MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **BITSAT MODEL** | **Date: 24-04-2020**

Time: 3 Hours | **Max. Marks: 450**

PHYSICS

SYLLABUS: Newton's laws of motion, friction, system of particulars and rotation motion

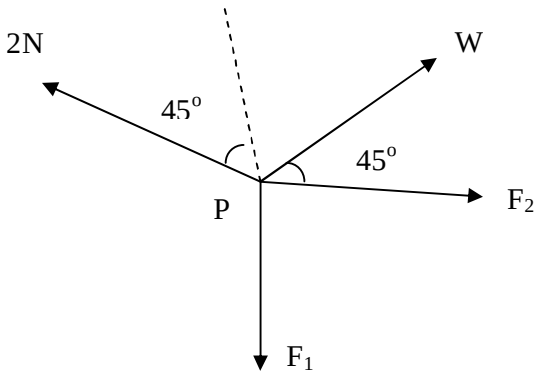
1. **A particle is moving along straight line with initial velocity +7 m/s and uniform acceleration $-2m/s^2$. The distance travelled by the particle in 4th second of its motion is**

1) Zero 2) 0.25m 3) 0.5m 4) 7m

2. **Two particle A and B thrown with speeds in the ratio $1:\sqrt{2}$ acquired same heights. If A is thrown at an angle 45^0 with the horizontal, the angle of projection of B will be**

1) 0^0 2) 60^0 3) 30^0 4) 45^0

3. **There are four forces acting at point 'P produced by strings as shown in figure which is at rest. The forces F_1 and F_2 (in N) are**

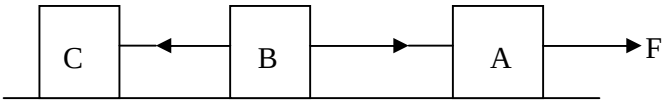


1) $\frac{1}{\sqrt{2}},\frac{3}{\sqrt{2}}$ 2) 1,3 3) $\sqrt{2},3\sqrt{2}$ 4) $\frac{3}{\sqrt{2}},\frac{1}{\sqrt{2}}$

4. **A shell of mass 0.01 kg is forced by a gun of mass 10kg. if the muzzle speed of the shell is 50m/sec. what is the recoil speed of the gun?**

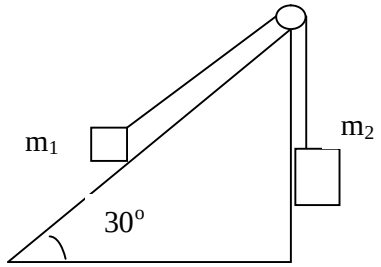
1) 0.05 m/sec 2) 0.025 m/sec 3) 0.125 m/s 4) 0.50 m/s

5. **Three identical blocks of masses $m = 2$ kg are drawn by a force $F = 10.2N$ on a frictionless surface. What is the tension (in N) in the string between the block B and C?**



1) 9.2 2) 3.4 3) 4 4) 9.8

6. **A block of mass $m_1 = 4kg$ lying on a plane inclined at an angle of 30^0, is connected to another freely suspended block of mass $m_2 = 6kg$ with the help of a string passing over a smooth pulley as shown in fig. The acceleration of each block is ($g = 10m/s^2$)**

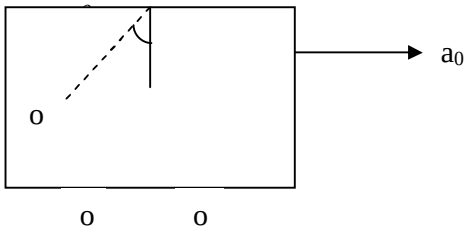


1) $8m/s^2$ 2) $5m/s^2$ 3) $4m/s^2$ 4) $1m/s^2$

7. A person of mass 60kg in a lift. The change in the apparent weight of the person when the lisf moves up with an acceleration of $2m/s^2$ and then down with an acceleration of $2m/s^2$ is ?

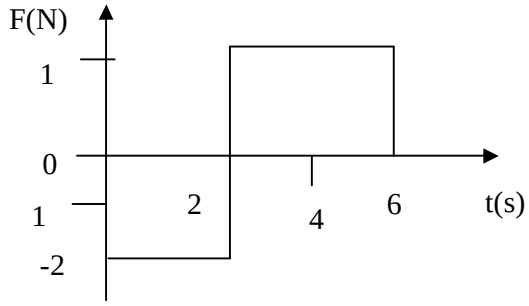
1) 120 N 2) 240 N 3) 480 N 4) 720 N

8. A pendulum is hanging from the celling of a car having an acceleration of a car having an acceleration a_0 with respect to the road. Find the tension in the string in this position



1) $\sqrt{a_0^2+g^2}$ 2) $m\sqrt{a_0^2+g^2}$ 3) mg 4) ma_0

9. A force time graph for the motion of body is as shown in a figure. Change in linear momentum between 0 and 6 sec is



1) Zero 2) 8 Ns 3) 4 Ns 4) 2 Ns

10. A uniform chain of length 'L' hangs partly from a table which is kept in equilibrium by friction. The maximum length that can stand without slipping is 'l', the coefficient of friction between the table and the chain is?

1) $\frac{l^2}{L-l}$ 2) $\frac{l}{L-l}$ 3) $\frac{l}{L+l}$ 4) $\frac{L-l}{l}$

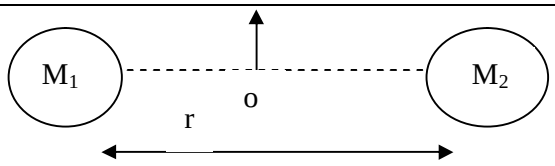
11. A space craft of mass 2000kg moving with a velocity of 600 m/s suddenly explodes in to two pieces one piece of mass 500kg is left stationary. The velocity of other part must be?

1) 600m/s 2) 800 m/s 3) 1500 m/s 4) 1000 m/s

12. A particle is in SHM with an amplitude of 10cm. when it is at 6cm from mean position magnitude of its velocity is equal to that its acceleration. The frequency of oscillations is _____ (H_z)

1) $\frac{3}{4\pi}$ 2) $\frac{2}{3\pi}$ 3) $\frac{3}{7\pi}$ 4) $\frac{8}{3\pi}$

13. Two stars of masses M_1 and M_2 are separated by a distance r. A meteorite of mass m from their center of mass position O, was projected to escape the gravity field of two stars system. The minimum speed of projection is



1) $\sqrt{\frac{2GM_1M_2}{r(M_1+M_2)}}$ 2) $\sqrt{\frac{2GM_1M_2}{r}}$

3) $\sqrt{\frac{2G(M_1-M_2)}{rM_1}}$ 4) $\sqrt{\frac{2G(M_1+M_2)(M_1^2+M_2^2)}{rM_1M_2}}$

14. A body of mass M hits normally a rigid wall velocity V and bounces back with the same velocity. The impulse experienced by the body

1) MV 2) 1.5MV 3) 2MV 4) Zero

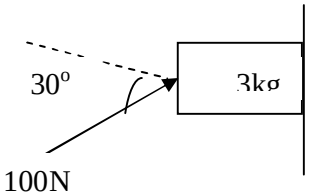
15. A car of mass 1000kg negotiation a banked curve of radius 9m on a frictionless road. If the banking angle is 45^0, the speed of the car is

1) 20 m/s 2) 3 m/s 3) 5 m/s 4) 10 m/s

16. The upper half of an inclined plane of inclination 'θ' is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower of the plane is given by

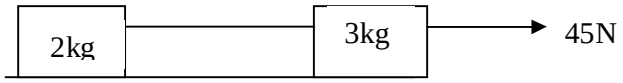
1) $\mu = 2\tan\theta$ 2) $\mu = \tan\theta$ 3) $\mu = \frac{1}{\tan\theta}$ 4) $\mu = \frac{2}{\tan\theta}$

17. A force of 100N is applied on a block of mass 3kg as shown in the figure the coefficient of friction between the surface and the block is $\mu = \frac{1}{\sqrt{3}}$. The frictional force acting on the block is?



1) 15N downwards 2) 25N upwards 3) 50N downwards 4) 30N upwards

18. Two blocks of masses 2kg and 3kg are connected by a light string as shown in the figure and placed on a horizontal surface μ between all surfaces is 0.1 and $g = 10m/s^2$. The acceleration of the system is when force applied F= 45N

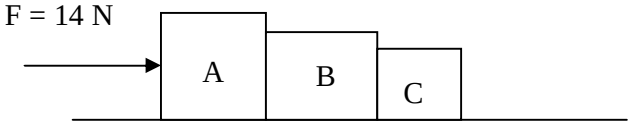


1) $8m/s^2$ 2) $6m/s^2$ 3) $10m/s^2$ 4) $4m/s^2$

19. A block is released from top of a smooth inclined plane. It reaches the bottom of the plane is 6sec. the time taken by the body to cover the first half of the inclined plane is?

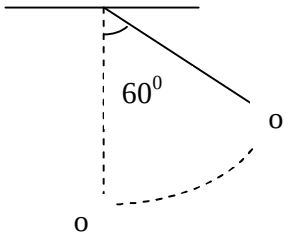
1) 3sec 2) 4sec 3) $3\sqrt{2}$ sec 4) 5sec

20. Three blocks A, B and C of masses 4kg, 2kg and 1kg respectively are in contact on a frictionless surface, as shown. If a force of 14N is applied on the 4kg block then the concact force between A and B is



1) 8N 2) 18N 3) 2N 4) 6N

21. A simple pendulum of length $l = 1m$ is deflected from $\theta = 60^0$. The rate change of speed of the bob at $\theta = 30^0$ is $\left(g = 10m/s^2\right)$



1) $5\sqrt{3}m/s^2$ 2) $5m/s^2$ 3) $10m/s^2$ 4) $2.5m/s^2$

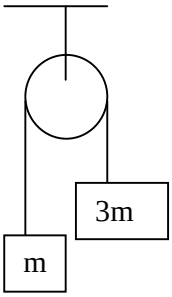
22. A body under the action of a force $\vec{F} = 6\hat{i} - 8\hat{i} + 10\hat{k}$ acquires an acceleration of $1m/s^2$. The mass of this body must be?

1) 10kg 2) 20 kg 3) $10\sqrt{2}kg$ 4) $2\sqrt{10}kg$

23. An open organ pipe has fundamental frequency $2KH_z$. The number of over tons that can be directly head by a person (A person can here the highest frequency up to 20000 H_z)

1) 9 2) 10 3) 7 4) 4

24. Two masses 3m and m are suspended from a light friction less pulley with the help of a massless string. If the system is set force the acceleration of center of mass will be

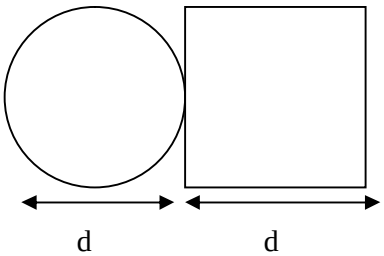


1) g 2) $\frac{g}{2}$ 3) $\frac{g}{4}$ 4) None of these

25. A sphere rolls down on an inclined plane of inclination 'θ'. What is the acceleration as the sphere reaches bottom?

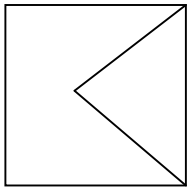
1) $\frac{7}{5}g\sin\theta$ 2) $\frac{3}{5}g\sin\theta$ 3) $\frac{5}{7}g\tan\theta$ 4) $\frac{2}{5}g\tan\theta$

26. A circular plate of diameter 'd' and square plate of side 'd' are placed as shown in figure centre of mass of this combination from the centre of disc is (both having same density)



1) $\frac{4d}{4+\pi}$ 2) $\frac{4d}{3+\pi}$ 3) $\frac{2d+3\pi}{4+\pi}$ 4) $\frac{3d+7\pi}{4+\pi}$

27. When a triangular portion is removed from one edge of a square plate of side 'a' as shown in figure then shift in centre of mass is ?



a

1) $\frac{a}{6}$ 2) $\frac{a}{9}$ 3) $\frac{a}{3}$ 4) $\frac{9}{a}$

28. When a train is approaching the observer the frequency of the whislle is 100 eps while when it has passed the observer, it is 50 eps calculate the frequency when the observer moves with train

1) $44.47H_z$ 2) $55.57H_z$ 3) $66.67H_z$ 4) $77.77H_z$

29. If linear density of rod of length 3m varies as $\lambda = 2 + x$ then the position of the centre of gravity of the rod is?

1) $\frac{7}{3}m$ 2) $\frac{12}{7}m$ 3) $\frac{10}{7}m$ 4) $\frac{9}{7}m$

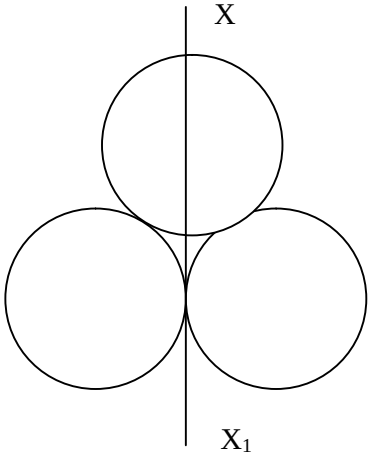
30. The centre of mass of three particle of masses 1kg, 2kg, 3kg is at (3, 3, 3) with reference to a fixed coordinate system where should a fourth particle of mass 4kg be placed so that centre of mass of the system of particle shifted to a point (1, 1, 1)

1) (-1, -1, -1) 2) (-2, -2, -2) 3) (2, 2, 2) 4) (1, 1, 1)

31. What is the linear velocity if $w = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\bar{r} = 5\hat{i} - 6\hat{i} + 6\hat{k}$

1) $6\hat{i} + 2\hat{i} - 3\hat{k}$ 2) $-18\hat{i} - 13\hat{i} + 2\hat{k}$ 3) $4\hat{i} - 13\hat{i} + 6\hat{k}$ 4) $6\hat{i} - 2\hat{i} + 8\hat{k}$

32. Three identical spherical shells, each of mass m and radius r are placed as shown infigure. Consider an axis XX^1 which is touching to two shells and passing through diameter of third shell. Moment of inertia of the system consisting of the three spherical shell about XX^1 axis is

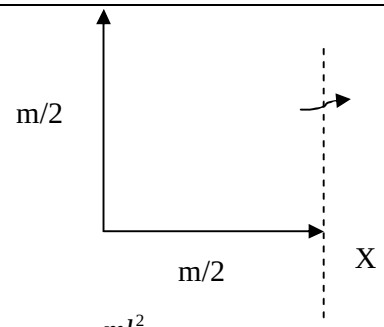


1) $4mr^2$ 2) $\frac{11}{5}mr^2$ 3) $3mr^2$ 4) $\frac{16}{5}mr^2$

33. Three rods each of length L and mass M are placed along x, y and z axes in such a way that one end of each of the rod is the at the origin. The moment of inertia of this system about x-axis is

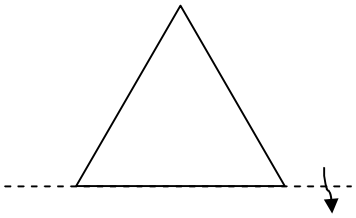
1) $\frac{2ML^2}{3}$ 2) $\frac{4ML^2}{3}$ 3) $\frac{5ML^2}{3}$ 4) $\frac{ML^2}{3}$

34. A uniform rod of mass m and length 'l' is bent into shape of L. it is moment of inertia about the axis shown in figure



1) $\frac{ml^2}{6}$ 2) $\frac{ml^2}{3}$ 3) $\frac{ml^2}{2}$ 4) None

35. Three point masses each of mass m are placed at cornors of an equilateral triangle of side l then the moment of inertia of this system about an axis along one side of the triangle is?



1) ml^2 2) $3ml^2$ 3) $\frac{3}{4}ml^2$ 4) $\frac{2}{3}ml^2$

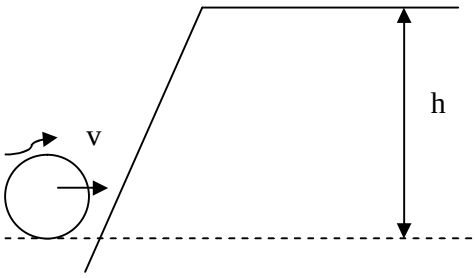
36. A particle of mass m is projected at t = 0 from origin with a speed v_0 at an angle 45^0 to horizontal. The magnitude of angular momentum of the particle about point of projection when it is at maximum height

1) $\frac{mv_0^3}{4\sqrt{2}g}$ 2) $\frac{mv_0^3}{2g}$ 3) $\frac{mv_0^3}{\sqrt{2}g}$ 4) 0

37. The M.I of a uniform rod about a perpendicular axis passing through one end is I_1. The same rod is bent into a ring and its M.I about a diameter I_2. Then $\frac{I_1}{I_2}$ is?

1) $\frac{\pi^2}{3}$ 2) $\frac{2\pi^2}{3}$ 3) $\frac{4\pi^2}{3}$ 4) $\frac{8\pi^2}{3}$

38. A solid sphere is rolling on a friction less surface shown in figure with a translational velocity V m/s. if the sphere climbs up to height 'h' then value of 'V; should be?



1) $\sqrt{\frac{10gh}{7}}$ 2) $\sqrt{2gh}$ 3) $2gh$ 4) $\frac{10}{\sqrt{7}}gh$

39. On a smooth inclined plane a body of mass M attached between two springs. The other ends of the spring are fixed to firm supports. Each spring has force constant K fixed to firm support. Find the time period of oscilation of the body

1) $2\pi\sqrt{\frac{M}{K}}$ 2) $2\pi\sqrt{\frac{M}{2K}}$ 3) $2\pi\sqrt{\frac{M}{K}}$ 4) $2\pi\sqrt{\frac{M}{3K}}$

40. A satellite is revving in a circular orbit of radius 1000km around a plant with a speed 2km/s. find the acceleration due to gravity at that height?

1) $2m/s^2$ 2) $3m/s^2$ 3) $4m/s^2$ 4) $5m/s^2$

CHEMISTRY

SYLLABUS: First Year total Inorganic chemistry & Second Year total Inorganic chemistry

41. If the ionisation enthalpy and electron gain enthalpy of an element are 275 and $86K\ Cal\ ,mol^{-}$ respectively, then the electro regativity of the element on the pauling scale is

1) 2.8 2) 0.0 3) 4.0 4) 2.6

42. Which of the following does not contain any coordinate covalent bond?

1) NH_4Cl 2) $NaBF_4$ 3) $H_3O^{\oplus}$ 4) CO_3^{-2}

43. The correct order of strength of H – bond in the following compound

1) $H_2O > H_2O_2 > HF > H_2S$ 2) $HF > H_2O_2 > H_2O > H_2S$

3) $HF > H_2O > H_2S > H_2O_2$ 4) $HF > H_2O > H_2O_2 > H_2S$

44. How many resonance forms can be written for the nitrate ion, $\left(NO_3^-\right)$?

1) 1 2) 2 3) 3 4) 4

45. In an octahedral crystal field, the t2g orbitals are

1) Raised in energy by $0.4\Delta_0$ 2) Lowered in energy by $0.4\Delta_0$

3) Raised in energy by $0.6\Delta_0$ 4) Lowered in energy by $0.6\Delta_0$

46. Which of the following type of isomerism in not exhibited by $\left[CO\left(H_2O\right)_3\left(NH_3\right)_2\left(NO_3\right)\right]Br_2$?

1) Linkage isomerism 2) Ionization isomerism

3) Hydrate isomerism 4) Geometrical isomerism

47. In the participation of impare nickel by monds process, metal is purified by

1) Electrolytic reduction 2) Vapour phase thermal decomposition

3) Thermite reduction 4) Carbon reduction

48. Correct match is

1) Bayer's method – Na_2CO_3

2) Matte – 98% $Cu_2S + 2\%FeS$

3) Van arkel method – AgI

4) Thomas slag – Raw material for cement industry

49. The solubility of metal halides depends on their nature, Lattice enthalpy and hydration enthalpy of the indiridual ions. Amoung fluoride of alkali metals, the lowest solubility of LiF in water is due to?

1) Ionic nature of lithian fluoride 2) High lattice enthalpy

3) High hydration enthalpy of $Li^{\oplus}$ 4) Low IE of Li

50. Mortar is mixture of

1) $Ca\left(OH\right)_2$, silica and water 2) $CaCO_3$ *and* SiO_2

3) *CaO and Silica* 4) $CaCO_3, SiO_2$ and water

51. Anhydrous aluminium chloride $\left(Al_2Cl_6\right)$ is covalent compound and soluble in water giving

1) Al^{+3} *and* $Cl^{\square}$ *ions* 2) $\left[Al\left(H_2O\right)_3\right]^{3+}$ and $Cl^{\square}$ *ions*

3) $\left[AlCl_2\left(H_2O\right)_4\right]^{+}$ and $\left[AlCl_4\left(H_2O\right)_2\right]^{-}$ ions 4) None of the above

52. PbI_4 does not exist because

1) Iodine is not a reactive

2) $Pb(IV)$ is oxidizing I^- is strong reducing agent

3) $Pb(IV)$ is more stable than $Pb(II)$

4) Pb^{+4} is easily than $Pb(II)$

53. In which process does the nitrogen undergo oxidation?

1) $N_2 \rightarrow 2NH_3$ 2) $N_2O_4 \rightarrow 2NO_2$ 3) $NO_3^- \rightarrow N_2O_5$ 4) $NO_2^- \rightarrow NO_3^-$

54. The correct order of acidity (increasing) is

1) $CO_2 > H_2O_2 > H_2O$ 2) $H_2O < H_2O_2 < CO_2$

3) $H_2O < H_2O_2 > CO_2$ 4) $H_2O_2 > CO_2 > H_2O$

55. Thermally most stable compound is

1) $HOClO_3$ 2) $HOClO_2$ 3) $HOCl$ 4) $HOClO$

56. The product of I^- with MnO_4^- in alkaline medium

1) I_2 2) IO_3^- 3) IO^- 4) IO_4^-

57. $CuSO_{4(aq)} \xrightarrow{H_2S\uparrow} M \downarrow \xrightarrow[of\ KCN]{Excess} N + O$**; then final products N and O respectively**

1) $\left[Cu(CN)_4\right]^{3-}, (CN)_2$ 2) $CuCN, (CN)_2$

3) $\left[Cu(CN)_4\right]^{2-}, (CN)_2$ 4) $Cu(CN)_2, K_2S$

58. Which of the reaction is correct?

1) $Cl^- + Br_2 \rightarrow Br^- + Cl_2$

2) Mohr's salt $\xrightarrow{NaOH} NH_3\uparrow$

3) $K_2Cr_2O_7 \xrightarrow{SO_3}$ green colour solution

4) $FeCl_2 \xrightarrow{NaOH} (ppt.coloured) \xrightarrow{NaOH}$ soluble complex

59. Consider the following reaction and select incorrect statement about gap (P):

$Zn + HNO_{3(dilute)} \rightarrow Zn(NO_3)_2 + P\uparrow$

1) Gives neutral solution in water 2) Contains more O_2 than air

3) Forms brown ring with $FeSO_4$ solution 4) None of these

60. How many moles of H_2O are liberated when one mole hydrated $MgCl_2$ is heated?

1) 6 2) 5 3) 4 4) 3

61. $I^-_{(aq)} + MnO^-_{4(aq)} \xrightarrow{H^\oplus} X + Mn^{2+}_{(aq)}$

$I^-_{(aq)} + MnO^-_{4(aq)} \xrightarrow[weakly\ OH^-]{Nettral\ of} Y + MnO_2$

$MnO_4^- + Mn^{2+}_{(aq)} \xrightarrow{ZnSO_4} Z + 4H^\oplus$

Product X,Y,Z are respectively

1) I_2, IO_3^-, MnO_2 2) IO_3^-, I_2, MnO_2 3) I_2, IO_3^-, MnO_4^{2+} 4) IO_3^-, I_2, MnO_4^{-2}

62. Colorless gas that has oxidizing as well as reducing properties

1) CO_2 2) SO_2 3) NO_2 4) SO_3

63. $Cu^{2+}_{(aq)} + X^-_{(aq)} \xrightarrow{R.T} CaX\downarrow + X_2$ **X cannot be**

1) $Cl^-_{(aq)}$ 2) $I^-_{(aq)}$ 3) $CN^-_{(aq)}$ 4) $SCN^-_{(aq)}$

64. Which metal gives NH_4NO_3 when react with dilute HNO_3?

1) Zn 2) Pb 3) Cu 4) Au

65. Which of the following metal hydroxide is not soluble in excess of NH_3 solution?

1) $Fe(OH)_2$ 2) $Ni(OH)_2$ 3) $Cd(OH)_2$ 4) $Cu(OH)_2$

66. Which of the following compound is completely water soluble?

1) $BaSO_4$ 2) $PbCl_4$ 3) $FeCl_3$ 4) Hg_2Cl_2

67. **Chlorine gas is not produced by heating?**

1) $SoCl_2$ 2) $PbCl_4$ 3) $FeCl_3$ 4) $HgCl_2$

68. **Colour of $CrO^{2-}_{4(aq)}$ is not change by**

1) $dil.HCl$ 2) NH_3 solution 3) CH_3COOH 4) NO_2 gas

69. **Diamagnetic gas neutral towards water is**

1) N_2O 2) NO_2 3) No 4) N_2O_3

70. **Gas that cannot be collected over water is**

1) N_2 2) O_2 3) SO_2 4) PH_3

71. **Which of the following cation does not liberate gas with H_2S in neutral medium?**

1) Fe^{3+} 2) Cu^{2+} 3) Bi^{3+} 4) Ag^{+}

72. **The colour of the iodine solution is discharged by shaking with**

1) Sodium chloride 2) Sodium Sulphate 3) $SO_{2(aq)}$ 4) $Na\ Br$

73. **Which of one among the following pairs of ions cannot be separated by H_2S in dilute HCl?**

1) Bi^{3+}, Sn^{2+} 2) Al^{3+}, Hg^{2+} 3) Zn^{2+}, Cu^{2+} 4) Ni^{2+}, Cu^{2+}

74. $oxalate + MnO_2 + Dil.H_2So_4 \rightarrow gas$**. The gas evolved is**

1) CO_2 2) CO 3) SO_2 4) O_2

75. **Acid rain occur due to atmospheric pollution of**

1) SO_2 2) NH_3 3) CO_2 4) N_2O

76. **Which of the following gas is not a greenhouse gas?**

1) CO 2) O_3 3) CH_4 4) H_2O vapour

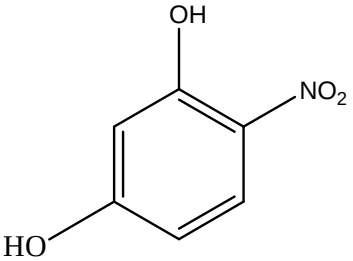
77. **The correct solubility order is / are**

I) $CaCO_3 > SrCO_3 > BaCO_3$ **II)** $Li_2CO_3 < Na_2CO_3 < K_2CO_3$

III) $K_2CO_3 < Rb_2CO_3 < Cs_2CO_3$ **IV)** $NaCO_3 > K_2Co_3 > Pb_2CO_3$

1) II, IV 2) I, IV 3) II, III, IV 4) I, II, III

78. **The type of molecular force of atracton present in the following compound is**



1) Intermolecular force 2) Intra molecular force

3) Vander wads force 4) All of these

79. **Which kind of isomerism is exhibited by octahectral $\left[CO(NH_3)_4 Br_2\right]Cl$?**

1) Geometrical and ionization 2) Geometrical and optical

3) Optical and ionization 4) Geometrical only

80. **Which of the following compler is optically inactive?**

1) $\left[CO(en)_3\right]Cl_3$ 2) Cis – $\left[CO(NH_3)_3 Cl_2\right]$

3) Cis – $\left[CO(en)_2 Cl_2\right]Cl$ 4) Cis – $\left[CO(en)(NH_3)_2 Cl_2\right]Cl$

ENGLISH PROFICIENCY

Out of the four alternatives choose the one which expresses the same meaning of the word (synonym)

81. Consolation _____

1) comfort 2) problem 3) sadness 4) solution

82. Auxiliary _____

1) chef 2) supplemental 3) separate 4) negligible

83. Profess _____

1) to become expert at 2) to Proclaim
3) persistent 4) powerful

84. Quench _____

1) to extinguish 2) to kindle 3) to make silent 4) to solurate

85. Nostalgia _____

1) nouseous 2) repulsive 3) home sickness 4) hope less ness

86. Riddle _____

1) to entangle 2) to question 3) to explain 4) to fill with holes

Choose the word, opposite meaning to the given word (Antonym)

87. Auspicious

1) prosperous 2) unfavorable 3) improper 4) new

88. Recompense

1) enolument 2) reward 3) payment 4) penalty

89. Disdain

1) haughtiness 2) admiration 3) penitence 4) hatred

90. Glorifies

1) debases 2) admiration 3) adores 4) denounces

91. Gaudy

1) extravagant 2) cheap 3) sober 4) ornate

92. Dull

1) sleek 2) ventilating 3) obscene 4) glossy

Fill in the blank with suitable preposition

93. I prefer coffee _____ tea.

1) than 2) to 3) on 4) with

Fill in the blank with suitable article

94. He is _____ European

1) the 2) an 3) a 4) no article

Arrange the sentences in correct pattern and mark at the correct combination

95. Today we live in modern technology era

P. We have lot of problem
Q. We want to get everything in one day
R. Ancient time was quiet pleasant
S. We had no problem then
C. perhaps greed is the main cause for this

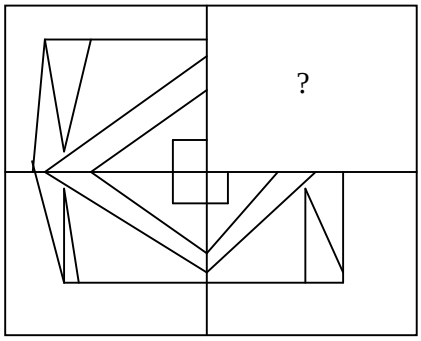
1) PQRS 2) PRSQ 3) SRQP 4) RPQS

LOGICAL REASONING

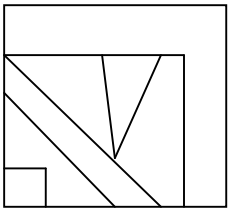
96. A, B, C, D, E, F and G are standing in a queuece not necessarily in that order. Each one is wearing a cap of different colour. Violet, indigo, blue, green, yellow, orange and red. D is able to see in front of him green and blue but not red. G can see caps of all the colours other than orange. If E is wearing indigo then F wears

1) Blue 2) Red 3) Violet 4) Orange

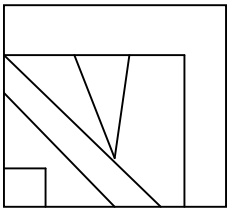
97. Select a figure from the options which complete the question figure shown below



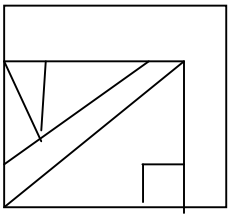
1)



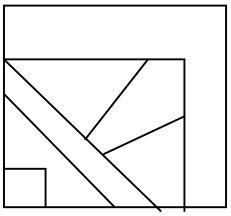
2)



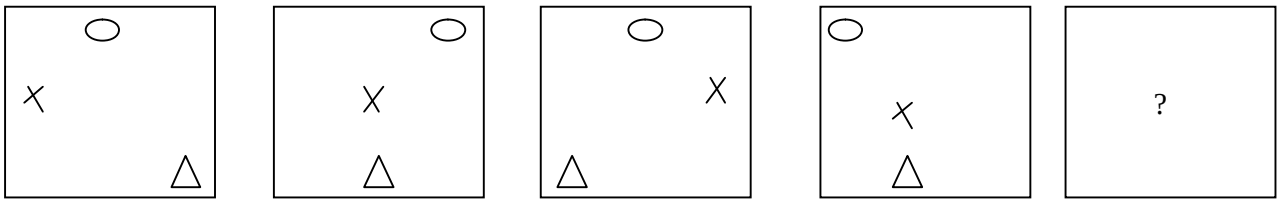
3)



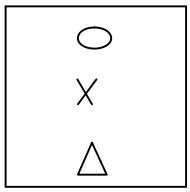
4)



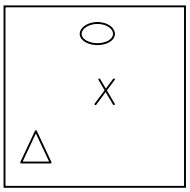
98. Find the figure that comes in place of '?' and follows / continues the same relationship



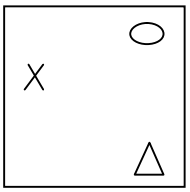
1)



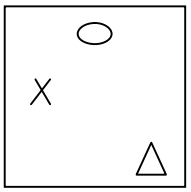
2)



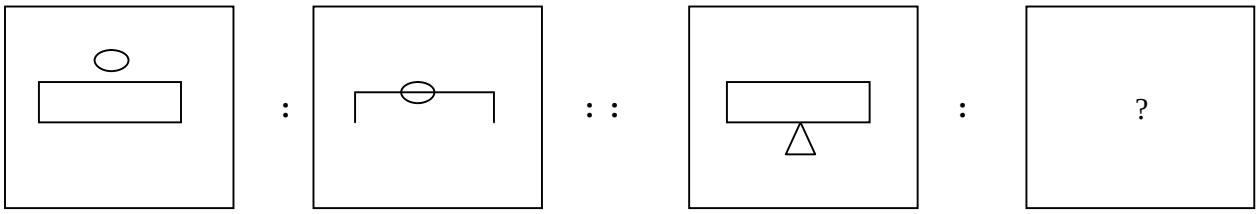
3)

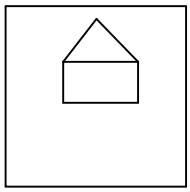
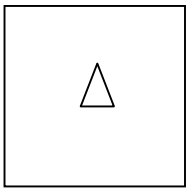
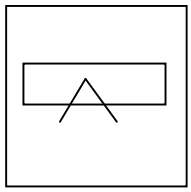
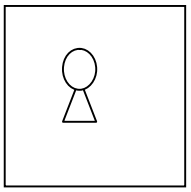


4)



99. If figure on left of ': :' follows a particular relationship, establish the same relationship on the right as well

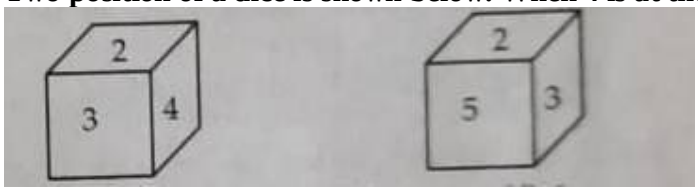


1) 
2) 
3) 
4) 

100. If 2 3 4 9 6 = C Y S T E and 1 5 7 8 = B U R P, then 8 5 3 6 7 = ?

1) P Y S E R 2) P U Y E R 3) P U Y S R 4) P S E R Y

101. Two position of a dice is shown below. When 4 is at the bottom, what number will be at the top?

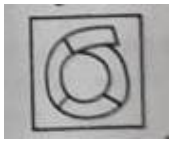


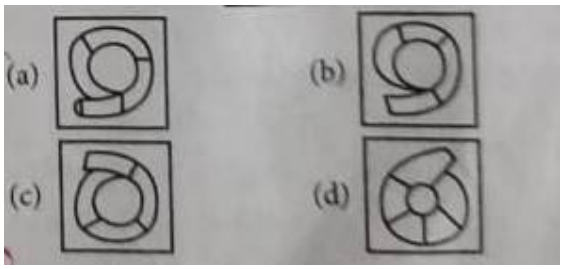
1) 1 2) 3 3) 4 4) 5

102. Laxman went 15km to the west from my house, then turned left and walked 20km. He then turned east and walked 25km and finally turning left covered 20km. How far was he from my house?

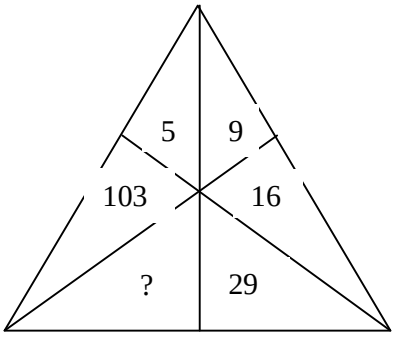
1) 5 km 2) 10 km 3) 40 km 4) 80 km

103. Find the mirror image in the given figure





104. Find the missing character from the given alternatives



1) 54 2) 55 3) 56 4) 57

105. The son of M is the father of N and grandfather (mother's father) of R, S is the daughter of N and sister of B. On the basis of this information, how is M related to B?

1) Grandfather 2) Grandmother 3) Grandmother's mother 4) Data inadequate

MATHS - A

SYLLABUS: UT- 1 & UT – 2

106. If A, B, C are three sets such that $A\cap B=A\cap C$ and $A\cup B=A\cup C$ then

1) $A=C$ 2) $B=C$ 3) $A\cap B=\phi$ 4) $A=B$

107. $A=\left\{x:\cos x>\frac{-1}{2},0\le x\le\pi\right\},B=\left\{x:\sin x>\frac{1}{2},\frac{\pi}{3}\le x\le\pi\right\}$ **then**

1) $A\cap B=\left[\frac{\pi}{3},\frac{\pi}{3}\right]$ 2) $A\cap B=\left[\frac{-\pi}{3},\frac{2\pi}{3}\right]$ 3) $A\cup B=\left[\frac{-5\pi}{6},\frac{5\pi}{6}\right]$ 4) $A\cup B=\left[\frac{5\pi}{6},\pi\right]$

108. If $A=\{1,2,3,4,5\}\ B=\{p,q,r,s\}$ **then** $n(A\times B)=$

1) 3 2) 4 3) 20 4) 54

109. Let $R=\{(1,3),(4,2),(2,4),(3,1)\}$ **be a relation on the set** $A=\{1,2,3,4\}$**. The relation R is**

1) A function 2) Reflexive 3) Non symmetric 4) Transitive

110. If $f(x)$ **is a function such that** $f(x+y)=f(x)+f(y)$ **and** $f(1)=7$ **then** $\sum_{r=1}^{n}f(r)=$

1) $\frac{7n}{2}$ 2) $\frac{7(n+1)}{2}$ 3) $7n(n+1)$ 4) $\frac{7n(n+1)}{2}$

111. The domain of $f(x)=\frac{3}{4-x^2}+\log_{10}^{(x^3-x)}$ **is**

1) $(1,2)$ 2) $(-1,0)\cup(1,2)$

3) $(1,2)\cup(2,\infty)$ 4) $(-1,0)\cup(1,2)\cup(2,\infty)$

112. If $A=\begin{bmatrix}x^2 & 6 & 8\\ 3 & y^2 & 9\\ 4 & 5 & z^2\end{bmatrix}$, $B^T=\begin{bmatrix}2x & 3 & 5\\ 2 & 2y & 6\\ 1 & 4 & 2z-3\end{bmatrix}$ **where x, y, z are real and trance of** $B=trance\ of\ A^T$ **then**

$\frac{1}{x}+\frac{1}{y}+\frac{1}{z}-xyz=$

1) 0 2) 2 3) -2 4) 3

113. If $x\ne 6,b,c$ **satisfy** $\begin{vmatrix}a & 2b & 2c\\ 3 & b & c\\ 4 & a & b\end{vmatrix}=0$ **then abc =**

1) $a+b+c$ 2) 0 3) b^3 4) $ab+bc$

114. $\sin^2 1^0+\sin^2 2^0+\sin^2 3^0+....+\sin^2 180^0=$

1) 0 2) 1 3) 90 4) 89

115. $a\sin^2\theta+b\cos^2\theta=c$ **then** $\tan^2\theta=$

1) $\frac{b-c}{a-c}$ 2) $\frac{c-b}{a-c}$ 3) $\frac{a-c}{b-c}$ 4) $\frac{a-c}{c-b}$

116. If $\tan\theta_1 = K\cot\theta_2$ then $\frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1-\theta_2)} =$

1) $\frac{1+K}{1-K}$ 2) $\frac{1-K}{1+K}$ 3) $\frac{K+1}{K-1}$ 4) $\frac{K-1}{K+1}$

117. If $\alpha-\beta=\frac{3\pi}{4}$ then $(1-\tan\alpha)(1+\tan\beta) =$

1) 0 2) 1 3) -1 4) 2

118. If $180^0 < \theta < 270^0, \sin\theta = \frac{-3}{5}, \cos\frac{\theta}{2} =$

1) $\frac{-1}{\sqrt{10}}$ 2) $\frac{1}{\sqrt{10}}$ 3) $\frac{1}{10}$ 4) 10

119. $\cos^2(\theta-45)+\cos^2(\theta+15)-\cos^2(\theta-15) =$

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

120. $\cos 6^0 \sin 24^0 \cos 72^0 =$

1) $\frac{-1}{8}$ 2) $\frac{-1}{4}$ 3) $\frac{1}{8}$ 4) $\frac{1}{4}$

121. If x and y are acute angles such that $\cos x+\cos y=\frac{3}{2}$ and $\sin x+\sin y=\frac{3}{5}$ then $\sin(x+y) =$

1) $\frac{3}{4}$ 2) $\frac{3}{5}$ 3) $\frac{4}{5}$ 4) $\frac{2}{5}$

122. The period of $f(x)=\cos\left(\frac{x}{3}\right)+\sin\left(\frac{x}{2}\right)$ is

1) 2π 2) 4π 3) 8π 4) 12π

123. The $n \in N$, and the period of $\frac{\cos nx}{\sin\left(\frac{x}{n}\right)}$ is 4π, then $n =$

1) 4 2) 3 3) 2 4) 1

124. The maximum value of $\sin^2\theta+\cos^4\theta$ is

1) 0 2) 1 3) $\frac{3}{4}$ 4) $\frac{\pi}{2}$

125. The range of $\log_{\sqrt{5}}^{\left[\sqrt{2}(\sin x-\cos x)+3\right]}$ is

1) $[0,2]$ 2) $[1,2]$ 3) $[0,3]$ 4) $[1,3]$

126. If $\sin(270^0-x)=\cos 292^0$, then x in $(0,2\pi)$ is

1) $248^0\,(or)\,112^0$ 2) $35^0\,(or)\,8^0$ 3) $46^0\,(or)\,7^0$ 4) $265^0\,(or)\,119^0$

127. The smallest value of θ satisfying the equation $\sqrt{3}(\cot\theta+\tan\theta)=4$ is

1) $\frac{2\pi}{3}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{12}$

128. $\cos^{-1}\left(\frac{-1}{2}\right)-2\sin^{-1}\left(\frac{1}{2}\right)+3\cos^{-1}\left(\frac{-1}{\sqrt{2}}\right)-4\tan^{-1}(-1) =$

1) $\frac{19\pi}{12}$ 2) $\frac{35\pi}{12}$ 3) $\frac{47\pi}{12}$ 4) $\frac{43\pi}{12}$

129. In ΔABC, if $2R+r=r_1$ then the triangle is

1) Isosceles 2) Equilateral 3) Right angled 4) None

130. The angles of elevation of the tops of two vertical towers as seen from the middle point of the line joining the foot of the towers are $60^0, 30^0$ respectively. The ratio of the height of the towers is

1) $2:1$ 2) $\sqrt{3}:1$ 3) $3:2$ 4) $3:1$

131. If α, β are the roots of the equation $x^2+5x+2=0$ then $\left(\frac{\alpha}{2+5\alpha}\right)^2+\left(\frac{\beta}{2+5\beta}\right)^2=$

1) $\frac{4}{21}$ 2) $\frac{19}{4}$ 3) $\frac{21}{4}$ 4) $\frac{4}{19}$

132. In a triangle PQR, $\angle R=\frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2+bx+c=0$, $a\neq 0$ then

1) $a=b+c$ 2) $c=a+b$ 3) $b=c$ 4) $b=a+c$

133. If $\left(7+4\sqrt{3}\right)^{x^2-8}+\left(7+4\sqrt{3}\right)^{x^2-8}=14$ then $x=$

1) $3,\sqrt{7}$ 2) $\pm 3;\pm 1$ 3) $\pm 3;\pm\sqrt{7}$ 4) $\pm 3;\pm 4$

134. If the roots of the equation $x^3+3px^2+3qx-8=0$ are in G. P, then $\frac{q^3}{p^3}=$

1) 1 2) -2 3) 4 4) -8

135. If α and β are the roots of the equation $x^4-x^3+1=0$ then the value of $\frac{\alpha^3(1-\alpha)}{\beta^3(1-\beta)}=$

1) 1 2) 2 3) 4 4) 3

136. If α, β, γ are roots of $x^3+px^2+qx+r=0$ then $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha)=$

1) $2\left(P^2-3q\right)$ 2) $r-pq$ 3) q^2-2pr 4) $\frac{p^2-2q}{r}$

137. The letters of the word 'RANDOM' are arranged in all possible ways. The number of arrangements in which there are 2 letters between R and D is

1) 36 2) 48 3) 144 4) 72

138. The sum of all the four digit number that can be formed with 0, 2, 3, 5 is

1) 66660 2) 66480 3) 64440 4) 65520

139. How many different words can be formed by jumbling the letters in the word "MISSISSIPPI" in which no two S's are adjacent?

1) $8.6_{c_4}.7_{c_4}$ 2) $8.7.8_{c_4}$ 3) $6.8.7_{c_4}$ 4) $7.6_{c_4}.8_{c_4}$

140. A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five questions. The number of choices available to him is

1) 196 2) 280 3) 346 4) 140

141. The remainder obtained when $1!+2!+.....100!$ is divisible by 240 is

1) 153 2) 154 3) 155 4) 156

142. If all the seven letters of the word "LEADING" are permuted in all possible ways and the words thus formed are arranged as in the dictionary order then the word in 2017th place is

1) ELIGDAN 2) ELNADGI 3) ELINAG 4) ELNDAGI

143. The number of quadrate expressions with which coefficients drawn from the set $\{0,1,2,3\}$ is

1) 27 2) 36 3) 48 4) 64

144. The coefficient of x^5 in the product of $\left(1+x^2\right)^5(1+x)^4$ is

1) 60 2) 40 3) 120 4) 52

145. The middle term in the expansion of $\left(1-3x+3x^2-x^3\right)^{2n}$ is

1) $6n_{c_{2n}}(-x)^{3n}$ 2) $6n_{c_{2n}}(-x)^{2n+1}$ 3) $4n_{c_{3n}}(-x)^{3n}$ 4) $6n_{c_{3n}}(-x)^{3n-1}$

146. The number of rational terms in the expansion of $\left(\sqrt[4]{5}+\sqrt[5]{4}\right)^{100}$ is

1) 50 2) 5 3) 6 4) 51

147. If $z_1=-\sqrt{3}+i$ and $z_2=-\sqrt{3}-i$ then the principle amplitude of the complex number $\frac{z_1}{z_2}$ is

1) $\frac{\pi}{3}$ 2) $\frac{5\pi}{6}$ 3) $\frac{-\pi}{3}$ 4) $\frac{5\pi}{3}$

148. If $\left|z-\frac{4}{z}\right|=2$ then the greatest value of $|z|$ is

1) $\sqrt{5}+1$ 2) $\sqrt{5}-1$ 3) $1-\sqrt{5}$ 4) $\sqrt{2}+1$

149. If w is a complex cube root of unity then $\frac{a+bw+cw^2}{c+aw+bw^2}+\frac{a+bw+cw^2}{b+cw+aw^2}=$

1) -1 2) 1 3) 2 4) 0

150. If $x_n=\cos\left(\frac{\pi}{3^n}\right)+i\sin\left(\frac{\pi}{3^n}\right)$ then $x_1x_2.....\infty=$

1) 1 2) i 3) -i 4) -1

MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **BITSAT MODEL** | **Date: 24-04-2020**

Time: 3 Hours | **Max. Marks: 450**

KEY SHEET

PHYSICS

1) **3** 2) **3** 3) **4** 4) **1** 5) **2** 6) **3** 7) **2** 8) **2** 9) **1** 10) **3**

11) **2** 12) **2** 13) **4** 14) **3** 15) **2** 16) **1** 17) **3** 18) **1** 19) **3** 20) **4**

21) **2** 22) **3** 23) **1** 24) **3** 25) **3** 26) **1** 27) **2** 28) **3** 29) **2** 30) **2**

31) **2** 32) **1** 33) **1** 34) **1** 35) **3** 36) **1** 37) **4** 38) **1** 39) **2** 40) **3**

CHEMISTRY

41) **1** 42) **4** 43) **4** 44) **3** 45) **2** 46) **1** 47) **2** 48) **2** 49) **2** 50) **1**

51) **3** 52) **2** 53) **4** 54) **2** 55) **1** 56) **2** 57) **1** 58) **2** 59) **3** 60) **2**

61) **1** 62) **2** 63) **1** 64) **1** 65) **1** 66) **2** 67) **4** 68) **2** 69) **1** 70) **3**

71) **1** 72) **3** 73) **1** 74) **1** 75) **1** 76) **1** 77) **4** 78) **4** 79) **1** 80) **2**

ENGLISH PROFICIENCY

81) **1**	82) **2**	83) **2**	84) **1**	85) **3**	86) **4**	87) **2**	88) **4**	89) **2**	90) **4**
91) **3**	92) **4**	93) **2**	94) **3**	95) **2**					

LOGICAL REASONING

96) **2**	97) **1**	98) **4**	99) **3**	100) **2**	101) **4**	102) **2**	103) **3**	104) **1**	105) **4**

MATHS - A

106) **2**	107) **1**	108) **3**	109) **3**	110) **4**	111) **4**	112) **2**	113) **3**	114) **3**	115) **2**
116) **1**	117) **4**	118) **1**	119) **1**	120) **3**	121) **3**	122) **4**	123) **3**	124) **2**	125) **1**
126) **1**	127) **3**	128) **4**	129) **3**	130) **4**	131) **3**	132) **2**	133) **3**	134) **4**	135) **1**
136) **2**	137) **3**	138) **3**	139) **4**	140) **1**	141) **1**	142) **2**	143) **3**	144) **1**	145) **1**
146) **3**	147) **3**	148) **1**	149) **1**	150) **2**					

HINTS & SOLUTIONS
PHYSICS

1. $v = \mu - at \Rightarrow \mu = at \Rightarrow t = 3.5\sec$

$s_{4th} = s_4 - s_3$

$= 0.5$

Δs in 4^{th} second $= s_{3\to3.5} + s_{3.5\to4} = 0.5$

2. $H_A = H_B$

$$\frac{\sin^2\theta}{\sin^2 45} = \left(\frac{\mu_A}{\mu_B}\right)^2 \Rightarrow \theta = 30^0$$

3. Point 'P' is in equilebrelium

$\sum F_x = 0$

$\cos 45^0 + F_2 - 2\sin 45^0 = 0$

$F_2 = 2\sin 45^0 - \cos 45^0$

$$F_2 = \frac{2}{\sqrt{2}} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$\sum F_x = 20$

$2\cos 45^0 + \sin 45^0 - F_1 = 20$

$F_1 = 2\cos 45^0 + \sin 45^0$

$$= \frac{2}{\sqrt{2}} + \frac{1}{\sqrt{2}}$$

$$F = \frac{3}{\sqrt{2}}$$

4. From the conservation of momentum

$Mv_2 = mv_1$

$$v_2 = \frac{m}{M}v_1$$

$$v_2 = \frac{0.01}{10} \times 50 = 0.05 m/s$$

5. $$a = \frac{F}{M}$$

$$a = \frac{10.2}{6} = 1.7 m/s^2$$

$F = ma$

$T_2 = 2 \times 1.7$

$T_2 = 3.4N$

$\sum F = ma$

$F - T_1 = 2 \times 1.7$

$T_1 = F - 2 \times 1.7 = 10.2 - 3.4 = 6.8N$

Force between _____is $T_2 = 3.4N$

6. Acceleration $$a = \frac{Net\ pulling\ force}{total\ mass}$$

$$a = \frac{6g - 4g\sin 30^0}{4+6}$$

$$a = \frac{6g-4g}{10} = 4m/s^2$$

7. When the lift moves downwards with acceleration 'a' apparent weight $W_2 = m(g-a)$

$$W_2 = 60(10-2) = 60\times 8$$

$$W_2 = 480N$$

Change in apparent weight $W = W_1 - W_2$

$$720 - 480$$

$$W = 240N$$

8. At extreme position, bends bob is at rest

i.e $\sum F_x = 0$ $\qquad\qquad$ $\sum F_y = 0$

$T\sin\theta - ma_0 = 0$ $\qquad\qquad$ $T\cos\theta - mg = 0$

$$T^2 = (ma_0)^2 + (mg)^2$$

$$T = m\sqrt{a_0^2 + g^2}$$

9. Area of $F-T$ graph = Impulse

But impulse = change in linear momentum

$\therefore$ change in linear momentum = area of F – t graph

$$= 2\times(-2) + 4\times 1$$

$$= 0$$

10. $\mu = \dfrac{Length\ of\ chain\ hanging\ from\ the\ table}{Length\ of\ chain\ lying\ on\ the\ table} = \dfrac{l}{L-l}$

11. Conservation of linear momentum

$$Mu = m_1u_1 + m_2 + u_2$$

$$2000\times 600 = 500\times 0 + 1500\times v$$

$$v = 800m/s$$

12. $v = a$

$$w\sqrt{A^2 - y^2} = w^2 y$$

$$w = \frac{8}{6} \Rightarrow n = \frac{2}{3\pi}$$

13. Apply L.C.E

$$\frac{-GM_1m}{r_1} + \frac{1}{2}mv^2 - \frac{GM_2m}{r_2^2} = 0$$

14. Impulse = change in momentum

$$= Mv - (-Mv) = 2Mv$$

15. $v_{max} = \sqrt{rg\tan\theta}$

$$= \sqrt{90\times 10\times \tan 45^0}$$

$$= \sqrt{900}$$

$$v_{max} = 30m/\sec$$

16. $mg\sin\theta x = \mu mg\cos\theta \times \dfrac{2}{2}$

$$\mu = \frac{2\sin\theta}{\cos\theta}$$

$$\mu = 2\tan\theta$$

17. up force > down force
body moves up wards
friction is down wards
Friction force $f_x = \mu N$

But $\mu = \frac{1}{\sqrt{3}}$

$N = 50\sqrt{3}$

$f_x = \frac{1}{\sqrt{3}} \times 50\sqrt{3}$

$f_x = 50N$

18. $N = (2+3)g = 5g$

$N = 50$ Newton

$\sum F_x = Ma$

$a = \frac{\sum F}{M} = \frac{45-5}{(2+3)}$

$a = \frac{40}{5} = 8m/s^2$

19. $t = \sqrt{\frac{2l}{g\sin\theta}} = 6\sec$

$t^1 = \frac{1}{\sqrt{2}} 6 = 3\sqrt{2}\sec$

20. $a = \frac{F}{M} = \frac{14}{7} = 2m/\sec^2$

$\sum F = Ma$

$14 - N_1 = 4 \times 2$

$N_1 = 14 - 8 = 6N$

21. Rate of change of speed

$\frac{d\theta}{dt} = \tan gential\ acceleration$

$= \frac{\tan gential\ \ force}{mass}$

$\frac{d\theta}{dt} = 10\left(\frac{1}{2}\right) = 5m/s^2$

22. $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$

$|F| = \sqrt{36+64+100}$

$F = \sqrt{200} = 10\sqrt{2}$

23. All hormovies present in open pipe

$n(2000) = 20000$

$n = 10$

Overtimes = 9

24. $a = \frac{3mg - mg}{3m+m} = \frac{2mg}{4m} = \frac{g}{2}$

$= \frac{ma + 3m(-a)}{4m} = \frac{-a}{2}$

25. $a = \dfrac{g\sin\theta}{1+\beta}$

For sphere $\beta = \dfrac{2}{5}$

$a = \dfrac{g\sin\theta}{1+\dfrac{2}{5}} = \dfrac{5}{7}g\sin\theta$

26. $X_{\sin} = \dfrac{A_1x_1 + A_2x_2}{A_1 + A_2} = \dfrac{\pi\dfrac{d^2}{4}\times 0 + d^2\times d}{\pi\dfrac{d^2}{4} + d^2}$

$X_{\sin} = \dfrac{4d}{4+\pi}$

27. $x_{cm} = \dfrac{A_1x_1 - A_2x_2}{A_1 - A_2} = \dfrac{9^2\times 0 - \dfrac{a^2}{4}\times\dfrac{9}{3}}{a^2 - \dfrac{9^2}{4}}$

$x_{cm} = -\dfrac{a^3}{12}\times\dfrac{4}{3a^2} = -\dfrac{a}{9}$

$\therefore x_{cm} = \dfrac{a}{9}$

28. In the case of approach, $100 = \dfrac{fV}{V - V_S}$

While in case of moving a way $50 = \dfrac{fV}{V + V_S}$

By solve $f = 66.67H_z$

29. $x_{cm} = \dfrac{\int_0^3 xdm}{\int_0^3 dm}$

$x_{cm} = \dfrac{\int_0^3 x(2+x)dx}{\int_0^3 (2+x)dx}$

$x_{cm} = \dfrac{2\left(\dfrac{x^2}{2}\right)^3 + \left(\dfrac{x^3}{3}\right)^3}{2(x)_0^3 + \left(\dfrac{x^2}{2}\right)_0^3}$

$x_{cm} = \dfrac{12}{7}m$

30. Initial C.M = (3, 3, 3)

$x_{cm} = \dfrac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3}$

$x_1 + 2x_2 + 3x_3 = 18$

New C.M = (1, 1, 1)

$$x_{cm}^{1}=\frac{m_1x_1+m_2x_2+m_3x_3+m_4x_4}{m_1+m_2+m_3+m_4}$$

$$1=\frac{x_1+2x_2+3x_3+4x_4}{1+2+3+4}$$

$$x_4=-2$$

Simplify $y_4=-2,\ z_4=-2$

$$\therefore (x_4,y_4,z_4)=(-2,-2,-2)$$

31. $\vec{V}=\vec{w}\times\vec{r}$

$$\bar{v}=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ 3 & -4 & 1\\ 5 & -6 & 6\end{vmatrix}$$

$$=\hat{i}(-24+6)-\hat{i}(18-5)+\hat{k}(-18+20)$$

$$\vec{v}=-18\hat{i}-13\hat{j}+2\hat{k}$$

32. $I_2=I_3=\frac{2}{3}mr^2+mr^2=\frac{5}{3}mr^2$

$$\therefore I=I_1+I_2+I_3$$

$$=\frac{2}{3}mr^2+2\times\frac{5}{3}mr^2$$

$$I=4mr^2$$

33. About z – axis

$$I_z=0,\ I_x=I_y=\frac{ml^2}{3}$$

$$I=I_x+I_y+I_z$$

$$I=\frac{2ml^2}{3}$$

34. $I_1=\frac{\left(\frac{m}{2}\right)\left(\frac{l}{2}\right)^2}{3}=\frac{ml^2}{24}$

$$I_2=0+\frac{m}{2}\left(\frac{l}{2}\right)^2=\frac{ml^2}{8}$$

$$I=I_1+I_2=\frac{ml^2}{24}+\frac{ml^2}{8}$$

$$I=\frac{4ml^2}{24}=\frac{ml^2}{6}$$

35. $I=I_1+I_2+I_3=0+0+m\left(\frac{\sqrt{3}}{2}l\right)^2$

$$I=\frac{3ml^2}{4}$$

36. $L=mvr$

$$L=m\underset{0}{v}\cos 45^0\times v$$

$$L = \frac{m v_0}{\sqrt{2}} \cdot \frac{v_0^2}{2g} \cdot \frac{1}{2}$$

$$L = \frac{m v_0^3}{4\sqrt{2}g}$$

37. $I_1 = \frac{ml^2}{3}$ $\qquad I_2 = \frac{1}{2}mr^2$

$$\frac{I_1}{I_2} = \frac{\frac{ml^2}{3}}{\frac{ml^2}{8\pi^2}} = \frac{8\pi^2}{3} \qquad I_2 = \frac{1}{2}m\left(\frac{l}{2\pi}\right)^2 = \frac{ml^2}{8\pi^2}$$

38. From the conservation of energy

Potential energy = Translational K.E + rotational K.E

$$mgh = \frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{2}{5}\right)mR^2\frac{v^2}{R}$$

$$\frac{7}{10}mv^2 = mgh$$

$$v \geq \sqrt{\frac{10}{7}gh}$$

39. $T = 2\pi\sqrt{\frac{M}{k_e}}$

$$K_e = 2k$$

$$T = 2\pi\sqrt{\frac{M}{2K}}$$

40. centripetal acceleration equal to acceleration due to gavity

$$a = \frac{\vartheta^2}{r} = g_h$$

$$g_h = \frac{2\times 2\times 10^6}{1000\times 10^3} = 4m/s^2$$

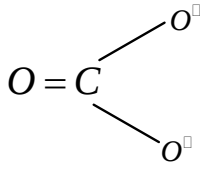
CHEMISTRY

41. $I.E + E.A = 275 + 86 = 361 \qquad KCal \quad mol^-$

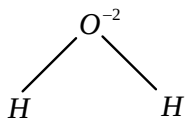
$361\times 4.184 = 1510.42 KJ\ mol^-$

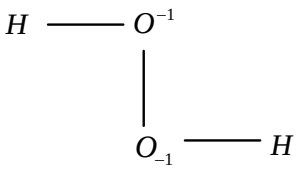
Electrogativity $= \frac{1510.42}{540} = 2.797 = 2.8$

42. CO_3^{2-} ;

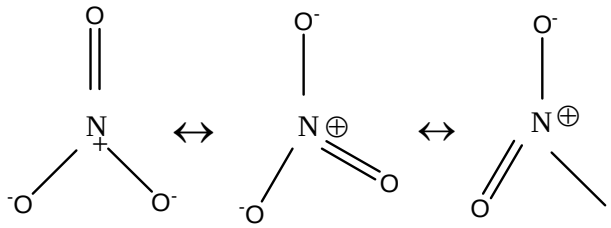


43. The amount of formal negative charge an oxygen atom in case of water is more than that of H_2O_2





44.



45. Lowered in energy by $0.4\Delta_0$

46. It does not have ambidentate ligand

47. $\underset{(impure)}{Ni} + 4CO \xrightarrow{50^0 to 60^0 c} \underset{(volatile\ compound)}{\left[Ni(CO)_4\right]} \xrightarrow[Thermal\ decomposition]{200 to 300^0 c} \underset{(pure)}{Ni} + 4CO\uparrow$

48. Roasted mass obtained from roasting step is called matte $(98\%Cu_2S + 2\%FeS)$

49. L.E of LiF > Hydration energy of LiF

50. $Ca(OH)_2 + silica + H_2O = mortar$

51. $AlCl_3.6H_2O \xrightarrow{dissociation} \left[AlCl_2(H_2O)_4\right]^+ + \left[AlCl_4(H_2O)_2\right]^-$

52. Pb IV is oxidizing agent
$I^{\oplus}$ is reducing agent } redox reaction is possible

53. $\overset{+3}{NO_2^-} \xrightarrow{oxidation} \overset{+5}{NO_3^+}$

54. $CO_2 > H_2O_2 > H_2O$; CO_2 is a Lewis acid

55. Thermal stability order $\Rightarrow HClO_4 > HClO_3 > HClO_2 > HClO$

56. $MnO_4^- + I^- + H_2O \rightarrow 2MO_2 + IO_3^- + 2OH^-$

57. $CuSO_4 \xrightarrow{H_2S} \underset{(M)}{2CuS} \xrightarrow{\underset{excess}{KCN}} \underset{(N)}{\left[Cu(CN)_4\right]^{-3}}, \underset{(O)}{(CN)_2}$

58. Any NH_4^+ salt react with base to from NH_3 gas $NH_4^{\oplus} + OH^- \rightarrow NH_3\uparrow H_2O$

59. $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + N_2O$

60. N_2O does not form drown ring (NO from brown ring)

61. $MgCl_2.6H_2O \xrightarrow{\Delta} MgO + 2HCl + 5H_2O$

62. $S \xleftarrow{(R)} SO_2\uparrow \xrightarrow{(O)} SO_4^{2-}$
SO_2 is colour less gas

63. Cu^{2+} oxidizing property it oxidizes $I_{aq}^-, CN_{aq}^-, SCN_{aq}^-$ into $I_2, (CN)_2, (SCN)_2$ respectively but does not oxidizes $Cl_{(aq)}^-$ as it is weaker reductant

64. Pb, Cu, Au metals do not react with dilate HNO_3

65. $Fe(OH)_2$ is insoluble in NH_4 solution

66. $Ba(OH)_2$ is water soluble

67. Hg_2Cl_2 do not produce chlorine gas

68. $CrO_4^{2-} \underset{in\ base}{\overset{in\ acid}{\rightleftharpoons}} \underset{organe}{Cr_2O_7^{2-}}$; NH_3 is base in solution

69.a. $N_2O \rightarrow$ Diamagnetic, neutral

b. $NO_2 \rightarrow$ paramagnetic, acidic

c. $NO \rightarrow$ paramagnetic, neutral

d. $N_2O_3 \rightarrow$ diamagnetic, acidic

70. SO_2 is soluble in water, so cannot be collected over water

71. $Fe^{3+}_{(aq)} + H_2S \xrightarrow{\text{Redou}} S\downarrow + Fe^{2+}_{(aq)} \xrightarrow{Neatral, H_2S} No\ ppt$

72. $\underset{colour}{I_2} \rightarrow \underset{colour}{HI}\ less$

$SO_2 + I_2 + 2H_2O \rightarrow H_2SO_4 + 2HI$

73. BP^{3+}, Sn^{2+}

74. $C_2O_4^{-2} + MnO_2 + H_2SO_4 \rightarrow CO_2 + Mn^{+2}$

75. Acid rains is due to SO_2 and NO_2 gas

76. CO is not a greenhouse gas it is poisonous gas

77. Alkali metals solubility increases down the group

78. Concept

79. $\left[Ma_4b_2\right]$ exhibit geometrical isomerism not optical

$\left[CO(NH_3)_4 Br\right]Cl$ & $\left[CO(NH_3)_4 Cl\right]Br \Rightarrow$ Ionisation isomers

80. Ma_3b_3 does not exhibits optical isomerism

LOGICAL REASONING

96. D – violet E – indigo F – red G – orange

From the last statement, we get that G- orange, E – indigo as D is able to see green, blue not violet and F can see violet and yellow butt not violet and F can see violet and yellow but not red, so we can say A, B, C have yellow, green, blue and F cannot see red only if F wears red and 'G' wears orange, so F must wear red.

97. **1**

98. Triangles shifts centre, left, right and so on in bottom row, circle shift right, center, right, left and so on in top row and cross shift centre, right, lift in middle the middle row.

99. Upper figure moves to intersect lower figure and bottom line from lower figure is missing

100.

C Y S T E *B U R D*

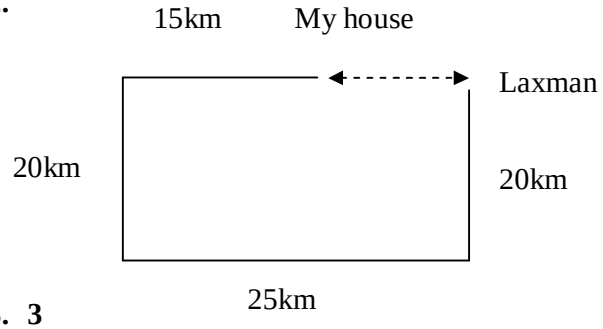
↓↓↓ ↓↓ and ↓↓ ↓ ↓

2 3 4 9 6 1 5 7 8

85367 = *PUYER*

101. Two dice shows 2 and 3 in both the faces so, whenever there are two same faces, the other faces are opposite. Hence 4 and 5 are opposite faces.

102.



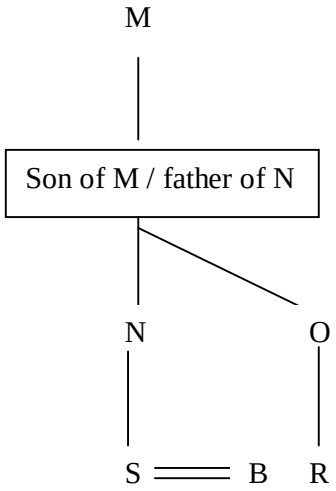
103. **3**

104.

$(5\times 2)-1=9$; $(9\times 2)-2=16$

$(16\times 2)-3=29$ $(29\times 2)-4=54$

105.



We are not sure about the gender of M so, data is inadequate to answer this.

MATHS- A

106. $B = B \cup (A \cap B) = B \cup (A \cap C) = (B \cup A) \cap (B \cup C) = (A \cup B) \cap (B \cup C)$

$= (A \cup C) \cap (B \cup C) = (A \cap B) \cup C = (A \cap C) \cup C = C$

107. $A = \left\{ x : \cos x > \dfrac{-1}{2}, 0 \le x \le \pi \right\} = \left\{ x : 0 \le x \le \dfrac{2\pi}{3} \right\}$

$B = \left\{ x : \sin x > \dfrac{1}{2}, \dfrac{\pi}{3} \le x \le \pi \right\} = \left\{ x : \dfrac{\pi}{3} \le x \le \dfrac{5\pi}{6} \right\}$

$A \cap B = \left[\dfrac{\pi}{3}, \dfrac{2\pi}{3} \right]$

108. $n(A \times B) = n(A).n(B) = 5 \times 4 = 20$

109. $(2,4)(2,3) \in R \Rightarrow 2$ has two images $\Rightarrow R$ is not a function

$(1,1) \notin R \Rightarrow R$ is not reflexive $(2,3) \in R, (3,2) \notin R$

$\therefore R$ is not symmetric

110. $f(x+y) = f(x) + f(y) \Rightarrow f(r) = rf(1) \Rightarrow \sum_{r=1}^{n} f(r) = f(1) \sum_{r=1}^{n} r = \dfrac{7n(n+1)}{2}$

111. $\dfrac{3}{4-x^2} + \log_{10}(x^3 - x)$ is defined $\Rightarrow 4 - x^2 \ne 0, x^3 - x > 0, x \ne \pm 2, (x+1)x(x-1) > 0$

$\therefore$ domain $= (-1,0) \cup (1,2) \cup (2,\infty)$

112. Trance of $B =$ Trance of $A^T \Rightarrow$ Trance of $B^T =$ Trance of A

$2x + 2y + 2z - 3 = x^2 + y^2 + z^2$

$(x-1)^2 + (y-1)^2 + (z-1)^2 = 0$

$x - 1 = 0, y - 1 = 0, z - 1 = 0$

$\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z} - xyz = 1 + 1 + 1 - 1 = 2$

113. $R_1 \to R_1 - 2R_2$

$$\begin{vmatrix} a-6 & 0 & 0 \\ 3 & b & c \\ 4 & a & b \end{vmatrix} = 0$$

$a-6\left(b^2-ac\right)=0$

$a-6=0 \; a=6$

$b^2=ac$

$b^3=abc$

114. $\sin^2 1^0+\sin^2 2^0+....+\sin^2 180^0=\sin^2 1^0+\sin^2 2^0+....+\sin^2 90^0+.....+\sin^2 1^0+0$

$=2\left[\left(\sin^2 1^0+\sin^2 89\right)+....+\left(\sin^2 44+\sin^2 46\right)+\sin^2 45\right]+1$

$=2\left(44+\frac{1}{2}\right)+1=90$

115. $a\sin^2\theta+n\cos^2\theta=c$

$a\tan^2\theta=c\sec^2\theta$

$a\tan^2\theta+b=c+c\tan^2\theta$

$\left(a-c\right)\tan^2\theta=c-b$

$\tan^2\theta=\frac{c-b}{a-c}$

116. Given that $\tan\theta_1:\tan\theta_2=k$

$\frac{\cos\left(\theta_1-\theta_2\right)}{\cos\left(\theta_1+\theta_2\right)}=\frac{\cos\theta_1\cos\theta_2+\sin\theta_1\sin\theta_2}{\cos\theta_1\cos\theta_2-\sin\theta_1\sin\theta_2}=\frac{1+\tan\theta_1\tan\theta_2}{1-\tan\theta_1\tan\theta_2}=\frac{1+k}{1-k}$

117. Given $\alpha-\beta=\frac{3\pi}{4}$

$\frac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}=-1$

$\tan\alpha-\tan\beta+\tan\alpha\tan\beta=-1$

$1-\tan\alpha+\tan\beta-\tan\alpha\tan\beta=1+1$

118 $180<\theta<270\Rightarrow 90^0<\frac{\theta}{2}<135^0$

$\cos\frac{\theta}{2}=\sqrt{\frac{1+\cos\theta}{2}}=\sqrt{\frac{1-\frac{4}{5}}{2}}=\sqrt{\frac{1}{10}}=-\frac{1}{\sqrt{10}}$

119. $G.E=\frac{1+\cos 2\left(\theta-45\right)}{2}+\sin 2\theta\sin\left(-30\right)=\frac{1}{2}+\frac{\sin\theta}{2}-\frac{\sin\theta}{2}$

$=\frac{1}{2}$

120. $\cos 6^0\sin 24^0\cos 72^0=\frac{1}{2}\left(2\sin 24^0\cos 6\right)\cos 72^0=\frac{1}{2}\left[\sin 30^0+\sin 18^0\right]\cos 12^0$

$=\frac{1}{2}\left[\frac{1}{2}+\frac{\sqrt{5}-1}{4}\right]\left(\frac{\sqrt{5}-1}{4}\right)=\frac{1}{8}$

121. $\frac{\sin x+\sin y}{\cos x+\cos y}=\frac{\frac{3}{4}}{\frac{3}{2}}\Rightarrow\frac{2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)}{2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)}=\frac{1}{2}\Rightarrow\tan\left(\frac{x+y}{2}\right)=\frac{1}{2}$

$$\sin(x+y)=\frac{2\tan\left(\frac{x+y}{2}\right)}{1+\tan^2\left(\frac{x+y}{2}\right)}=\frac{2\left(\frac{1}{2}\right)}{1+\left(\frac{1}{2}\right)}=\frac{4}{5}$$

122. Period $L.C.M\left\{\frac{2\pi}{\frac{1}{3}},\frac{2\pi}{\frac{1}{2}}\right\}=L.C.M\ of\ \{6\pi,4\pi\}=12\pi$

123. Period of $\frac{\cos nx}{\cos\left(\frac{x}{n}\right)}$ is L.C.M $\left(\frac{2\pi}{n},2n\pi\right)\Rightarrow 4\pi\Rightarrow n=2$

124. $=\frac{1-\cos 2\theta}{2}+\left(\frac{1+\cos 2\theta}{2}\right)^2=\frac{1-\cos 2\theta}{2}+\frac{1+2\cos 2\theta+\cos^2 2\theta}{4}$

$=\frac{7}{8}+\frac{1}{4}\cos 4\theta$

Maximum value $=\frac{7}{8}+\frac{1}{8}=\frac{8}{8}=1$

$(1-\tan\alpha)(1+\tan\beta)=2$

125. $-\sqrt{2}\le\sin x-\cos x\le\sqrt{2}\Rightarrow -2\le\sqrt{2}(\sin x-\cos x)\le 2$

$\Rightarrow 1\le\sqrt{2}(\sin x-\cos x)+3\le 5$

$\Rightarrow 0\le\log_{\sqrt{5}}^{\left[\sqrt{2}(\sin x-\cos x)+3\right]\le 2}$

126. $\sin(270^0-x)=\cos 292^0=\cos(270^0+22^0)=\sin 22^0$

$=270^0-x=22^0,180^0-22^0\Rightarrow x=248^0\ (or)112^0$

127. $\cot\theta+\tan\theta=\frac{4}{\sqrt{3}}\Rightarrow\frac{\cos\theta}{\sin\theta}=\frac{4}{\sqrt{3}}\Rightarrow\frac{\cos^2\theta+\sin^2\theta}{\sin\theta\cos\theta}=\frac{4}{\sqrt{3}}$

$\frac{2}{\sin 2\theta}=\frac{4}{\sqrt{3}}\Rightarrow\sin 2\theta=\frac{\sqrt{3}}{2}\Rightarrow 2\theta=\frac{\pi}{3}\Rightarrow\theta=\frac{\pi}{6}$

128. $\cos^{-1}\left(\frac{-1}{2}\right)-2\sin^{-1}\left(\frac{1}{2}\right)+3\cos^{-1}\left(\frac{-1}{\sqrt{2}}\right)-4\tan^{-1}(-1)$

$=\frac{2\pi}{3}-2\left(\frac{\pi}{6}\right)+3\left(\frac{3\pi}{4}\right)-4\left(\frac{-\pi}{4}\right)=\frac{\pi}{3}+\frac{13\pi}{4}=\frac{43\pi}{12}$

129. $2R+r=r_1\Rightarrow 2R=r_1-r\Rightarrow 2R=4R\sin^2\frac{A}{2}\Rightarrow\sin^2\frac{A}{2}=\frac{1}{2}$

$\Rightarrow\sin\frac{A}{2}=\frac{1}{\sqrt{2}}$

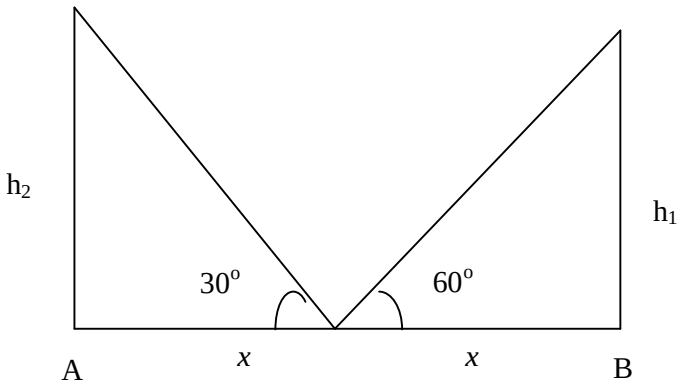
$A=90^0$

130. $\tan 60^0=\frac{h_1}{\frac{x}{2}}=h_1$

$\tan 30^0=\frac{h_2}{\frac{x}{2}}$

$$\frac{x}{2\sqrt{3}} = h_2$$

$$\frac{h_1}{h_2} = \frac{\frac{x\sqrt{3}}{2}}{\frac{x}{2\sqrt{3}}} \Rightarrow \frac{h_1}{h_2} = \frac{3}{1} \Rightarrow h_1 : h_2 = 3:1$$



131. Given α, β are roots of $x^2 + 5x + 2 = 0$

$\alpha + \beta = -5 \;\; \alpha\beta = 2$

$\alpha^2 + 5\alpha + 2 = 0 \;\; 5\alpha + 2 = -\alpha^2 \Rightarrow 5\beta + 2 = -\beta^2$

Now $\left(\frac{\alpha}{2+5\alpha}\right)^2 + \left(\frac{\beta}{2+5\beta}\right)^2 = \left(\frac{\alpha}{-\alpha^2}\right)^2 + \left(\frac{\beta}{-\beta^2}\right)^2 = \frac{1}{\alpha^2} + \frac{1}{\beta^2} = \frac{\alpha^2+\beta^2}{\alpha^2\beta^2}$

$= \frac{(\alpha+\beta)^2 - 2\alpha\beta}{(\alpha\beta)^2} = \frac{25-4}{4} = \frac{21}{4}$

132. $p + q = \frac{\pi}{2}$

$\tan\left(\frac{P}{2}\right) + \tan\left(\frac{Q}{2}\right) = \frac{-b}{a}$

$\tan\left(\frac{P}{2}\right)\tan\left(\frac{Q}{2}\right) = \frac{c}{a}$

Now $\frac{P}{2} + \frac{Q}{2} = \frac{\pi}{4}$

$$\frac{\tan\frac{P}{2} + \tan\frac{Q}{2}}{1 - \tan\frac{P}{2}\tan\frac{Q}{2}} = 1$$

$$\frac{\frac{-b}{a}}{1 - \frac{c}{a}} = 1$$

$$\frac{-b}{a-c} = 1$$

$$\frac{b}{c-a} = 1 \Rightarrow b = c - a$$

$c = a + b$

133. By option verification

134. $x^3+3px^2+3qx-8=0$

$\frac{a}{r}, a, ar$ in G.P

$\frac{a}{r}\times a\times ar=8$

$a^3=8$

$a=2$ is root of $8+12p6q-8=0$

$12p+6q=0$

$2p=-q$

$\frac{q}{p}=-2\Rightarrow\frac{q^3}{p^2}=-8$

135. α is a root $\Rightarrow\alpha^4-\alpha^3+1=0$

$\alpha^3(1-\alpha)=1$

β is a root $\Rightarrow\beta^4-\beta^3+1=0$

$\Rightarrow\beta^3(1-\beta)=1$

136. $\alpha+\beta+r=-p$

$\alpha+\beta=-p-r$

$\beta+r=-p-\alpha$

$r+\alpha=-p-\beta$

$\Rightarrow(-p-\alpha)(-p-\beta)(-p-r)=-\left[p^3+p^2(\alpha+\beta+r)+p(\alpha\beta+\beta r+r\alpha)+\alpha\beta r\right]$

$=r-pq$

137. R, D can be arranged in 2! Ways. Arrange two letters from 4 letters in ${}^4p_3$ ways and let total of this is one unit. With this unit and remaining are arranged in 3! Ways

Total $=2!{}^4p_3.3!$ ways

138. Here $n=4$, $r=4$

Sum of given digits $\left[\left({}^{n-1}P_{r-1}\times 111....r\ times\right)^{-}-{}^{n-2}P_{r-2}\times 111....(r-1)times\right]$

139. Given MISSISSIPPI $\Rightarrow$ MIIIP

Can be arranged in $\frac{7!}{2!4!}$ and in 8 gaps 4 S' s can be arranged in ${}^8c_4$ ways

140. First case $\Rightarrow {}^5c_4\times{}^8c_6=5\times 28=140$

Second case $\Rightarrow {}^5c_5\times{}^8c_5=1\times 56=56$

Total $=140+56=196$

141. $1!+2!+....100!=1!+2!+3!+4!+5!+(240\times M)$

$=153+204M$

142. Option verification

ELNADGI

143.

ax^2+bx+c

a	b	c
1	0	0
2	1	1
3	2	2
	3	3

Total $= 3\times 4\times 4 = 48$

144. Coefficient x^5 is $5_{c_1}\times 4_{c_3} + 5_{c_2}\times 4_{c_1} = 20+40 = 60$

145. $\left(1-3x+3x^2-x^3\right)^{2n} = (1-x)^{6x}$

Here n is even then middle is $6n_{c_{3n}}(-x)^{3n}$

146. $\left[\dfrac{100}{LCM\ of\ (4,5)}\right]+1 = \dfrac{100}{20}+1 = 5+1 = 6$

147. $\dfrac{z_1}{z_2} = \dfrac{-\sqrt{3}+i}{-\sqrt{3}-i}\times\dfrac{-\sqrt{3}+i}{-\sqrt{3}+i} = \dfrac{1-\sqrt{3}i}{2}$

Principle amplitude of $\dfrac{z_1}{z_2}$ is $\dfrac{-\pi}{3}$

148. $|z| = \left|z-\dfrac{4}{z}+\dfrac{4}{z}\right| \le \left|z-\dfrac{4}{z}\right|+\left|\dfrac{4}{z}\right| = 2+\dfrac{4}{|z|}$

$\Rightarrow |z|^2 = z|z|+4 \Rightarrow |z-1|^2 \le 5$

$\therefore |z| \le \sqrt{5}+1$

149. $\dfrac{a+bw+cw^2}{c+aw+bw^2}+\dfrac{a+bw+cw^2}{b+cw+aw^2} = \dfrac{1}{w}\left(\dfrac{aw+bw^2+c}{c+aw+bw^2}\right)+\dfrac{1}{w^2}\left(\dfrac{aw^2+b+cw}{b+cw+cw^2}\right)$

$= w^2+w = -1$

150. Given $x_n =$ c is $\left(\dfrac{\pi}{3^n}\right)$

$\therefore x_1x_2x_3....x_\infty = c$ is $\left(\dfrac{\pi}{3}+\dfrac{\pi}{3^2}+\dfrac{\pi}{3^3}+....\infty\right)$

$= c$ is $\pi\left(\dfrac{1}{3}+\dfrac{1}{3^2}+\dfrac{1}{3^3}+....\infty\right)$

$= c$ is $\dfrac{\pi}{2}$

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