MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC	**JEE MAINS JR GT**	**Date: 05-04-2020**
Time: 3 Hours		**Max. Marks: 300**

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.

MATHS

1. **Let** $a,b,c \in R$**. If** $f(x)=ax^2+bx+c$ **is such that** $a+b+c=3$ **and** $f(x+y)=f(x)+f(y)+xy,$ $\forall x,y \in R$ **then** $\sum_{n=1}^{10} f(n)$ **is equal to**

A)190 B)255 C)330 D)165

2. **If** $f(x)=2^{10}.x+1, g(x)=3^{10}.x-1$ **and** $fog(x)=x$ **then '** x **' is equal to**

A) $\frac{3^{10}-1}{3^{10}-2^{-10}}$ B) $\frac{2^{10}-1}{2^{10}-3^{-10}}$ C) $\frac{1-3^{-10}}{2^{10}-3^{-10}}$ D) $\frac{1-2^{-10}}{3^{10}-2^{-10}}$

3. **If A is any 3 x 3 matrix with** $|A| \neq 0$ **and** $(A-3I)(A-5I)=0$ **where** $I=I_3$ **and** $O=O_3$**. If** $\alpha A+\beta A^{-1}=4I$ **then** $\alpha+\beta$ **is equal to**

A)13 B)7 C)12 D)8

4. **If A is orthogonal matrix of order 3 then det (adj 2A) =**

A) 4 B)16 C) 64 D) 27

5. **If** $5(\tan^2 x-\cos^2 x)=2\cos 2x+9$**, then the value of** $\cos 4x$ **is**

A) $\frac{2}{9}$ B) $\frac{-7}{9}$ C) $\frac{-3}{5}$ D) $\frac{1}{3}$

6. **The sum of all values of** $\theta \in \left(0,\frac{\pi}{2}\right)$ **satisfies** $\sin^2 2\theta+\cos^4 2\theta=\frac{3}{4}$ **is**

A) π B) $\frac{\pi}{2}$ C) $\frac{3\pi}{8}$ D) $\frac{5\pi}{4}$

7. $\sin^{-1}(\sin 10)=$

A)10 B) $10-3\pi$ C) $3\pi-10$ D) $3\pi+10$

8. **In** ΔABC**, if** $c^4-2(a^2+b^2)c^2+a^4+a^2b^2+b^4=0$ **then** $\angle C=$

A) 30^0 B) 45^0 C) 60^0 D) 75^0

9. **If a vector** $\vec{a}$ **of magnitude 50 is collinear with vector** $\vec{b}=6\hat{i}-8\hat{j}-\frac{15}{2}\hat{k}$ **and makes an acute angle with positive z – axis then**

A) $\vec{a}=4\vec{b}$ B) $\vec{a}=-4\vec{b}$ C) $\vec{b}=4\vec{a}$ D) $\vec{a}=-2\vec{b}$

10. **Number of real solutions of** $\sin(e^x)\cos(e^x)=2^{x-1}+2^{-x-1}$ **is**

A)zero B)one C)two D) infinite

11. **The equation of the line whose y-intercept is $\frac{4}{5}$ and which is perpendicular to $5x+2y+7=0$ is**

A) $2x-5y+4=0$ B) $10x-15y-4=0$ C) $28x-21y+12=0$ D) $20x+12y-9=0$

12. **The angle between the line joining the points $(1,-2),(3,2)$ and the line $x+2y-7=0$ is**

A) 0 B) $\frac{\pi}{4}$ C) $\frac{\pi}{2}$ D) π

13. **If $A=(3,1,-2)$ $B=(-1,0,1)$ and l,m are the projections of AB on the y –axis, zx plane respectively then $3l^2-m+1=$**

A)-1 B)0 C)1 D)9

14. **A plane which bisects the angle between the two given planes $2x-y+2z-4=0$ and $x+2y+2z-2=0$ passes through the point**

A) $(1,4,-1)$ B) $(2,-4,1)$ C) $(2,4,1)$ D) $(1,-4,1)$

15. **If the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-2}{4}$ meets the plane $x+2y+3z=15$ at a point 'p' then the distance of 'p' from the origin is**

A) $\frac{7}{2}$ B) $2\sqrt{5}$ C) $\frac{9}{2}$ D) $\frac{\sqrt{5}}{2}$

16. $\underset{y\to x}{Lt}\frac{\sin^2 y-\sin^2 x}{y-x}$ =

A) $\sin 2y$ B) $\sin 2x$ C) $\cos^2 y$ D) $\cos^2 x$

17. $\underset{n\to\infty}{Lt}\frac{1.1!+2.2!+.....+n.n!}{(n+1)!}=$

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

18. **If $x\log_e(\log_e^x)-x^2+y^2=4$ $(y>0)$ then $\frac{dy}{dx}$ at $x=e$ is equal to**

A) $\frac{1+2e}{2\sqrt{4+e^2}}$ B) $\frac{e}{\sqrt{4+e^2}}$ C) $\frac{2e-1}{2\sqrt{4+e^2}}$ D) $\frac{1+2e}{\sqrt{4+e^2}}$

19. **The tangent to the curve $y=xe^{x^2}$ passing through the point (1, e) also passed through the point**

A) $\left(\frac{4}{3},2e\right)$ B) $(2,3e)$ C) $(3,6e)$ D) $\left(\frac{5}{3},2e\right)$

20. **The height of a right circular cylinder of maximum volume inscribed in a sphere of radius 3 is**

A) $2\sqrt{3}$ B) $\frac{2}{3}\sqrt{3}$ C) $\sqrt{6}$ D) $\sqrt{3}$

SECTION-II

(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.

Marking scheme: +4 for correct answer, 0 in all other cases.

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21. **A function $f(x)$ satisfies the equation $x^2 f(x) + f(1-x) = 2x - x^4$ for all real x then $f\left(\frac{3}{2}\right) =$ _____**

22. **If $f(x+y, x-y) = xy$ then f(5,4)= _____**

23. **If $K = 1 + \frac{1}{2}(1+2) + \frac{1}{3}(1+2+3) + \frac{1}{4}(1+2+3+4) + \ldots.$ up to 20 terms then $\frac{K}{2}$ = _____**

24. **If the function 'f' given by $f(x) = x^3 - 3(a-2)x^2 + 3ax + 7$ for some $a \in R$ is increasing in $(0,1]$ and decreasing in $[1,5)$ then a root of the equation $\frac{f(x)-14}{(x-1)^2} = 0 \ (x \neq 1)$ is ____**

25. **The area enclosed by $2|x| + 3|y| \leq 6$ is _____**

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PHYSICS

26. **The position of a particle as a function of time t, is given by $x = 4t + 3t^2 - t^3$. When the particle attains zero acceleration, then its velocity will be**

1)4 2)3 3)7 4)8

27. **Two particles are projected from the same point with the same speed 'u', such that they have the same range R, but different maximum heights h_1 and h_2 . which of the following is correct?**

1)$R^2 = 2h_1h_2$ 2)$R^2 = 16h_1h_2$ 3)$R^2 = 4h_1h_2$ 4)$R^2 = h_1h_2$

28. **Two masses m_1 and m_2 are connected by a string passing over pulley. When set free, m_1 moves downwards by 1.4m in 2 seconds. The ratio between $m_1$and m_2 is**

1)9 : 7 2)11:9 3)13:11 4)15:13

29. **A block slides down a rough inclined plane of slope angle θ with a constant velocity. It is then projected up the same plane with an initial velocity V , then the distance travelled by the block up the plane before coming to rest is**

1) $\frac{V^2}{4g\sin\theta}$ 2) $\frac{V^2}{2g\sin\theta}$ 3) $\frac{V^2}{g\sin\theta}$ 4) $\frac{4V^2}{g\sin\theta}$

30. **A body of mass 1 kg is acted upon by a force $F = 6t^2 - 2$ newton. The impulse acting on the body from t = 0 second to t = 2 seconds.**

1) 10 Ns 2) 12 Ns 3) 14 Ns 4)16Ns

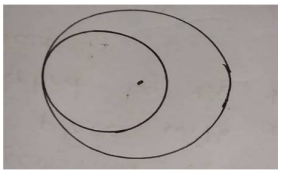
31. **A force acts on a 2kg object so that its position is given as a function of time as $x = 3t^2 + 5$. What is the work done by this force in first 5 seconds?**

1) 850 J 2) 900J 3) 875 J 4) 950J

32. **A plastic ball falling from a height of 19.6 m rebounds numbers of times. If total time for second collision is 4 seconds, then co – efficient of restitution is**

1) 0.1 2)0.3 3)0.5 4)0.7

33. **From a uniform circular disc of radius R, a disc of radius R/2 is removed as shown. Then the distance of centre of mass of the remaining part from the center of mass of the original disc is**



1) $\frac{R}{6}$ 2) $\frac{R}{8}$ 3) $\frac{R}{4}$ 4) $\frac{R}{3}$

34. **A wheel of moment of inertia 30 kgm^2 is making 20 rev/min. The torque required to stop it in 10 seconds is**

1)3.14 N-m 2)6.28 N-m 3)1.57N-m 4) 4 N-m

35. **If translatory K.E of a rolling solid sphere is 35J then its total Kinetic energy is**

1) 42J 2)49 J 3)56J 4)63 J

36. **A pendulum clock runs fast by 5 seconds per day at 20^{0}C and goes slow by 10 seconds per day at 35^{0}C. It shows correct time at a temperature of**

1)27.5^{0}C 2)25^{0}C 3)30^{0}C 4)33^{0}C

37. **a body takes 10 minutes to cool from 60^{0}C to 50^{0}C. The temperature of surroundings is constant at 25^{0}C. Then, the temperature of the body after next 10 minutes will be approximately.**

1)47^{0}C 2)43^{0}C 3)41^{0}C 4)45^{0}C

38. **A Carnot engine takes in 3000 Kcal of heat form a reservoir at 627^{0}C and gives it to a sink at 27^{0}C. The work done by the engine is**

1) 4.2 x 10^6 J 2) 8.4 x 10^6 J 3)16.8 x 10^6 J 4) zero

39. **1/2 mole of helium gas is contained in a container at S.T.P. The heat energy needed in cal to double the pressure of the gas keeping the volume constant is (R=2 cal mol^{-1}K^{-1})**

1)3276 2)1683 3)918 4)409.5

40. **One mole of mono atomic gas at 27^{0}C is mixed with three moles of mono atomic gas at 127^{0}C. If there is no exchange of heat with the atmosphere, then the final temperature will be**

1)102^{0}C 2)170^{0}C 3)375^{0}C 4)423^{0}C

41. **A particle of mass 10 grams is kept on the surface of a uniform sphere of mass 100kg and radius 10cm. Find the work done against the gravitational force between them to take the particle for away from the sphere.**

1)13.34 x10^{-10}J 2)3.33 x 10^{-10}J 3)6.67 x 10^{-9} J 4)6.67 x 10^{-10}J

42. **A catapult consists of two parallel rubber strings, each of length 10cm and cross – sectional area 10mm^2. When stretched by 5 cm, it can throw a stone of mass 100 grams to a vertical height of 25m. the Young's modulus of rubber is**

1) 9.8 x 10^7 N/m^2 2)9.8 x 10^8 N/m^2 3)9.8 x 10^9 N/m^2 4) 9.8 x 10^{10} N/m^2

43. **A large wooden piece in the form of a cylinder floats on water with two – thirds of its length immersed. When a man stands on its upper surface, a further one – sixth of its length is immersed. The ratio of masses of man and the wooden piece is**

1) 1:2 2) 1:3 3)1:4 4)1:5

44. **A particle executing SHM oscillates between two fixed points separated by 20cm. If its maximum velocity is 40 cm/s, then find its velocity when its displacement is 5cm from its mean position.**

1) $20\sqrt{3}$ m/s 2)20 m/s 3) $20\sqrt{3}$ cm/s 4)20 cm/s

45. The distance covered by a body in time $(5 \pm 0.6)s$ is $(40 \pm 0.4)m$. The percentage error in the speed is

1)8% 2)10% 3)12% 4)13%

SECTION- II

(Numerical Value Answer Type)

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46. A ball is thrown from the top of a building 45 m high with a speed of 20 ms^{-1} above the horizontal at an angle of 30^0. The speed of the ball in ms^{-1} just before it touches the ground is _____[g = 10ms^{-2} and take $\sqrt{13} = 3.605$]

47. A simple pendulum of length 4.9m is immersed in a liquid of density 0.4 kg/m3. If the density of bob is 0.8 kg/m^3, then the time period of oscillation in seconds is_____

48. A small air bubble of 0.1 mm diameter is formed just below the surface of water. If surface tension of water is 0.072 Nm^{-1}, then the pressure in side the air bubble in kilo pascal is _____[Atmospheric pressure = 1.01 x 10^5 pa]

49. When an air bubble of radius 'r' rises from the bottom to the surface of a lake, its radius becomes 5r / 4 [the pressure of the atmosphere is equal to the 10m height of water column]. If the temperature is constant and the surface tension is neglected, the depth of the lake in meters is _____

50. A boatsman finds that he can save 6 seconds in crossing a river by quicker path, then by shortest path. If the velocity of boat and river be respectively 17 m/s and 8m/s, then river width in meters is _____

SECTION – I

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CHEMISTRY

51. The radius of the second Bohr orbit for hydrogen atom is : [plank's constant h = 6.626 x 10^{-34} JS; mass of electron = 9.1091x10^{-31} kg; charge of electron e = 1.60210x 10^{-19}C, permittivity of vaccum $\in_0$ = 8.85x10^{-12} kg^{-1} m^{-3} A^2)

1)2.12A^0 2)1.65A^0 3)4.76A^0 4)0.529A^0

52. If the de – Broglie wavelength of the electron in n^{th} Bohr orbit in a hydrogenic atom is equal to 1.5 πa_0 [a_0 is Bohr radius] , then the value of $\frac{n}{z}$ is :

1)1.0 2)0.40 3)0.75 4)1.50

53. The correct order of electron affinity is

1)0>F>Cl 2)F>0>Cl 3)Cl>F>0 4)F>Cl>0

54. Bond order and magnetic nature of CN^- are respectively

1)3, diamagnetic 2)3, paramagnetic

3)2.5, paramagnetic 4)2.5, diamagnetic

55. Which of the following molecule has two sigma (σ) and two pi ((π) bonds?

1) C_2H_4 2) N_2F_2 3) $C_2H_2Cl_2$ 4) HCN

56. Among the following which is a redox reaction

1) $N_2 + O_2 \xrightarrow{2000K}$ 2) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

3)Reaction between $NaOH$ and H_2SO_4 4)Reaction between H_2SO_4 and $NaCl$

57. Oxidation number of 'K' in K_2O, K_2O_2 and KO_2 respectively is

1)+1, +2 and +4 2)+1, +4 and +2 3)+1, +1 and +1 4)+2, +1 and $+\frac{1}{2}$

58. A compound (A: $B_3N_3H_3Cl_3$) reacts with $LiBH_4$ to form inorganic benzene (B). (A) reacts with (C) to form $B_3N_3H_3(CH_3)_3$ (B) and (C) are respectively.

1)Boron nitride, MeMgBr 2)Boron nitride, MeBr

3)Borazine, MeBr 4)Borazine, MeMgBr

59. No. of SP^2 hybrid orbitals in benzene is

1)18 2)24 3)6 4)12

60. If Z is a compressibility factor, vanderwaal's equation at moderate pressure can be written as:

1) $Z = 1 + \frac{RT}{pb}$ 2) $Z = 1 - \frac{a}{VRT}$ 3) $Z = 1 - \frac{pb}{RT}$ 4) $Z = 1 + \frac{pb}{RT}$

61. Experimentally it was found that a metal oxide has formula $M_{0.98}0$. Metal M, is present as M^{+2} and M^{+3} in its oxide. Fraction of the metal which exits as M^{+3} would be:

1)4.08% 2)6.05% 3)5.08% 4)7.01%

62. What will be the value of ΔG^0, if equilibrium constant for a reaction is 10

1) -50.44 KJ mol^{-1} 2)-57.44 KJ mol^{-1} 3)-25.44 KJ mol^{-1} 4)-10KJ mol^{-1}

63. Which of the following conditions in drinking water causes blue baby syndrome

1)>100 ppm of sulphate 2)>50 ppm of lead

3)>50 ppm of nitrate 4)>50 ppm of chloride

64. The chloride that cannot get hydrolysed in

1) $PbCl_4$ 2)$SiCl_4$ 3)CCl_4 4)$SnCl_4$

65. The chemical nature of hydrogen peroxide is

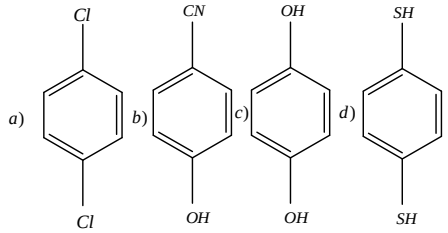
1)oxidizing agent in acidic medium, but not in basic medium

2)Oxidising and reducing agent in both acidic and basic medium

3)Reducing agent in basic medium, but not in acidic medium

4)oxidizing and reducing agent in acidic medium but not in basic medium.

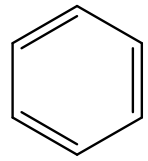
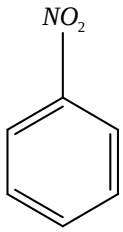
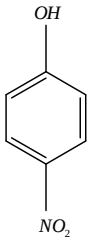
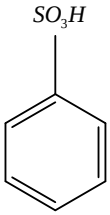
66. For which of the following molecule $\mu \neq 0$?



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

67. Identify 'D' in the following sequence of reaction

ethylene $\xrightarrow{Br_2/CCl_4}$ A $\xrightarrow[(2)\,NaNH_2]{(1)\,Alc.KOH}$ B $\xrightarrow[metaltube]{Hot}$ C $\xrightarrow[Conc.H_2SO_4\,60^0C]{Conc.HNO_3}$ D

1)  2)  3)  4) 

68. Which of the following is not aromatic ?

1)Cyclopenta dienyl anion 2)Benzene

3)Cyclopenta dienyl cation 3) cycloheptatrienyl cation

69. In which of the following reactions alkane is not formed ?

1) $CH_3Br \xrightarrow[\text{dry ether}]{Na}$ 2) $CH_3COONa \xrightarrow[\Delta]{NaOH/CaO}$

3) $CH_3COONa \xrightarrow[Electrolysis]{H_2O}$ 4) $BrCH_2-CH_2Br \xrightarrow[\Delta]{alc.KOH}$

70. The increasing order of nucleophilicity of the following nucleophiles is

a) CH_3COO^- b) H_2O c) $CH_3SO_3^-$ d) OH^-

1)a<d<c<b 2)b<c<d<a 3)d<a<c<b 4)b<c<a<d

SECTION-II

(Numerical Value Answer Type)

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71. The Pk_a of a weak acid (HA) is 4.5. the P^{OH} of an aqueous buffer solution of HA in which 50% of the acid is ionized is _____

72. Haemoglobin contains 0.33%. iron [Fe = 56]. The molecular weight of haemoglobin is 68000. The number of iron atoms in one molecule of haemoglobin is _____.

73. Total number of acyclic isomers possible for molecular formula C_4H_6 is __

74. Total number of orbitals associated with the principal quantum number n = 3 ___

75. Oxidation number of sulphur in tetrathionate ion is_____

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HYDERABAD

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Time: 3 Hours		**Max. Marks: 300**

KEY SHEET

MATHEMATICS

1) **C**	2) **D**	3) **D**	4) **C**	5) **B**	6) **B**	7) **C**	8) **C**	9) **B**	10) **A**
11) **A**	12) **C**	13) **A**	14) **B**	15) **C**	16) **B**	17) **B**	18) **C**	19) **A**	20) **A**
21) **-1.25**	22) **2.25**	23) **57.50**	24) **7**	25) **12**					

PHYSICS

26) **C**	27) **B**	28) **D**	29) **A**	30) **B**	31) **B**	32) **C**	33) **A**	34) **B**	35) **B**
36) **B**	37) **B**	38) **B**	39) **D**	40) **A**	41) **D**	42) **A**	43) **C**	44) **C**	45) **D**
46) **36.05**	47) **6.28**	48) **103.88**	49) **9.53**	50) **765.000**					

CHEMISTRY

51) **A**	52) **C**	53) **C**	54) **A**	55) **D**	56) **A**	57) **C**	58) **D**	59) **A**	60) **B**
61) **A**	62) **B**	63) **C**	64) **C**	65) **B**	66) **D**	67) **B**	68) **C**	69) **D**	70) **D**
71) **9.5**	72) **4**	73) **4**	74) **9**	75) **2.5**					

HINTS & SOLUTIONS
MATHS

1. $f(x+y)=f(x)+f(y)+xy$

$\Rightarrow (2a-1)xy-c=0\forall x,y\in R$

$\Rightarrow a=\frac{1}{2},c=0\Rightarrow b=\frac{5}{2}$

$f(x)=\frac{1}{2}x^2+\frac{5}{2}x$

$\Rightarrow \sum_{n=1}^{10} f(n)=\frac{1}{2}\sum_{n=1}^{10}n^2+\frac{5}{2}\sum_{n=1}^{10}n$

$=\frac{1}{2}\left[\frac{10 \text{ x } 11 \text{ x } 21}{6}\right]+\frac{5}{2}\left[\frac{10 \text{ x } 11}{2}\right]$

$=\frac{385}{2}+\frac{275}{2}=\frac{660}{2}=330$

2. $f(3^{10}.x-1)=x$

$2^{10}(3^{10}.x-1)+1=x$

$2^{10}.3^{10}.x-2^{10}+1=x$

$x\left[2^{10}.3^{10}-1\right]=2^{10}-1$

$x=\frac{2^{10}-1}{2^{10}.3^{10}-1}=\frac{1-2^{-10}}{3^{10}-2^{-10}}$

3. $(A-3I)(A-5I)=0$

$A^2-8A+15I=0$

$A-8I+15A^{-1}=0$

$\Rightarrow A+15A^{-1}=8I$

$\Rightarrow \frac{1}{2}A+\frac{15}{2}A^{-1}=4I$

$\alpha+\beta=\frac{1}{2}+\frac{15}{2}=8$

4. $|A|=\pm 1,\ |adj2A|=|2A|^{n-1}=\left[2^n|A|\right]^{n-1}$

$=\left[2^3(\pm 1)\right]^2=64$

5. Put $\tan^2 x=t$

$5\left(t-\frac{1}{1+t}\right)=2\left(\frac{1-t}{1+t}\right)+9$

$5\left[\frac{t+t^2-1}{1+t}\right]=\frac{2-2t+9+9t}{1+t}$

$5t^2+5t-5=7t+11$

$5t^2-2t-16=0$

$5t^2-10t+8t-16=0$

$5t(t-2)+8(t-2)=0\Rightarrow \tan^2 x=2$

$\cos 2x=\frac{1-2}{1+2}=\frac{-1}{3}\Rightarrow \cos 4x=2\left(\frac{1}{9}\right)-1=\frac{-7}{9}$

6. $\sin^2 2\theta+(1-\sin^2 2\theta)^2=\frac{3}{4}$

$\sin^2 2\theta+1+\sin^4 2\theta-2\sin^2 2\theta=\frac{3}{4}$

$4\sin^4 2\theta-4\sin^2 2\theta+1=0\Rightarrow (2\sin^2 2\theta-1)^2=0$

$\Rightarrow \sin^2 2\theta=\frac{1}{2}\Rightarrow \sin 2\theta=\pm\frac{1}{\sqrt{2}}$

$\Rightarrow 2\theta=\frac{\pi}{4},\frac{3\pi}{4},\Rightarrow \theta=\frac{\pi}{8},\frac{3\pi}{8}$

$\Rightarrow$ sum of all values = $\frac{\pi}{8}+\frac{3\pi}{8}=\frac{\pi}{2}$

7. From graph of $\sin^{-1}(\sin x)$

8. $(a^2+b^2-c^2)^2-a^2b^2=0$

$a^2+b^2-c^2=\pm ab$

We have

$\cos c=\frac{a^2+b^2-c^2}{2ab}=\frac{\pm ab}{2ab}=\pm\frac{1}{2}$

$\Rightarrow c=60^0$

9. $\vec{a}=\lambda(6\hat{i}-8\hat{j}-\frac{15}{2}\hat{k})$

$\Rightarrow \sqrt{36\lambda^2+64\lambda^2+\frac{225}{4}\lambda^2}=50$

$\frac{25}{2}\lambda=\pm 50\Rightarrow \lambda=\pm 4$

$\Rightarrow \vec{a}=\pm 4(6\hat{i}-8\hat{j}-\frac{15}{2}\hat{k})$

But $\vec{a}$ makes acute angle with z axis

$\Rightarrow \vec{a}=-4\bar{b}$

10. $\sin(2e^x)=2^x+2^{-x}$

But $2^x + 2^{-x} \geq 2 \Rightarrow$ no solution.

11. $c = \frac{4}{5}$, slope of 5x + 2y + 7 = 0 is $\frac{-5}{2}$

Req. line slope = $\frac{2}{5}$

Equation of line $y = \frac{2}{5}x + \frac{4}{5}$

12. $m_1 = \frac{2+2}{3-1} = 2$

$m_2 = \frac{-1}{2}$

$m_1 m_2 = -1$

13.

$l = |y_1 - y_2| = 1$

$m = \sqrt{(x_1 - x_2)^2 + (z_1 - z_2)^2} = \sqrt{16+9} = 5$

$3l^2 - m + 1 = 3 - 5 + 1 = -1$

14. angle bisector

$\frac{2x - y + 2z - 4}{3} = \pm \frac{x + 2y + 2z - 2}{3}$

$x - 3y = 2, 3x + y + 4z = 6$

15. a point on given line

$(1 + 2\lambda, -1 + 3\lambda, 2 + 4\lambda)$

Substitute In plane

$1 + 2\lambda - 2 + 6\lambda + 6 + 12\lambda = 15$

$\lambda = \frac{1}{2}$

Point $(2, \frac{1}{2}, 4)$

Distance From origin =

$\sqrt{4 + \frac{1}{4} + 16} = \frac{9}{2}$

16. by L-H rule

$\underset{y \to x}{Lt} \frac{2 \sin y \cos y}{1} = \sin 2x$

17. 1.1! + 2.2.! + 3.3! + ……+ n.n! = (n+A)! -1

18. Differentiate w.r to x

$\frac{x}{\log x} \text{x } \frac{1}{x} + \log(\log x) - 2x + 2yy^1 = 0$

$\frac{1}{\log x} + \log_e (\log x) + 2yy^1 = 2x \ldots..(1)$

$x = e$ in given curve

$O - e^2 + y^2 = 4$

$y = \pm\sqrt{4 + e^2}$

Substitute in (1) $1 + 0 + 2yy^1 = 2e$

$y^1 = \frac{2e-1}{2y} = \frac{2e-1}{2\sqrt{4+e^2}}$

19. $y = xe^{x^2}$

$\frac{dy}{dx} = 2x^2 e^{x^2} + e^{x^2}$

Equation of tangent is

$y - e = 3e(x - 1)$

Which passes through $\left(\frac{4}{3}, 2e\right)$

20. $\frac{h^2}{4} + r^2 = 9$

$r^2 = 9 - \frac{h^2}{4}$

$V = \pi\left(9 - \frac{h^2}{4}\right)h$

$V^1 = 9\pi - \frac{3}{4}\pi h^2 = 0$

$3\pi\left(3 - \frac{1}{4}h^2\right) = 0$

$h = 2\sqrt{3}$.

21. Given $x^2 f(x) + f(1-x) = 2x - x^4$

$(1-x)^2 f(1-x) + f(x) = 2(1-x) - (1-x)^4$

By eliminating $f(1-x)$, we get

$f(x) = 1 - x^2 \Rightarrow f\left(\frac{3}{2}\right) = 1 - \frac{9}{4} = \frac{-5}{4} = -1.25$

22. $x + y = 5$
$x - y = 4$ $\Rightarrow x = \frac{9}{2}, y = \frac{1}{2}$

$f(5,4) = \left(\frac{9}{2}\right)\left(\frac{1}{2}\right) = \frac{9}{4} = 2.25$

23. $K = \sum_{n=1}^{20} \frac{\frac{n(n+1)}{2}}{n} = \frac{1}{2}[2 + 3 + 4 + ...21]$

$= \frac{1}{2}\left[\frac{21\text{x } 22}{2} - 1\right] = \frac{1}{2}(230) = 115$

$\frac{k}{2} = 57.50$

24. $f^{|}(x) = 3x^2 - 3(a-2).2x + 3a$;

$f^{|}(1)=0 \Rightarrow a=5$;

$$\frac{f(x)-14}{(x-1)^2}=\frac{x^3-9x^2+15x+7-14}{(x-1)^2}=0$$

$x-7=0$

$x=7$

PHYSICS

26 $v=\frac{dx}{dt}$

$a=\frac{dv}{dt}=0$

27. $R=\frac{u^2\sin 2\theta}{g}, h_1=\frac{u^2\sin^2\theta}{2g}$ and $h_2=\frac{u^2\cos^2\theta}{2g}$

28. $a=\frac{(m_1-m_2)g}{m_1+m_2}; s=\frac{1}{2}at^2$

$\mu=\tan\theta$

29. $v^2=u^2-2as$

$a=-g(\sin\theta+\mu\cos\theta)$

30. Impulse $=\int_0^t F.dt$

31.

$x=3t^2+5$

$v=\frac{dx}{dt}=6t$

At $t=0s, u=0$

At t= 5 s, v = 30 m/s

$w=\frac{1}{2}m[v^2-u^2]$

32. $t=\sqrt{\frac{2h}{g}}[1+2e]$

33. shift in cm = $\frac{m_1x_1-m_2x_2}{m_1-m_2}$

34. $T=I\alpha; \alpha=\frac{w_2-w_1}{t}$

35. Total K. E = $\frac{1}{2}mv^2\left[1+\frac{K^2}{R^2}\right]$

25.

$$\frac{2c^2}{|ab|}=\frac{2\text{x}36}{2\text{x}3}=12$$

36.

$5=\frac{1}{2}\alpha[t-20].....(1)$

$10=\frac{1}{2}\alpha[35-t].....(2)$

From (1) and (2), t = 25^0C

37. $\frac{\theta_1-\theta_2}{t}=K\left[\frac{\theta_1+\theta_2}{2}-\theta_5\right]$

38. $\eta=\frac{W}{Q}=1-\frac{T_2}{T_1}$

39. $du=nC_vdT$

40. Resultant temperature = $\frac{n_1Cv_2T_1+n_2Cv_2T_2}{n_1Cv_1+n2Cv_2}$

41. $W=\frac{GMm}{R}$

42. $U=\left[\frac{1}{2}\text{x stress x strain x volume}\right]\text{x2}$

U = mgh

43. weight of floating body

Mg = Veg

44. $V_{\max}=AW$

$V=w\sqrt{A^2-x^2}$

$A=10cm$

45. $\frac{\Delta v}{v}=\left[\frac{\Delta s}{s}+\frac{\Delta t}{t}\right]$ x 100%

46. $V=\sqrt{V_x^2+V_y^2}$

$V_x=u\cos\theta 3$

$V_y=u\sin\theta-gt$

47. T = $2\pi\sqrt{\frac{1}{g\left[1-\frac{p}{\sigma}\right]}}$

48. $P=P_0+\frac{2T}{r}$

49. $P_1V_1=P_2V_2$

50. $t_1=\frac{W}{V_b}$

$t_2=\frac{W}{\sqrt{V_b^2-v_R^2}}$

$t_2 - t_1 = 6$

CHEMISTRY

51. $r_n = 0.529 \times n^2 A^0$ or $r_n = 0.53 \times n^2 A^0$
$= 0.53 \times 2^2 A^0$
$r_n = 2.12 A^0$

52. $2\pi r = n\lambda, 2\pi a_0 \frac{n^2}{z} = n\lambda$

$2\pi A_0 = \frac{n^2}{z} = n.1.5\pi a_0$

$\frac{n}{z} = \frac{1.5}{2} = \frac{3}{4} = 0.75$

53. Due to small size and more inter electronic repulsions, EA of fluorine is less
than chlorine.

54. In CN^-, total no. of electrons = 14, then Bond order = 3
Filling in molecular orbitals
$^{\sigma}15^{2\sigma}15^{2\sigma}25^{2\sigma}25^2\pi 2P_x^2 = \pi 2P_y^2 \sigma 2P_z^2$

$B.O = \frac{Nb - Na}{2} = \frac{10-4}{2} = 3$

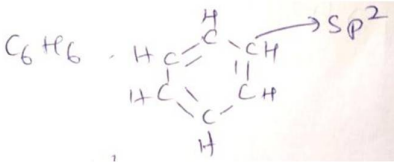
It is diamagnetic.

55. $H - C \equiv N$ has 2 σ & 2π bonds

56. (1) $N_2^0 + O_2^0 \xrightarrow{2000k} 2N^{+2}O^{-2}$ in 2, 3, 4 there is no change in the oxidation states of elements.

57. K belongs to IA group it's common oxidation state is +1. Only.

58. $B_3N_3H_3Cl_3 + LiBH_4 \rightarrow B_3N_3H_6 = LiCl + BCl_3$
$B_3N_3H_3Cl_3 + MeMgBr \rightarrow B_3N_3H_3(CH_3)_3 + MgBrCl$

59. 

Each 'c' forms 3 Sp^2 hybrid orbitals
$\therefore$ 6c x 3 = 18 H.O

60. $\left(P + \frac{a}{v^2}\right)(v - b) = RT$
At low pressure
$\left(P + \frac{a}{v^2}\right) \text{x} v = RT$

$Pv + \frac{a}{v} = RT$

$\frac{PV}{RT} + \frac{a}{VRT} = 1 \Rightarrow z + \frac{a}{VRT} = 1$

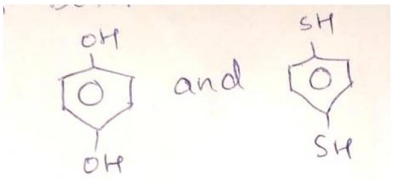
61. Metal oxide = $M_{0.98}O$
If 'x' ions of M are in +3 state, then
$3x + (0.98 - x)x\ 2 = 2$
$X = 0.04$
$\therefore$ the percentage of metal in +3 state would be $= \frac{0.04}{0.98} \text{x} 100 = 4.08\%$

62. $\Delta G = -2.303RT \log K$
$= 2.303 \text{ X } 8.314 \text{ x } 10^{-3} \text{ x } 300$
log 10
Δ G = -57.44 Kj/mol

63. If NO_3^- is >50 ppm then it causes blue baby syndrome

64. 'C' in CCl_4 does not have vacant orbital required for hydrolysis.

65. H_2O_2 is oxidizing agent as well as reducing agent in both acidic and basic medium.

66. 

Are non planar molecules

67. $C_2H_4 \xrightarrow{Br_2/CCl_4} C_2H_4Br_2 \xrightarrow[(2)\,NaNH_2]{(1)\,Alc.KOH}$
$C_2H_2 \xrightarrow[\text{metal tube}]{hot} C_6H_6 \xrightarrow[ConC.HNO_3\,60^0C]{ConC.H_2SO_4} C_6H_5NO_2$

68. 
It does not follows Huckel's rule
4n+2 = No. of πe^-
4n = 2 = 4 $\Rightarrow$ 4n =2 $n = \frac{2}{4} = 0.5$

69. Alc. KOH is dehydrohalogenating agent

70. $H_2O < CH_3SO_3^- < CH_3COO- < OH^-$
lone pair donating tendency on oxygen is reduced nucleophilicity reduced.

71. $P^H = P^{Ka} + \log \frac{[salt]}{[Acid]}$

$P^{Ka} = 4.5$

As acid is 50% ionized

[salt] = [acid]

$P^{OH} = 14 - 4.5 = 9.5$

72. For 100 parts - 0.33 gm of Fe

68000 parts - ?

$\frac{68000}{100} \times 0.33 = 224.4$ gm of Fe.

56gm is the wt of 1 Fe atom

224 gm is the wt of 4 Fe atoms.

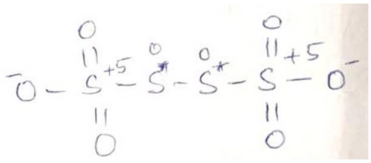
73. The total no. of acyclic isomers of C_4H_6 are 4

(1) $CH_2 = CH\text{-}CH{=}CH_2$ (2) $CH_2 = C{=} CH - CH_3$

(3) $CH \equiv C\text{-}\ CH_2 {-}CH_3$ (4) $CH_3 - C \equiv C\text{-}CH_3$

74. Number of orbitals = $n^2 = 3^2 = 9$

75. Tetrathionate ion is $S_4O_6^{-2}$



Average of four oxidation number of sulphurs of the $S_4O_6^{-2}$ is