2}\right)$ (D) $Y = -0.4\sin 2\pi\left(t - \frac{x}{2}\right)$

33. A string of mass $2.5\,Kg$ is under tension of $200\,N$. The length of the stretched string is $20.0\,m$. If the transverse jerk is struck at one end of the string. The disturbance will reach the other end is

(A) 1 sec (B) 0.5 sec (C) 2 sec (D) 3 sec

34. A person normally weighing 50kg stands on a massless platform which oscillates up and down at a frequency of $2.0\,\text{sec}^{-1}$ and an amplitude 5.0 cm. A weighing machine on the platform gives the persons weight against time. What will be the maximum and minimum reading in the machine.

(A) 442N, 65N (B) 884N, 95.5N (C) 665N, 75.5N (D) 440N, 60N

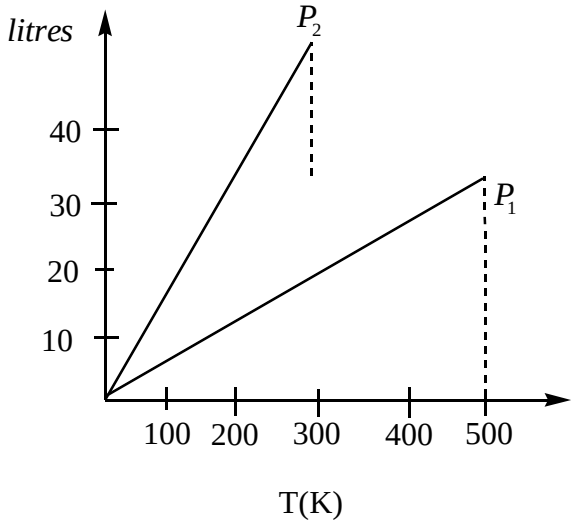
35. A particle executing SHM has a maximum speed of $30\,cm/\text{sec}$ and a maximum acceleration of $60\,cm/\text{sec}^2$. The period of oscillation is

(A) $\pi\,\text{sec}$ (B) $2\,\text{sec}$ (C) $2\,\text{sec}$ (D) $\frac{\pi}{2}\,\text{sec}$

36. A particle is dropped from a height H. The de-Broglie wavelength of the particle as a function of height H is proportional to

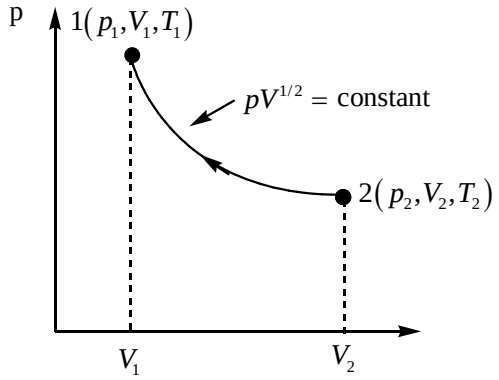
(A) H (B) $H^{\frac{1}{2}}$ (C) H^{0} (D) $H^{-\frac{1}{2}}$

37. Volume versus temperature graphs for a given mass of an ideal gas are shown in figure. At two different values of constant pressure. What can be inferred about relation between P_1 and P_2



(A) $P_1 > P_2$ (B) $P_1 = P_2$ (C) $P_1 < P_2$ (D) Data insufficient

38. Consider a P-V diagram in which the path followed by one mole of perfect gas in a cylindrical container obeys law $PV^{\frac{1}{2}} = \text{constant}$ what is the ratio of the temperature $\frac{T_1}{T_2}$ if $V_2 = 2V_1$



(A) $\frac{T_1}{T_2}=\frac{1}{2}$ (B) $\frac{T_1}{T_2}=\frac{2}{3}$ (C) $\frac{T_1}{T_2}=\frac{1}{\sqrt{2}}$ (D) $\frac{T_1}{T_2}=\frac{\sqrt{3}}{2}$

39. The radius of a metal sphere at room temperature T is R and the coefficient of linear expansion of the metal is $\propto$. The sphere heated a little by a temperature ΔT so that its new temperature is $T+\Delta T$. The increase in the volume of the sphere is approximately.

(A) $2\pi R \propto \Delta T$ (B) $\pi R^2 \propto \Delta T$ (C) $\frac{4\pi R^2 \propto \Delta T}{3}$ (D) $4\pi R^3 \propto \Delta T$

40. A paramagnetic sample shows a net magnetisation of $8Am^{-1}$. When placed in an external magnetic field of $0.6T$ at a temperature of $4K$. When the same sample is placed in an external magnetic field of $0.2T$ at a temperature of $16K$. The magnetisation will be

(A) $\frac{32}{3}Am^{-1}$ (B) $\frac{2}{3}Am^{-1}$ (C) $6Am^{-1}$ (D) $2.4Am^{-1}$

41. An astronomical refractive telescope has an objective of focal length 20 m and eyepiece of focal length 2 cm.

(A) The length of the telescope tube is 10 m (B) The magnification is 1000

(C) The image formed is erect (D) The magnification is 500

42. An aluminium sphere is dipped into water. Which of the following is true

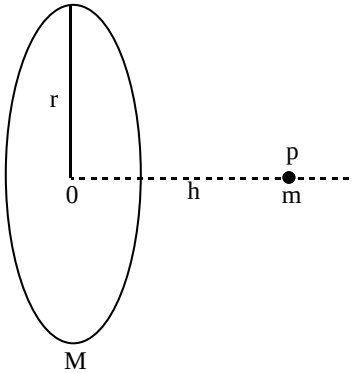
(A) Buoyancy will be less in water at $0^\circ C$ than that in water at $4^\circ C$

(B) Buoyancy will be more than in water at $0^\circ C$ than that in water $4^\circ C$

(C) Buoyancy in water at $0^\circ C$ will be same as that in water $4^\circ C$

(D) Buoyancy may be more or less in water at $4^\circ C$ depending on the radius of the sphere.

43. A mass m is placed at p at a distance h along the normal through the centre O' of a thin circular ring of mass M and radius r. Gravitational force on an object is F. If the mass is moved further away such that OP becomes 2h, by what factor the force of gravitation will decrease if h = r



(A) $F^{|}=\frac{4\sqrt{3}}{5}F$ (B) $F^{|}=\frac{4\sqrt{5}}{3\sqrt{2}}F$ (C) $F^{|}=\frac{4\sqrt{2}}{5\sqrt{5}}F$ (D) $F^{|}=\frac{5\sqrt{2}}{3\sqrt{3}}F$

44. Two H atoms in the ground state collide inelastically. The maximum amount by which their combined kinetic energy is reduce is

(A) $10.20eV$ (B) $20.40eV$ (C) $13.6eV$ (D) $27.2eV$

45. A message signal of frequency 10Khz and peak voltage of 10V is used to modulate a carrier of frequency 1 MHz and peak voltage of 20 volt .Then

A) modulation index = 0.5

B) modulation index =1

C) side band frequency are 1010Hz and 995 Hz respectively

D) option A and C are correct

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(Numerical Value Answer Type)

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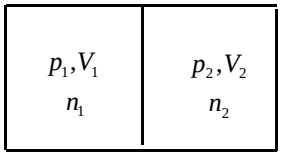
46. Consider a carnot's cycle operating between $T_1 = 550k$ and $T_2 = 250k$, producing $100J$ of mechanical work per cycle. The heat transferred to the engine by the reservoirs is

47. Consider a metal exposed to light of wavelength $600nm$. The maximum energy of the electron doubles when light of wavelength $400nm$ is used. The work function in eV $\left[\frac{hc}{\lambda(A^0)} = 12400\,eV\right]$

48. A train standing at the outer signal of a railway station blows a whistle of frequency $400Hz$ in still air. The train begins to move with a speed of $10m/\sec$ towards the platform. What is the frequency of the sound for an observer standing on the platform(sound velocities in air $= 330m/\sec$) in Hz

49. A container made of adiabatic walls shown in figure has two chambers separated by a partition, of volume $V_1 = 2.0L$ and $V_2 = 3.0L$. The chambers contain $n_1 = 4.0$ and $n_2 = 5.0$ moles of a gas at pressure $P_1 = 1.00$ atm and $P_2 = 2.00$ atm. Calculate the pressure after the partition is removed and the mixture attains equilibrium in atm



50. A bar magnet of magnetic moment M and moment of inertia I (about centre, perpendicular to length) is cut into two equal pieces, perpendicular to length. The period of oscillation of the original magnet about an axis through the mid point, perpendicular to length is 3.14 sec in a magnetic field 'B'. What would be the similar period 'T' for each piece in seconds .

CHEMISTRY

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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answer, out of which **ONLY ONE** option can be correct.
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51.

Column – I **(Treatment of reactant with excess water at room temperature)**	**Column – II** **(Reaction Characteristics)**
1. $XeF_4 \xrightarrow{H_2O}$ 2. $XeF_6 \xrightarrow{H_2O}$ 3. $SF_6 \xrightarrow{H_2O}$ 4. $N_2O_4 \xrightarrow{H_2O}$	(P) Disproportionation reaction (Q) One of the product is oxygen gas (R) Complete hydrolysis (S) Inert towards hydrolysis (T) One of the product is monobasic oxyacid

(A) 1→ P, Q, R	2 → P	3→ S	4 → P, R, T
(B) 1→ P	2 → P,Q	3→ S	4 → S, T
(C) 1→ Q	2 → S	3→ R	4 → T
(D) 1→ R	2 → P	3→ S	4 → R, T

52. Select the correct statement

I. During heating ZnO lattice it's density will increase

II. On heating ferromagnetic substance converts into a paramagnetic substance.

III. CaF_2 represent anion frenkel defect.

IV. During heating of NaCl lattice in presence of Sodium vapour, density of lattice will decrease

(A) I &II (B) II & III (C) I, II, III (D) III &IV

53. The correct statement about ICl_5 and ICl_4^- is

(A) ICl_5^- is square pyramidal and ICl_4^- is tetrahedral

(B) ICl_5^- is square pyramidal and ICl_4^- is square planar

(C) Both are isostructural

(D) ICl_5^- is trigonal bipyramidal and ICl_4^- is tetrahedral

54. Among the following molecules/ ions, $C_2^{2-}, N_2^{2-}, O_2^{2-}, O_2$ which one is diamagnetic and has the shortest bond length?

(A) C_2^{2-} (B) O_2 (C) O_2^{2-} (D) N_2^{2-}

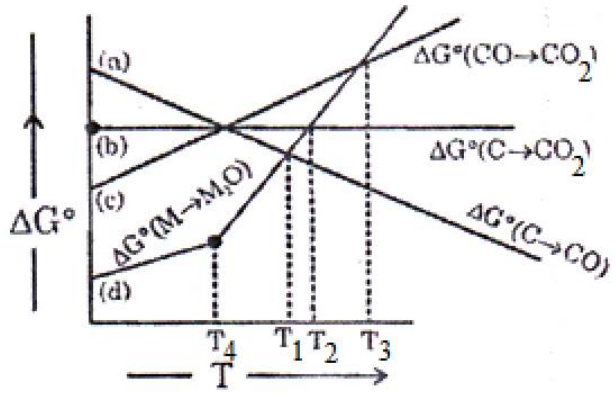
55. How many are example of narcotic analgesic?

(1) Aspirin (2) Paracetamol (3) Morphine (4) Codeine

(5) Heroin

(A) 2 (B) 3 (C) 4 (D) 5

56. How many statements are correct about following diagram?



(I) Carbon can be used to reduce the metal oxide and itself oxidized into carbondioxide at only above the T_3 temperature.

(II) Carbon can be used to reduce the metal oxide and itself oxidized into carbonmonoxide at above T_1 temperature.

(III) Carbon monoxide can reduce the metal oxide to the metal and itself oxidized to carbon dioxide at above T_3temperature.

(IV) Carbon can be used to achieve the reduce for metal oxide below the T_2temperature and carbon is oxidized to carbondioxide.

(V) T_4 is the boiling point of metal

(A) II, III (B) III, IV, V (C) III, V (D) I, II, III

57.

List- I	**List- II**
Type of ionic compound	(1) Cation at 50% of tetrahedral void
(P) NaCl type	(2) Cation at 100% of tetrahedral void
(Q) ZnS type	(3) Cation at cubic void
(R) CsCl type	(4) Cation at 100% octahedral void
(S) Na_2O type	

Codes:

	P	**Q**	**R**	**S**
(A)	4	1	3	2
(B)	2	1	4	1
(C)	1	2	3	4
(D)	4	3	4	2

58. A Chemist has 4 samples of artificial sweetener A, B, C and D. To identify these samples, he performed certain experiments and noted the following observations:

(i) A and D both form blue-violet color with ninhydrin.

(ii) Lassaigne extract of C gives positive $AgNO_3$ test and negative $Fe_4[Fe(CN)_6]_3$ test

(iii) Lassaigne extract of B and D gives positive sodium nitroprusside test.

Based on these observations which option is correct?

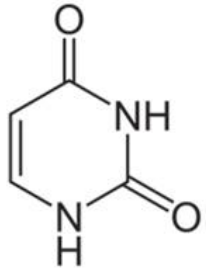
(A) A: Aspartame ; B ; Saccharin ; C : Sucralose ; D ; Alitame

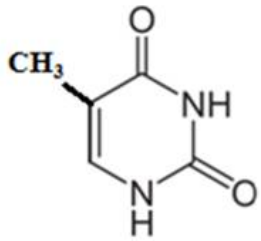
(B) A: Alitame ; B ; Saccharin ; C : Aspartame ; D ; Sucralose

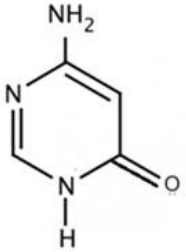
(C) A: Saccharin; B ;Alitame; C : Sucralose; D ; Aspartame

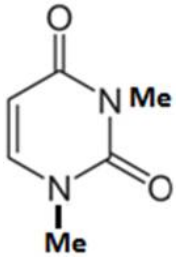
(D) A: Aspartame ; B ; Alitame; C : Saccharin; D ; Sucralose

59. Among the following compounds, which one is found in RNA?

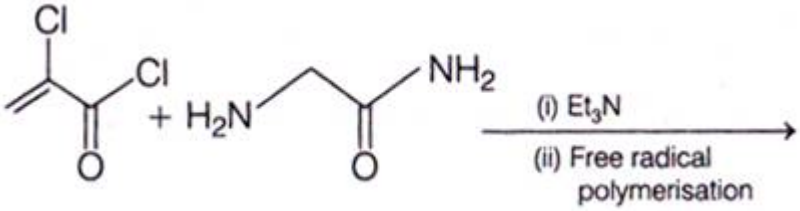
A) 

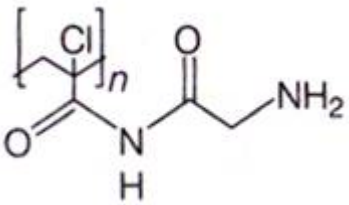
B) 

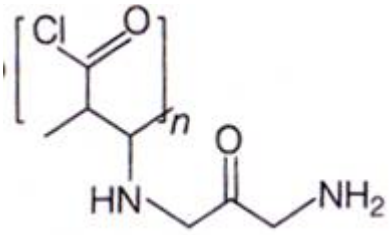
C) 

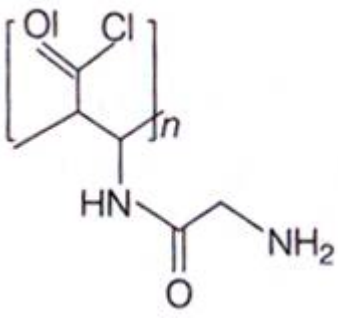
D) 

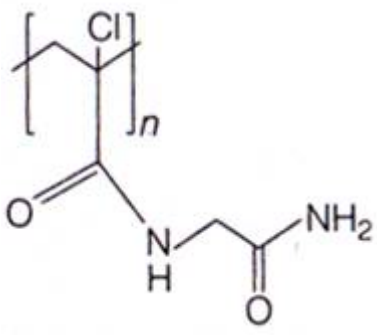
60. Major product of the following reaction is



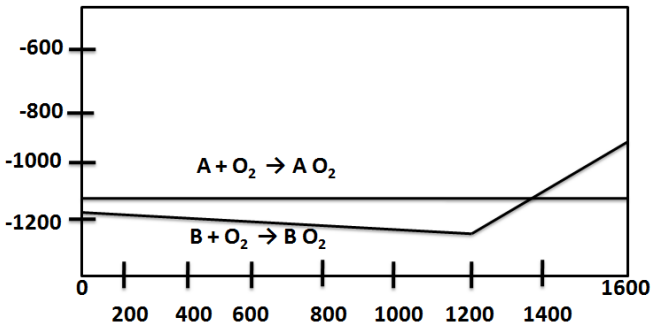
A) 

B) 

C) 

D) 

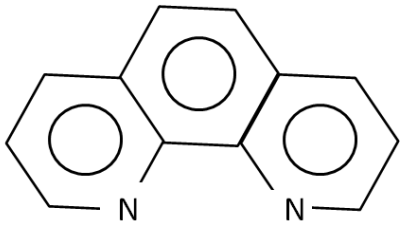
61. According to the following diagram, A reduces BO_2 when the temperature is :



(A) < 1400°C (B) >1400 °C

(C) < 1200°C (D) A will not be able to reduce BO_2

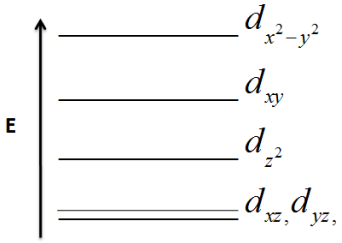
62. The complex ion that will lose its crystal field stabilization energy upon oxidation of its metal to +3 state is

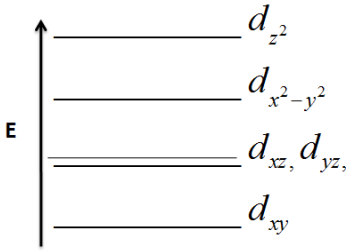
Phen = 

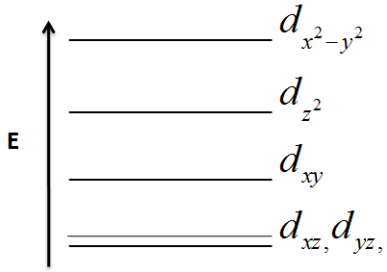
Ignore pairing energy

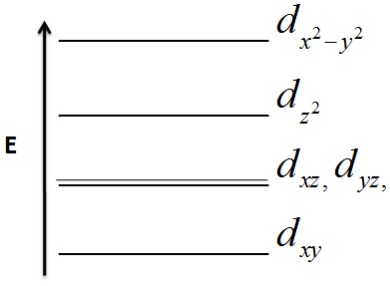
(A) $[Co(phen)_3]^{2+}$ (B) $[Ni(phen)_3]^{2+}$ (C) $[Zn(phen)_3]^{2+}$ (D) $[Fe(phen)_3]^{2+}$

63. Complete removal of both the axial ligands (along the z-axis) from an octahedral complex leads to which of the following splitting patterns? (relative orbital energies not on scale)

A) 

B) 

C) 

D) 

64. A water sample has ppm level concentration of the following metals: Fe= 0.2; Mn = 5.0; Cu = 3.0; Zn = 5.0. The metal that makes the water sample unsuitable for drinking is

(A)Cu (B)Fe (C)Mn (D) Zn

65. Match the pollutant(s) in Column I with the effect(s) in Column II.

Column I	**Column II**
(i) Oxides of sulphur	(a) Global warming

(ii) Nitrogen dioxide (b) Damage to kidney
(iii) Carbon dioxide (c) 'Blue baby' syndrome
(iv) Nitrate in drinking water (d) Respiratory diseases
(v) Lead (e) Red haze in traffic and congested areas

(a). (i) → (d), (ii) → (e), (iii) → (a), (iv) → (c), (v) → (b)
(b). (i) → (b), (ii) → (e), (iii) → (a), (iv) → (c), (v) → (d)
(c). (i) → (b), (ii) → (c), (iii) → (a), (iv) → (e), (v) → (d)
(d). (i) → (d), (ii) → (c), (iii) → (b), (iv) → (e), (v) → (a)

66. Consider the hydrated ions of Ti^{2+}, V^{2+}, Ti^{3+} *and* Sc^{3+}. The correct order of their spin-only magnetic moments is

(*A*) $Sc^{3+} < Ti^{3+} < Ti^{2+} < V^{2+}$ (*B*) $Sc^{3+} < Ti^{3+} < V^{2+} < Ti^{2+}$

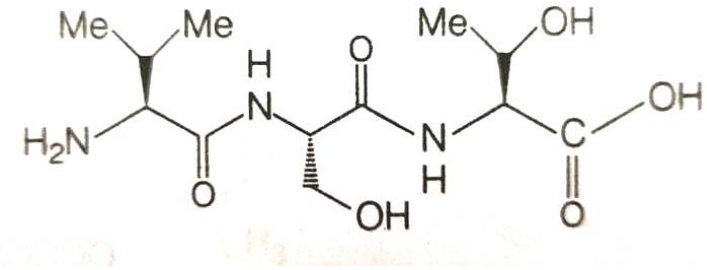
(*C*) $Ti^{3+} < Ti^{2+} < Sc^{3+} < V^{2+}$ (*D*) $V^{2+} < Ti^{2+} < Ti^{3+} < Sc^{3+}$

67. A gas undergoes physical adsorption on a surface and follow the given freundlich adsorption isotherm equation $\frac{x}{m} = Kp^{0.5}$

Adsorption of the gas increases with

(A) Increase in *p* and increase in **T** (B) Increase in *p* and decrease in **T**
(C) decrease in *p* and decrease in **T** (D) decrease in *p* and increase in **T**

68. The correct sequence of amino acids present in the tripeptide given below is



(A) Thr –Ser – Leu (B) Leu – Ser- Thr (C) Val – Ser – Thr (D) Thr – Ser - Val

69. At 100^{O}C, copper (Cu) has FCC unit cell structure with cell edge length of x A^0. What is the approximate density of Cu (in g cm^{-3}) at this temperature?

(A) $\frac{211}{x^3}$ (B) $\frac{205}{x^3}$ (C) $\frac{105}{x^3}$ (D) $\frac{422}{x^3}$

70. Homoleptic octahedral complexes of a metal ion 'M^{3++} with three monodentate ligands L_1 ,L_2 and L_3absorb wavelength in the region of green, blue and red respectively. The increasing order of the ligand strength is

(A) $L_1 < L_2 < L_3$ (B) $L_2 < L_1 < L_3$ (C) $L_3 < L_1 < L_2$ (D) $L_3 < L_2 < L_1$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, 0 in all other cases.

71. Among the following total number of acidic radicals gives colourless volatile gas/ vapour with dilute H_2SO_4 is / are 'y'

$C_2O_4^{2-}, Cl^-, Br^-, S_2O_3^{2-}, NO_3^-, CH_3COO^-, CO_3^{2-}, SO_3^{2-}$

& How many of the following salts/compounds are yellow incolour? (x)

Ag_2CrO_4, PbO_2, Bi_2S_3, $K_4\left[Fe(CN)_6\right]$, SnS_2, CuO, $Fe(CH_3OO)_3$, $BaCrO_4$, Na_2CrO_4 Then (x+y) = _____

72. The number of polymers which are condensation polymers as well as co-polymers are_____

(1) Nylon-6 (2) Nylon-6, 6 (3) Nylon-6, 10 (4) Dacron
(5) Bakelite (6) Melamine formaldehyde resin (7) Polyisoprene
(8) Styrene- butadiene rubber (9) PAN (10) Teflon

73. The number of geometrical isomers of the complex $[Cr(NH_3)_2(H_2O)_2Br_2]^+$ is

74. When a perfect monolayer of stearic acid is formed at the air-water interface, each molecule of stearic acid (mw=284, density = 0.94g cm^{-3}) occupies and area of 20 $\overset{o}{A}^2$. The length (in A^0) of the molecule is_____

75. Given that the crystal field stabilization energy of $\left[Co(H_2O)_6\right]^{2+}$ is 7360 cm^{-1}, the value of Δ_0 in kjmol^{-1}is (Use 1Kj = 83.7 cm^{-1}) _____

MELUHA INTERNATIONAL SCHOOL
HYDERABAD

SR MPC | **MAINS MODEL – GT 1** | **Date: 19-05-2020**
Time: 3 Hours | **Max Marks : 300**

KEY SHEET

MATHS

1) **B**	2) **A**	3) **A**	4) **A**	5) **B**	6) **C**	7) **B**	8) **B**	9) **B**	10) **A**
11) **C**	12) **B**	13) **B**	14) **A**	15) **D**	16) **C**	17) **C**	18) **B**	19) **B**	20) **D**
21) **0.6**	22) **17**	23) **1**	24) **196**	25) **833.25**					

PHYSICS

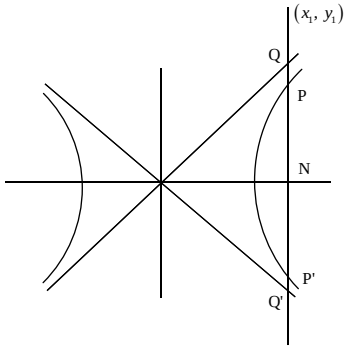
26) **A**	27) **D**	28) **B**	29) **B**	30) **C**	31) **D**	32) **C**	33) **B**	34) **B**	35) **A**
36) **D**	37) **A**	38) **C**	39) **D**	40) **B**	41) **B**	42) **A**	43) **C**	44) **A**	45) **A**
46) **183.33**	47) **1.03**	48) **412.5**	49) **1.6**	50) **1.57**					

CHEMISTRY

51) **A**	52) **D**	53) **B**	54) **A**	55) **B**	56) **A**	57) **A**	58) **A**	59) **A**	60) **D**
61) **B**	62) **D**	63) **A**	64) **C**	65) **A**	66) **A**	67) **B**	68) **C**	69) **D**	70) **C**
71) **8**	72) **5**	73) **5**	74) **25.08**	75) **-109.9**					

HINTS & SOLUTIONS
MATHEMATICS

01.



$$Np = \frac{4}{5}\sqrt{x_1^2 - 25}$$

$$NQ = \frac{4}{5}x_1$$

$$pQ = \frac{4}{5}\left(x_1 - \sqrt{x_1^2 - 25}\right)$$

$p'Q = \frac{4}{5}\left(x_1 + \sqrt{x_1^2 - 25}\right)$

$pQ.p'Q = 16$

02. roots are $\frac{1}{3} - d, \frac{1}{3}, \frac{1}{3} + d$ where $d \neq 0$ & $\beta = 3a^2 - d^2 = \frac{1}{3} - d^2 < \frac{1}{3}$

$\& \gamma = \frac{-1}{3}\left(\frac{1}{9} - d^2\right) \Rightarrow \gamma \in \left(\frac{-1}{27}, \alpha\right) \& \beta \in \left(-\alpha, \frac{1}{3}\right)$

03. $3\sin 3x + 12\sin^3 x = a$

$\Rightarrow 9\sin x = a$

$\Rightarrow a \in (-\infty, -9) \cup (9, \infty)$

04. $\sqrt{x+1} = t$ or $x + 1 = t^2$

$I = \int_3^4 \frac{2t}{\left(t^2 - 4\right)t} dt = \frac{2}{(2)(2)} \log \left|\frac{t-2}{t+2}\right|_3^4$

$= \frac{1}{2}\left(\log \frac{1}{3} - \log \frac{1}{5}\right)$

$= \frac{1}{2} \log \frac{5}{3}$

05. $|a| = |b| = |c| = |d| = 1$

$|2a - 9d|^2 = |-6b - 7c|^2$

$\Rightarrow 3\cos\alpha(\alpha + \delta) = 7\cos(\beta + \gamma)$

06. $f(x) = 0,1$ or x^k

07. Point of intersection $(-2,-2,-5)$ image of $(1,2,-2)$ in the plane $2x + 5y - 4z - 6 = 0$ is $\left(\frac{-11}{45}, \frac{-10}{9}, \frac{22}{45}\right)$

$\Rightarrow$ equation of line is $\frac{x+2}{79} = \frac{y+2}{40} = \frac{z+5}{247}$

08. $(-Z)^r \hat{i} + z^{3s} \hat{j}$

$z^r \hat{i} + \hat{j} + z^r \hat{k}$

$\Rightarrow r$ is odd & 3 multiple and s can be any number

09. $e^x \geq x + 1 \forall x \in [0,1]$

$\Rightarrow \int_0^1 \frac{e^x dx}{x+1} > 1$ & both are increasing functions and $\frac{e^x}{x+1} - \frac{(x+1)}{2} > 0 =$ exact one solution

10. $a_n + a_{n+2} = 2a_{n+1} \Rightarrow f(x) = 0$

11.

$K = \frac{4}{(2x-3)(3x-5y)} = \frac{7}{(y-2)(5y-7z)} = \frac{7}{(3z+1)(7z-3x)}$

$\frac{4}{(2x-3)} + \frac{7}{(y-2)} + \frac{7}{(3z+1)} = 0$

12. $y = mx - 2m - m^3 \Rightarrow m^3 + m(2-x) + y = 0$

$m_1 + m_2 + m_3 = 0$

$m_1 m_2 m_3 = -y$

$m_1 m_2 = -1$

$\Rightarrow m_3 = y$

$\Rightarrow m_1 + m_2 = -y$

$m_1 m_1 = 2 - x \Rightarrow -1 + y(m_1 + m_2) = 2 - x$

$\Rightarrow y^2 = (x-3)$

13. $\sim(p \Rightarrow q) \equiv \sim(\sim p \vee q) \equiv p \wedge \sim q$

14. $\cap(A \cup B) = 300 + 400 - 100 = 600$

$\cap(A \cup B)' = 800 - 600 = 200$

15. $1 + 3n = 3 + 5n_1 \Rightarrow 13,$

$\Rightarrow 3n - 5n_1 = 2 \Rightarrow n = \dfrac{2 + 5n_1}{3} \Rightarrow n = 4,9,14...$

$\Rightarrow \text{Sum} = 3 + 3(4 + 9 + 14)$

$= 3 + 3(27) = 3(28) = 84$

16. $2f(x).f'(x) = f(x).\dfrac{\cos x}{2 + \sin x}$

$2f'(x) = \dfrac{\cos x}{2 + \sin x}$

$2f(x) = \ln(2 + \sin x)$

$f(x) = \dfrac{1}{2}\ln\left(\dfrac{2 + \sin x}{2}\right), x \neq n\pi, n \in I$

17. ${}^{10}C_0\left[\text{coeff of } x^{10} \text{ in } (1+x)^{20}\right] - {}^{10}C_1\left[\text{coeff of } x^{10} \text{ in } (1+x)^{18}\right] + ...$

Coeff of $x^{10} \text{ in}\left[{}^{10}C_0(1+x)^{20} - {}^{10}C_1(1+x)^{18} + ...\right]$

coeff of $x^{10} \text{ in}\left[(1+x)^2 - 1\right]^{10}$

coeff of $x^{10} \text{ in}\left[x^{10}(2+x)^{10}\right]$

$= 2^{10}$

18. $S_n = (2-1) + \left(2 - \dfrac{1}{2}\right) + \left(2.\dfrac{1}{3}\right) + ...$

$S_n = 100 - H_{50}$

19. $\dfrac{dy}{dx} = \dfrac{-2xy}{x^2 + 3y^2} \& y = vx$

$\Rightarrow v + x\dfrac{dv}{dx} = -\dfrac{-2v}{1 + 3v^2} \Rightarrow x^2y + y^3 = 5$

20. $7y + 4x - 15 = 0$ is tangent at (2, 1) & meets the curve again at some other point

Area remains same even after rotation

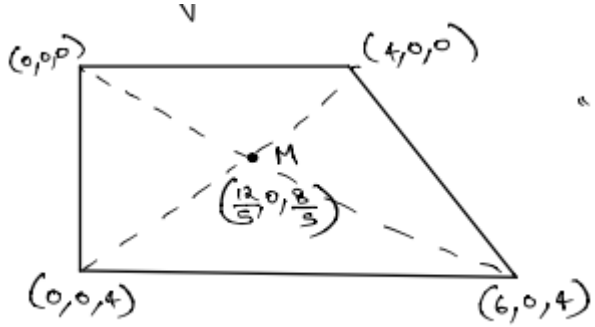
$$y=\frac{x^2}{64}\ \&\ \frac{y-16}{x}=m$$

$$\Rightarrow \frac{x^2}{64}-mx-16=0$$

$$\Rightarrow \text{Area}=\frac{\Delta^{\frac{3}{2}}}{6a^2}=\frac{\left(m^2+1\right)^{\frac{3}{2}}}{6\times\frac{1}{(64)^2}}=\frac{64\times 64}{6}$$

21. "M" will be the point of intersection of diagonals

$$\Rightarrow S:\left(\frac{12}{5},4,\frac{8}{5}\right)$$



22. $y=m(x-3)\pm r\sqrt{1-m^2}\ \&\ t=mx+\frac{1}{m}$

$$\Rightarrow \pm r\sqrt{1-m^2}=3m+\frac{1}{m}\Rightarrow r^2=\frac{\left(3m^2+1\right)^2}{m^2\left(1-m^2\right)}$$

$\Rightarrow r^2\in[8,\alpha)$

$\Rightarrow \forall r<2\sqrt{2}$ No common tangents

$r=2\sqrt{2}\Rightarrow$ two common tangents

$2\sqrt{2}<r<3\rightarrow$ four common tangents

$r=3\rightarrow$ three common tangents

$r>3\rightarrow$ two common tangents

23. It is the chord whose midpoint is (1, 2)

$\Rightarrow -x+y-8=0\ \ [S_1=S_{11}]$

24. $\frac{C_K}{C_K-1}=\frac{7-K}{K}$

$$\sum_{k=1}^{6}K\left\{7^2-14K+K^2\right\}=49\times 4=196$$

25. $\frac{n^2-1}{n}=\frac{(100)^2-1}{12}=833.25$

PHYSICS

26. Direction of polarization = $\hat{E}=\hat{k}$

$$\vec{E}\times\vec{B}=\frac{\hat{i}+\hat{j}}{\sqrt{2}}$$

Direction of propagation =

$$\therefore \vec{E}\times\vec{B}=\frac{\hat{i}+\hat{j}}{\sqrt{2}}$$

Correct answer (1)

27. $A=A_0\left(\frac{1}{2}\right)^{\frac{t}{T_{1/2}}}$

$500=700\left(\frac{1}{2}\right)^{\frac{t}{T_{1/2}}}$

$0.7\approx\left(\frac{1}{2}\right)^{\frac{t}{T_{1/2}}}$

$\left(\frac{1}{2}\right)^{1/2}\approx\frac{t}{T_{1/2}}$

$\frac{30}{T_{1/2}}\approx\frac{1}{2}\Rightarrow T_{1/2}=60$

$A=A_0\left(\frac{1}{2}\right)^{\frac{t}{T_{1/2}}}$

28. (Reference NCERT 14.3)

In the given circuit D_1 is reverse bias, D_2 is forward bias no current flows through junction B to A

29. $Y=\overline{\overline{A.B}.A}$

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

=0+0

=0

30. (Reference NCERT 10.2)

Width of slit=$10^4\,A^o$ wave length of visible light varies from 4000 A^o to 8000 A^o. Width of slit comparable to that of wavelength hence diffraction occurs maximum at centre.

31. (Reference NCERT page no 378

32. (Reference NCERT 14.8)

$A_r=\frac{2}{3}A_i=\frac{2}{3}(0.6)=0.4$

$y_r=A_r\sin 2\pi\left(t+\frac{x}{2}+\pi\right)$

$=-0.4\sin 2\pi\left(t+\frac{x}{2}\right)$

33. (Reference NCERT 14.9)

$\mu=\frac{m}{l}=\frac{2.5}{20}\Rightarrow 0.125$

$V = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{200}{0.125}} = 40$

$l = v.t$

$t = \frac{l}{v} = \frac{20}{40}$ =0.5 sec

34. (Reference NCERT 13.35)

at highest point

$N_1 = mg - ma = mg - m\omega^2 A$

At lowest point $l_2 = mg + ma = mg + m\omega^2 A$

$\omega = 2\pi f$

35. (Reference NCERT 13.10)

$\frac{V_{max}}{a_{max}} = \frac{A\omega}{\omega^2 A} = \frac{1}{\omega} = \frac{1}{2} = \frac{T}{2\pi}$

36. (Reference NCERT 11.1)

$V = \sqrt{2gH}$

$\lambda = \frac{h}{mv} = \frac{h}{m\sqrt{2gH}}$

37. (Reference NCERT 12.5)

$PV = nRT$

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

Slope

$m = \frac{dv}{dT} = \frac{nR}{p}$

$m\alpha \frac{1}{p}$

38. (Reference NCERT 11.23)

$T = \frac{PV}{nR} = \frac{P\sqrt{V}\sqrt{V}}{nR} = \frac{K\sqrt{V}}{nR}$

$\frac{T_1}{T_2} = \sqrt{\frac{V_1}{V_2}} = \frac{1}{\sqrt{2}}$

39. (Reference NCERT 10.7)

$V = \frac{4}{3}\pi R^3$

$\frac{dv}{dT} = 3R^2 \frac{dR}{dT}\left(\frac{4}{3}\pi\right)$

$\frac{1}{v}.\frac{dv}{dT} = 3\alpha$

$dv = 4\pi R^3 \alpha \Delta T$

40. (Reference NCERT 5.5)

$I\alpha \frac{B}{T}$

$I_1 = 8$

$B_1 = 0.6T$

$B_2 = 0.2T$

$T_1 = 4K$

$T_2 = 16K$

41. (Reference NCERT 9.16)

$$m = \frac{fo}{fe}\frac{20}{0.02}$$

magnification

=1000

42. (Reference NCERT 10.4)

$F_b = v\rho g$

$F \alpha \rho$

$\rho_{4^oC} > \rho_{o_C}$

43. (Reference NCERT 7.33)

$$F = \frac{GMmh}{\left(r^2 + h^2\right)^{\frac{3}{2}}}$$

$$F^{|} = \frac{GMm.2h}{\left(r^2 + 4h^2\right)^{3/2}}$$

$h = r$

$$\frac{F^{|}}{F} = \frac{4\sqrt{2}}{5\sqrt{5}}$$

44. (Reference NCERT 12.6)

Total energy associated with 2 hydrogen atoms in the ground state

$= 2 \times 13.6$

=27.2ev

The maximum amount by which their combined K.E is reduced by one of them goes into first excited state after inelastic collision.

Total energy of collision $= \frac{13.6}{2^2} + 13.6 = 17.0\,ev$

Maximum lass $= 27.2 - 17 = 10.2eV$

45. NCERT exercise question

46. (Reference NCERT 11.17)

$$n = 1 - \frac{T_2}{T_1}$$

$$n = \frac{w}{Q_1} \rightarrow Q_1 = \frac{w}{n}$$

47. (Reference NCERT 11.20)

$K^{|} = 2k$

$$K = \frac{hc}{\lambda} - w$$

$$K^{|} = 2k = \frac{hc}{\lambda^{|}} - w$$

$$2\left(\frac{1240}{600} - w\right) = \frac{1240}{400} - w$$

$w = 1.033eV$

48. (Reference NCERT 14.27)

$n = 400Hz$

$V_s = 10m/s$

$V = 330m/s$

$n^{|} = \left(\frac{V}{V - V_s}\right)n$

49. (Reference NCERT 12.20)

$P = \frac{P_1V_1 + P_2V_2}{V_1 + V_2} = 1.6atm$

50. (Reference NCERT 5.19)

$T^{|} = 2\pi\sqrt{\frac{I/8}{(M/2)B}} = \frac{2\pi}{2}\sqrt{\frac{I}{MB}} = \frac{T}{2} = \frac{3.14}{2} = 1.57\,\text{sec}$

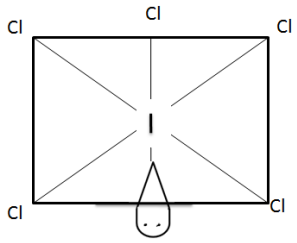
CHEMISTRY

51. Conceptual

52. Factual

53. (b) For $\overset{**}{I}Cl_5$

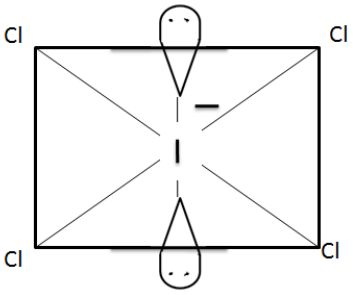
$H = \frac{1}{2}(7 + 5 - 0 + 0) = 6(sp^3d^2)$



sp^3d^2 hybridized
Geometry : Octahedral
Shape / Structure : Square pyramidal

For $\overset{**}{I}Cl_4^-$

$H = \frac{1}{2}(7 + 4 - 0 + 1) = 6(sp^3d^2)$



sp^3d^2 hybridized
Geometry : Octahedral
Shape / Structure : Square planar

So, ICl_5 and ICl_4^- are isolobal but not isostructural.

54.

Species	Mo energy order	Bond order	n, number of unpaired e-	Magnetic character
$C_2^{2-}\left(14e^-\right)$	$\left[8e^-\right]\pi_{2P_x^2} = \pi_{2P_y^2}\,\sigma_{2P_z^2}$	$\frac{6-0}{2} = 3$	0	Diamagnetic
$O_2\left(16e^-\right)$	$\left[8e^-\right]\sigma_{2P_z^2}\ \pi_{\pi_{2P_x^2}} = \pi_{2P_y^2}\ \pi^*_{\pi_{2P_x^1}} = \pi^*_{2P_y^1}$	$\frac{6-2}{2} = 2$	2	Paramagnetic

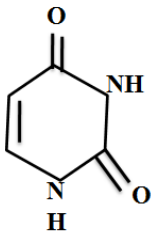
$O_2^{2-}\left(18e^-\right)$	$\left[8e^-\right]\sigma_{2P_z^2}\,\pi_{2P_x^2}=\pi_{2P_y^2}\,\pi^*_{2P_x^2}=\pi^*_{2P_y^2}$	$\frac{6-4}{2}=2$	0	Diamagnetic
$N_2^{2-}\left(16e^-\right)$	$\left[8e^-\right]\pi_{2P_x^2}=\pi_{2P_y^2}\,\sigma_{2P_z^2}\,\pi^*_{2P_x^1}=\pi^*_{2P_y^1}$	$\frac{6-2}{2}=2$	2	Paramagnetic

Bond length = $\alpha\,\frac{1}{BO\,(Bond\ order)}$

So order of bond length $\underset{(BO=3)}{C_2^2} < \underset{(BO=2)}{O_2} = N_2^{2-} < \underset{(BO=1)}{O_2^{2-}}$

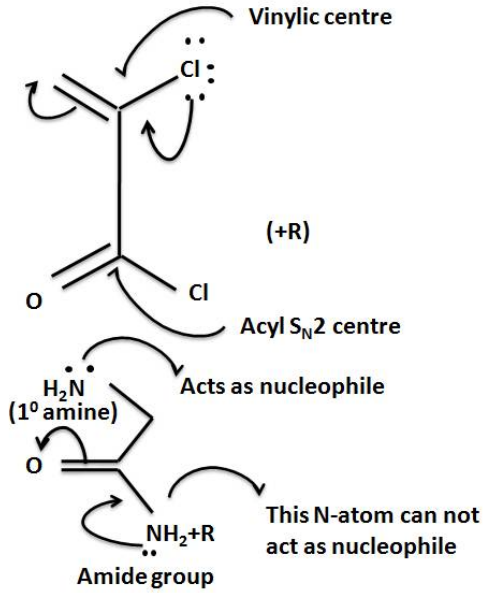
The diamagnetic species with shortest bond length is C_2^{2-} (option-a)

55. 3,4,5
56. II &III
57. Conceptual
58. Aspartame and Alitame contains peptide bond therefore it gives blue-violet color with ninhydrin.
59. (RNA) contains, adenine (A), guanine (G), cytosine (C) and uracil (U). In the given options



Is uracil (present in RNA only)

60. (d) The analysis of both the substrates:



61. > 1200 oC but 1400 oC

62. (d) Key idea: crystal field splitting occurs due to the presence of legends in a definite geometry. In octahedral complexes the energy of two, eg orbital's will increase by (0.6) Δo and that of three t2g will decrease by (0.4) Δo
The complex ions that will lose its crystal field stabilization energy upon oxidation of its metal to +3 state is [Fe(phen)3]2+.

$\left[Fe(phen)_3\right]^{2+} \xrightarrow{-e^-} \left[Fe(phen)_3\right]^{3+}$

In [Fe(phen)3]2+, electronic configuration of Fe2+ is 3d64S0. Phenanthrene is a strong field symmetrical bidentate ligand. The splitting of orbital in Fe2+ is as follows:

t2g6 & ego
Fe2+
CFSE = 6x -0.4 Δo = -2.4 Δo.
The splitting of orbital and arrangement of electrons in Fe 3+ is as follows:
Fe3+ t2g5 & ego
CFSE = 5x -0.4 Δo = -2.4 Δo.
Fe2+ upon oxidation of its metal to +3 state lose
Its CFSE from -2.4 Δo. to -2.0 Δo.

63. Completer removal of both the axial ligands (along the z-axis) from an octahedral complex leads to the following splitting pattern

The single electron in the $d_{x^2-y^2}$ orbital is being repelled by four ligands, while the electron in the d_{z^2} orbital is only being repelled by two ligands. Thus, the energy of the $d_{x^2-y^2}$ increases relative to that of d_{z^2}. A more stable arrangement arises when both the ex electrons pair up and occupy the lower energy d_{z^2} orbital. This leaves the $d_{x^2-y^2}$ orbital empty. Thus four legends can now approach along +x, -x, +y and –y directions without any difficulty as $d_{x^2-y^2}$ orbital is empty. However, ligands approaching along +z and –z directions meet very strong repulsive forces from filled d_{z^2} orbital's. Thus, only four ligands succeed in bonding to eh metal. A square planar complex is formed, the attempt to form an octahedral complex being unsuccessful.

64. Higher concentration of the manganese.

65. Conceptual

66. (a) The spin only magnetic moment (μ) of each ion can be calculated as

$\mu = \sqrt{n(n+2)}\,BM$

$[\because n = No.of\ unpared\ electron(s)] \Rightarrow \mu\ \alpha$ n, i.e,

Higher the number of unpaired electrons, higher will be the value of μ

Metal ion	Z	n (for metal ion)	M (BM)	Nature
Ti^{2+}	22	2(3d2)	$\sqrt{8}$	Paramagnetic
V^{2+}	23	3(3d3)	$\sqrt{15}$	Paramagnetic
Ti^{3+}	22	1(3d1)	$\sqrt{3}$	Paramagnetic
Sc^{3+}	21	0(3d0)	2	Diamagnetic

Thus, the correct order of spin only magnetic moments of given hydrated ions will be
$Sc^{3+} < Ti^{3+} < Ti^{2+}\ V^{2+}$

67. Where, x = amount of adsorbent, m = amount of adsorbent,

$\frac{x}{m}$ = degree of adsorption

$\frac{1}{n}$ = order of the reaction, where, o < $\frac{1}{n}$ < 1 and

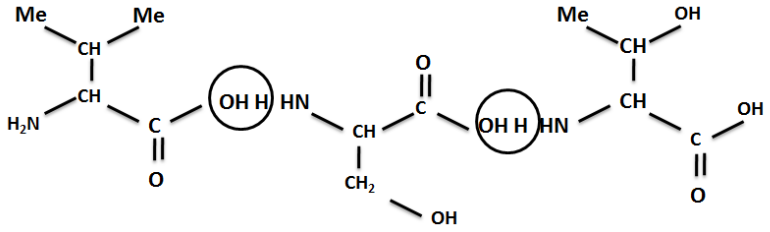
So, $1 < n < \infty$

There, $\frac{x}{m} = Kp^{\frac{1}{2}}$,

i.e, $\frac{x}{m} \alpha\ p^{\frac{1}{2}}$,

So, the rate of physical desorption of the gas increase with p (when T is constant) and decreases with T (when p is constant)

68. Formation of the tripe tide (Val-Ser-Thr) can be shown as:



69. (d) For fcc, rank of the unit cell (Z) =4
Mass of one Cu-atom, M= 63.55 u
Avogadro's number NA = 6.023 x1023 atom
Edge length, a = x $\overset{o}{A}$ = x x 10-8cm
Density (d) = $\frac{Z\,x\,M}{N_A\,x\,a^3}$
= $\frac{4x63.55}{6.023x10^{23}\,x\left(x\,X\,10^{-8}\right)^3}$
= $\frac{422.048}{x^3}\,g\,cm^{-3}$

70. In homoleptic complexes, the metal atom/ion is linked to only one type of ligand. Assuming, ligands are neutral, the octahedral complexes of M3+ can be,

[M(L1)6]3+ , [M(L2)6]3+ and [M(L3)6]3+

(I)	(II)	(III)
Green	Blue	Red (wave length)

$\lambda_{Absorption}$

So, $\lambda_{III}^{L3} > \lambda_{I}^{L1} > \lambda_{II}^{L2}$

$\therefore \Delta_{Absorption}^{o} : \Delta_{II}^{L2} > \Delta_{I}^{L1} > \Delta_{III}^{L3}$

$\left[\because Enegry\left(\Delta, CFSE\ \alpha\ \frac{1}{\lambda}\right)\right]$

We know, ligand strength $\alpha\ \Delta^{0}_{Absorption}$

So, the increasing order of the ligand strength will be, $L_3 < L_1 < L_2$

71. 4+4 = 8

72. 2,3,4,5,6

73. Five isomers

74. Volume of a molecule = $\frac{Mass}{Density}$
= $\frac{284g\ /mol}{0.94g\ /\ cm^3}$
= $\frac{284g\ /\ 6.023x10^{23}}{0.94}$

= 50.16x10-23 cm3/ molecule

Now, area occupied by each molecule

$= 20\bar{A}^2$

= 20X10-16 cm2

Now as, volume = Area x Lengtrh

$\therefore$ Length of molecule = $\frac{Volume\,of\ molecule}{Area\,of\ molecule}$

$= \frac{50.16x10^{-23}}{20x10^{-16}}$

= 2.508x10-7cm

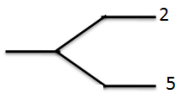
= 2.508x10-9m

= 25.08x10-10m

$= 25.08\ \overset{0}{A}$

75. $\left[Co(H_2o)_6\right]^{2+}$

$Co^{2+} - d^7$



CFSE = (-0.4X5+0.6X2)ΔO +pm

$\Rightarrow$ 7360 = -0.8 ΔO

$\therefore$ ΔO = -9200 cm-1

Since, 1Kj = 83.7 cm-1

$\therefore\ \Delta O = -\frac{9200}{83.7}$

ΔO = - 109.9 kJ