SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR EAMCET | **EAMCET UNIT-1** | **Date: 10-04-2020**

Time: 3 Hours | **Max. Marks: 160 M**

MATHEMATICS-A

SYLLABUS : Upto Transformations, Trigonometric\Equations, Inverse Trigonometric Functions

1. **If** $\sin\theta+\cos\theta=m$ **and** $\sec\theta+\cos ec\theta=n$ **then** $n\left[(m+1)(m-1)\right]$ **equal to**

1) m 2) n 3) 2 m 4) 2 n

2. **If** $\tan\theta+\sec\theta=e^x$ **then** $\cos\theta$ **equals**

1) $\frac{e^x+e^{-x}}{2}$ 2) $\frac{2}{e^x+e^{-x}}$ 3) $\frac{e^x-e^{-x}}{2}$ 4) $\frac{e^x-e^{-x}}{e^x+e^{-x}}$

3. **If** $\tan A+\cot A=4$ **than** $\tan^4 x+\cot^4 x=$

1) 110 2) 191 3) 80 4) 194

4. **If** $\tan\alpha=\left[1+2^{-x}\right]^{-1}$, $\tan\beta=\left[1+2^{x+1}\right]^{-1}$ **than** $\alpha+\beta=$

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

5. **If** $\frac{\sin^4 x}{2}+\frac{\cos^4 x}{3}=\frac{1}{5}$ **then** $\tan^2 x=$

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

6. **A, B, C are in A.P and** $B=\frac{\pi}{4}$ **then** $\tan A\tan B\tan C=$

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

7. **If** $P=\frac{2\sin\theta}{1+\sin\theta+\cos\theta}$ **and** $Q=\frac{\cos\theta}{1+\sin\theta}$ **then**

1) PQ = 1 2) $\frac{Q}{P}=1$ 3) $Q-P=1$ 4) $P+Q=1$

8. $\frac{\cos12°-\sin12°}{\cos12°+\sin12°}+\frac{\sin147°}{\cos147°}=$

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

9. **If** $K_1=\tan27\theta-\tan\theta$, $K_2=\frac{\sin\theta}{\cos3\theta}+\frac{\sin3\theta}{\cos9\theta}+\frac{\sin9\theta}{\cos27\theta}$ **then**

1) $K_1=K_2$ 2) $K_1=2K_2$ 3) $K_1+K_2=2$ 4) $K_2=2K_1$

10. **The numerical value of** $\sin12°\sin48°\sin54°=\frac{1}{K}\Rightarrow K=$

1) $\frac{1}{8}$ 2) $\frac{1}{9}$ 3) 4 4) 8

11. **If** $\sin2\theta+\sin2\phi=\frac{1}{2}$ **and** $\cos2\theta+\cos2\phi=\frac{3}{2}$ **then** $\cos^2(\theta-\phi)=$

1) $\frac{3}{8}$ 2) $\frac{5}{8}$ 3) $\frac{3}{4}$ 4) $\frac{5}{4}$

12. **If** $a^2-2a\cos x+1=674$ **and** $\tan\frac{x}{2}=7\Rightarrow$ **the integral value of 'a' is**

1) 5 2) 10 3) 15 4) 25

13. **The value of** $\frac{\sin 55^\circ - \cos 55^\circ}{\sin 10^\circ}$ **is**

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

14. If $\left(\frac{\sin\theta}{\sin\phi}\right)^2 = \frac{\tan\theta}{\tan\phi} = 3$ then

1) $\tan^2\phi = \frac{1}{2}$ 2) $\tan^2\phi = \frac{1}{3}$ 3) $\tan^2\phi = \frac{1}{4}$ 4) $\tan^2\phi = \frac{2}{5}$

15. **If** $K\left[\tan^6\frac{\pi}{9} - 33\tan^4\frac{\pi}{9} + 27\tan^2\frac{\pi}{9}\right] = 921$ **then the value of 'K' is**

1) 304 2) 305 3) 306 4) 307

16. **The value of** $\frac{\tan 70^\circ - \tan 20^\circ}{\tan 50^\circ} =$

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

17. **If** $x \neq n\pi, x \neq (2n+1)\frac{\pi}{2}, n \in z$ **and** $\frac{1+\tan x}{1-\tan x} = 1 + \sin 2x$ **then** $\tan x = -1$

1) 1 2) 0 3) –1 4) –2

18. **If** $\sin\alpha = \frac{336}{625}$ **and** $450^\circ < \alpha < 540^\circ$ **then** $\sin\frac{\alpha}{4} =$

1) $\frac{1}{5\sqrt{2}}$ 2) $\frac{7}{25}$ 3) $\frac{4}{5}$ 4) $\frac{3}{5}$

19. **If** $\cos A = \frac{3}{4}$ **then the value of** $16\cos^2\frac{A}{2} - 32\sin\frac{A}{2}\sin\frac{5A}{2}$ **is**

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

20. **The value of** $32\sin^6 15^\circ - 48\sin^4 15^\circ + \sin^2 15^\circ$ is

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

21. **The least value of** $\cos^2\theta - 6\sin\theta\cos\theta + 3\sin^2\theta + 2$ **is**

1) $4+\sqrt{10}$ 2) $4-\sqrt{10}$ 3) 0 4) 4

22. **Range of** $f(x) = \sin^{20} x + \cos^{48} x$ **is**

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

23. **The least value of** $3\sec^2\theta + 12\cos ec^2\theta$ is

1) 32 2) 27 3) 12 4) 15

24. **The equation** $\cos 2x + a\sin x = 2a - 7$ possesses a solution if

1) a < 2 2) $2 \le a \le b$ 3) a > b 4) 1 < a < 2

25. **If the least value of** $f(x) = \sin^2 x + \sin x + 3$ is 'K' then the value of $4K - 3$ is

1) 8 2) 9 3) 10 4) 11

26. **The sum of all the solutions of the equation** $\cos x\cos(60^\circ + x)\cos(60 + x) = \frac{1}{4}, x \in [0, 6\pi]$ is

1) 15π 2) 30π 3) $110\frac{\pi}{3}$ 4) 45π

27. **The number of solutions of the equation** $\tan^2 x - \sec^{10} + 1 = 0$ in $(0,10)$ is

1) 3 2) 6 3) 10 4) 0

28. **The real roots of the equation** $\cos^7 x + \sin^4 x = 1$ in the interval $(-\pi,\pi)$ are

1) $0, \frac{\pi}{3}, -\frac{\pi}{3}$ 2) $0, \frac{\pi}{2}, -\frac{\pi}{2}$ 3) $0, \frac{\pi}{4}, -\frac{\pi}{4}$ 4) $0, \frac{\pi}{6}, -\frac{\pi}{6}$

29. **The number of values of 'x' in the interval** $[0,5\pi]$ satisfying the equation $3\sin^2 x-7\sin x+2=0$ is

1) 0 2) 5 3) 6 4) 10

30. **If** $2\cot^2\theta+2\sqrt{3}\cot\theta+4\cos ec\theta+8=0$ then $\theta=$

1) $n\pi\pm\frac{\pi}{6},n\in z$ 2) $n\pi+\frac{\pi}{3},n\in z$ 3) $2n\pi+11\frac{\pi}{6},n\in z$ 4) $2n\pi+\frac{\pi}{6},n\in z$

31. **The value of** $\tan^2\left(\sec^{-1}2\right)+\cot^2\left(\cos ec^{-1}3\right)$ is

1) 11 2) 12 3) 13 4) 14

32. **The value of 'a' for which** $ax^2+\sin^{-1}\left(x^2-2x+2\right)+\cos^{-1}\left(x^2-2x+2\right)=0$ has a real solution, is

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

33. **If** $\sin^{-1}\left(\frac{x}{5}\right)+\cos ec^{-1}\left(\frac{5}{4}\right)=\frac{\pi}{2}$ then value of 'x' is

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

34. **The number of integral values of 'k' for which the equation** $7\cos x+5\sin x=2k+1$ has a solution is

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

35. $\sin^{-1}x=2\sin^{-1}a$ has a solution for

1) $-\frac{1}{\sqrt{2}}\le a\le\frac{1}{\sqrt{2}}$ 2) $a\in R$ 3) $|a|>\frac{1}{\sqrt{2}}$ 4) $a\in R$

36. **Number of solutions of the equation** $\tan x+\sec x=2\cos x$, lying in the interval $[0,2\pi]$ is

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

37. **The number of real solutions of** $\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\frac{\pi}{2}$ is

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

38. **If** $\sin^{-1}\frac{1}{3}+\sin^{-1}\frac{2}{3}=\sin^{-1}x$ than 'x' is equal to

1) 0 2) $\frac{\sqrt{5}-4\sqrt{2}}{9}$ 3) $\frac{\sqrt{5}+4\sqrt{2}}{9}$ 4) $\frac{\sqrt{6}+5\sqrt{2}}{9}$

39. **If** $\sin^{-1}x+\sin^{-1}y=2\frac{\pi}{3}$ then $\cos^{-1}x+\cos^{-1}y=$

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

40. **The value of** $\cot 70^\circ+4\cos 70^\circ$ is

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

MATHEMATICS-B

SYLLABUS : Coordinate system, Locus, Change of Axes, Straight Lines

41. **The mid points of sides of the triangle are** $D(6,1);E(3,5);F(-1,-2)$ then the vertex opposite to D is

1) $(-4,2)$ 2) $(-4,5)$ 3) $(2,5)$ 4) $(10,8)$

42. **The orthocenter of the triangle is** $(2,1)$ and the circumcenter is $\left(\frac{7}{2},\frac{5}{2}\right)$ then the centroid is

1) $(2,3)$ 2) $(3,2)$ 3) $(2,2)$ 4) $(3,3)$

43. $(4,-3)$ and $(-9,7)$ are the two vertices of a triangle and $(1,4)$ is its centroid. The area of the triangle is

1) $\frac{138}{2}$ 2) $\frac{319}{2}$ 3) $\frac{183}{2}$ 4) $\frac{381}{2}$

44. **Origin is the orthocenter of** ΔABC where $A=(5,-1), B=(-2,3)$ then the orthocenter of ΔOAC is

1) $(-4,-7)$ 2) $(3,-2)$ 3) $(-2,3)$ 4) $(5,-1)$

45. **The sides of a triangle ABC are BC = 5, CA = 4, AB = 3 if A = (0, 0) and the bisector of the internal angle A meets BC in** $D=\left(\frac{12}{7},\frac{12}{7}\right)$ then the coordinates of the in centre are

1) $(2,2)$ 2) $(3,2)$ 3) $(2,3)$ 4) $(1,1)$

46. $P(3,7)$ is a point on the line joining A (1, 1) and B (6, 16) the harmonic conjugate of P w.r.t A and B is

1) $(9,29)$ 2) $(-9,29)$ 3) (9, –29) 4) (–9, –29)

47. **Origin is the orthocenter of the triangle formed by the points** $(5,-1),(-2,3)$ and $(-4,-7)$ then its nine point centre is

1) $\left(-\frac{1}{3},-\frac{5}{3}\right)$ 2) $(5,3)$ 3) $(1,1)$ 4) $\left(-\frac{1}{4},-\frac{5}{4}\right)$

48. **If the points** $(k,2-2k),(-k+1,2k)$ and $(-4-k,6-2k)$ are collinear then the value of 'k' are

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

49. **The centroid of the triangle formed by the points (0, 0),** $(\cos\theta,\sin\theta)$ and $(\sin\theta,-\cos\theta)$ lies on the line $y=2x$ then $\tan\theta=$

1) $\tan^{-1}2$ 2) $\tan^{-1}(3)$ 3) $\tan^{-1}(-3)$ 4) $\tan^{-1}(-2)$

50. **A line passes through a fixed point** $A(a,b)$ the locus of the foot of the perpendicular on it from origin.

1) $x^2+y^2+ax+by=0$ 2) $x^2+y^2-ax-by=0$ 3) $x^2+y^2+ax-by=0$ 4) $x^2+y^2-ax+by=0$

51. **If** $p,x_1,x_2,x_3.....$ and $q,y_1,y_2,y_3,....$ form two infinite AP's with common difference a and b respectively. Then locus of $p(\alpha,\beta)$ where $\alpha=\frac{1}{n}(x_1+x_2+...x_n)$ and $\beta=\frac{1}{n}(y_1+y_2+....y_n)$ os

1) $a(x-p)=b(y-q)$ 2) $p(x-a)=q(y-b)$ 3) $p(x-p)=b(y-q)$ 4) $b(x-p)=a(y-q)$

52. **The locus of the point** $x=\frac{t^2-1}{t^2+1}, y=\frac{2t}{t^2+1}$ is

1) $y^2=x$ 2) $x^2=y$ 3) $x^2+y^2=1$ 4) $x^2-y^2=1$

53. **A point moves so that its distance from y – axis is half of its distance from the origin. If the equation to its locus is** $ax^2+by^2=c$ then descending order of a, b, c is

1) a, b, c 2) b, c, a 3) c, b, a 4) a, c, b

54. **Through** (x_0,y_0) a variable line is drawn cutting the axes at A, B if OACB is a rectangle then the locus of C is

1) $\frac{x_0}{2x}+\frac{y_0}{2y}=1$ 2) $\frac{x_0}{x}+\frac{y_0}{y}=1$ 3) $\frac{x_0}{3x}+\frac{y_0}{3y}=1$ 4) $\frac{2x_0}{y}+\frac{2y_0}{x}=1$

55. **The locus of the point represented by** $x=t^2+t+1, y=t^2-t+1$ is

1) $x^2-2xy+y^2-2x-2y+4=0$ 2) $x^2+2xy+y^2-2x-2y+4=0$

3) $x^2-2xy+y^2+2x+2y+4=0$ 4) $x^2+2xy-y^2+2x+2y-4=0$

56. **Let** $A(0,4), B=(6,0)$ and 0 be the origin. A point p moves so that the area of $\Delta POA = 2\Delta POB$. The locus of 'p' is

1) $x^2+9y^2=0$ 2) $9x^2+y^2=0$ 3) $x^2-9y^2=0$ 4) $9x^2-y^2=0$

57. **If the first point of trisection of A,B is** $(t,2t)$ and the ends A,B moves on x and y axes respectively. The locus of the mid – point of AB is

1) $x=y$ 2) $2x=y$ 3) $4x=y$ 4) $x=4y$

58. **If the roots of the equation** $(x_1^2-a^2)m^2-2x_1y_1m+y_1^2-b^2=0$ are the slopes of two perpendicular lines intersecting at $p(x_1,y_1)$ then the locus of 'p' is

1) $x^2+y^2=a^2+b^2$ 2) $x^2+y^2=a^2-b^2$ 3) $x^2-y^2=a^2+b^2$ 4) $x^2-y^2=a^2-b^2$

59. **Let 'p' be a moving point such that if PA and PB are two tangents from p to the circle** $x^2+y^2=1$ then $\angle AOB = 60°$ where 0 is the origin. The locus of p is a circle of a radius.

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

60. **The locus represented by the equation** $x^2+4x+2y-8=0$ is

1) hyperbola 2) circle 3) ellipse 4) parabola

61. **The angle of rotation of the axes so that xy term in the equation** $5x^2+4\sqrt{3}xy+9y^2=8$ may be missing

1) 30° 2) 45° 3) 60° 4) 15°

62. **By translating the axes to (a, 2a) the equation** $x^2+y^2-2ax-4ay+a^2=0$ changes to

1) $x^2+y^2=a^2$ 2) $x^2+y^2=4a^2$ 3) $x^2+y^2=2a^2$ 4) $x^2+y^2=3a^2$

63. **Let A be the image of (2, –1) w.r.t y-axis. With out transforming the origin. The axes are turned through. An angle 45° in the clock wise direction then A in the new system is**

1) $\left(\frac{1}{\sqrt{2}},\frac{3}{\sqrt{2}}\right)$ 2) $\left(-\frac{1}{\sqrt{2}},-\frac{3}{\sqrt{2}}\right)$ 3) $\left(-\frac{3}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$ 4) $\left(\frac{1}{\sqrt{2}},-\frac{3}{\sqrt{2}}\right)$

64. **The point to which the axes be translated so as to remove the first degree terms in the equation** $2x^2+3xy-2y^2-7x+y-2=0$ is

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

65. **The angle of rotation of the axes to remove the xy term in the equation** $x^2+2\sqrt{3}xy-y^2=2$ is

1) 15° 2) 30° 3) 45° 4) 60°

66. **By rotating the axes through 180° the equation** $x-2y+3=0$ changes to

1) $x+2y-3=0$ 2) $x-2y+10=0$ 3) $x-2y-3=0$ 4) $x+2y+3=0$

67. **The straight lines** $7x-2y+10=0, 7x+2y-10=0$ and $y+2=0$ form a triangle which is

1) equilateral 2) isosceles 3) right angle 4) scalene triangle

68. **If the lines** $3y+4x=1, y=x+5$ and $5y+bx=3$ are concurrent then 'b' is

1) 1 2) 2 3) 6 4) 0

69. **The line** $3x+4y=24$ cuts the axes at A and B. The in centre of ΔOAB is

1) $(1,2)$ 2) $(2,2)$ 3) $(12,12)$ 4) $(2,12)$

70. **The algebraic sum of the perpendicular distances from** $(2,0),(0,2),(1,1)$ to a variable line is zero. The line passes through a fixed point given by

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

71. **The line** $3x+2y=24$ meets the axes in A and B. The perpendicular of AB meets the line $y+1=0$ at C then $\Delta ABC =$

1) 81 2) 91 3) 71 4) 61

72. **The slope of a line through A (1, 1) is 1. The point on the line at distance** $5\sqrt{2}$ from A

1) $(-6,-6)$ 2) $(4,-4)$ 3) $(6,6)$ 4) $(-4,4)$

73. The area enclosed with in the lines $|x|+|y|=1$ is

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

74. If the straight line $x+y+1=0$ is changed in to the form $x\cos\alpha+y\sin\alpha=\rho$ then $\alpha=$

1) $\frac{\pi}{4}$ 2) $\frac{3\pi}{4}$ 3) $\frac{5\pi}{4}$ 4) $\frac{7\pi}{4}$

75. A line L passes through p(1, 2) such that p bisects the line segments intercepted between the axes than the perpendicular distance of L from the origin

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

76. If (–4, 5) is one vertex and $7x-y+8=0$ is one diagonal of a square then the perpendicular distance from (–3, 4) to the other diagonal is

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

77. If one vertex of on equilateral triangle of side 'a' lies at the origin and the other lies on the line $x-y\sqrt{3}=0$ then the third vertex is

1) $(a,0)$ 2) $(-a,0)$ 3) $(0,a)$ 4) (a,a)

78. If a ray travelling along the line x = 1 gets reflected form the line $x+y=1$ then the equation of the line along which the reflected ray travel is

1) $y=0$ 2) $x-y=1$ 3) $x=0$ 4) $x+y=1$

79. If a, b, c are three consecutive odd integers then the line $ax-by+c=0$ passes through the point

1) $(-1,2)$ 2) $(1,2)$ 3) $(2,3)$ 4) $(0,1)$

80. If the point (a, a) falls between the lines $|x+y|=2$ then

1) $|a|=2$ 2) $|a|=1$ 3) $|a|<1$ 4) $|a|=\frac{1}{2}$

PHYSICS

SYLLABUS: UNITS AND MEASUREMENTS,MOTION IN A STRAIGHT LINE,MOTION IN A PLANE, LAWS OF MOTION

81. What is the correct number of significant figures in0.0003026 ?

1) Four 2)Seven 3)Eight 4) Six

82. Which of the following is the most accurate?

1) 200.0 m 2) $20\times10^{1}m$ 3) $2\times10^{2}m$ 4) $0.2\times10^{3}m$

83. The physical quantity that does not have the dimensionalformula $ML^{-1}T^{-2}$ is

1) Force 2)Pressure 3)Stress 4) Modulus of elasticity

84. If unit of length and force are increased 4 times. The unit of energy

1) is increased by 4 times 2) is increased by 16 times
3) is increased by 8 times 4) remains unchanged

85. Resistance R = V/I, here V= (100 ± 5) V and I = (100 ± 0.2) A. Find percentage error in R.

1) 5% 2)2% 3)7% 4)3%

86. The ratio of the dimensions of Planck's constant and thatof the moment of inertia is the dimensions of

1) Time 2) Frequency 3)Angularmomentum 4)Velocity

87. The graph between displacement and time for a particle moving with uniform acceleration is a/an

1) straight line with a positive slope 2) parabola
3) ellipse 4) straight line parallel to time axis

88. The ball is projected up from ground with speed 30 m/sec.What is the average velocity for time 0 to 4 sec?

1) 10 m/sec 2) 20m/sec 3)15m/sec 4) zero

89. A body moves in straight line with velocity v_1 for 1/3rd time and for remaining time with v_2. Find average velocity

1) $\frac{V_1}{3}+\frac{2V_2}{3}$ 2) $\frac{V_1}{3}+\frac{V_2}{3}$ 3) $\frac{2V_1}{3}+\frac{V_2}{3}$ 4) $2V_1+\frac{V_2}{3}$

90. A particle moves from (2,3) m to (4,1) m. The displacement vector is

1) 2i + 2jm 2) –2i – 2jm 3) 2i – 2jm 4) –2i + 2jm

91. If Position of a particle is given by $x = (4t^2 – 8t)$, then which of the following is true?

1) Acceleration is zero at t = 0 2) Velocity is zero at t = 0

3) Velocity is zero at t = 1s 4) Velocity and acceleration will never be zero

92. A man leaves his house for a cycle ride. He comes back to his house after half-an-hour after covering a distance of one km. What is his average velocity for the ride ?

1) zero 2) 2 km h^{-1} 3) 10 km s^{-1} 4) 0.5 km s^{-1}

93. A passenger in a moving train tosses a coin. If the coin falls behind him, the train must be moving with

1) an acceleration 2) a deceleration 3) a uniform speed 4) all of the above

94. A ball is dropped from a high rise platform at t = 0 starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at t = 18s. What is the value of v? (take g = 10 m/s2)

1) 75 m/s **2)** 55 m/s **3)** 40 m/s **4)** 60 m/s

95. A ball is released from the top of tower of height h metre. It takes T second to reach the ground. What is the position of the ball in T/3 second ?

1) h/9 metre from the ground 2) 7h/9 metre from the ground

3) 8h/9 metre from the ground 4) 17h/18 metre from the ground

96. The ratio of distances traversed in successive intervals of time when a body falls freely under gravity from certain height is

1) 1 : 2 : 3 2) 1 : 5 : 9 3) 1 : 3 : 5 4) $\sqrt{1}:\sqrt{2}:\sqrt{3}$

97. The angle between the direction of $\hat{i}$ and $(\hat{i}+\hat{j})$ is

1) 90° 2) 0° 3) 45° 4) 180°

98. In the projectile motion, if air resistance is ignored, the horizontal motion is at

1) constant acceleration 2) constant velocity

3) variable acceleration 4) constant retardation

99. A moves with 65 km/h while B is coming back of A with 80 km/h. The relative velocity of B with respect to A is

1) 80 km/h 2) 60 km/h 3) 15 km/h 4) 145 km/h

100. The sum of magnitudes of two forces acting at a point is 16 N and their resultant $8\sqrt{3}$ N is at 90° with the force of smaller magnitude. The two forces (in N) are

1) 11, 5 2) 9, 7 3) 6, 10 4) 2, 14

101. The coordinates of a particle moving in x–y plane at any instant of time t are $x = 4t^2$; $y = 3t^2$. The speed of the particle at that instant is

1) 10t 2)5t 3)3t 4)2t

102. A boat which has a speed of 5 km h^{-1} in still water crosses a river of width 1 km along the shortest possible path in 15minutes. The velocity of the river water is

1) 1 km h^{-1} 2) 3 km h^{-1} 3) 4 km h^{-1} 4) $\sqrt{41}$ kmh^{-1}

103. A missile is fired for maximum range with an initial velocity of 20 m/s. If g = 10 m/s^2, the range of the missile is

1) 40m 2)50m 3)60m 4) 20m

104. A body projected at an angle with the horizontal has a range 300 m. If the time of flight is 6 s, then the horizontal component of velocity is

1) 30m/sec 2)50m/sec 3)40m/sec 4) 45m/sec

105. A cricket ball is hit at an angle of 30° to the horizontal with a kinetic energy E. Its kinetic energy when it reaches the highest point is

1) E/2 2) 0 3)2E/3 4) 3E/4

106. When a particle is in uniform circular motion it does not have

1) radial velocity and radial acceleration
2) radial velocity and tangential acceleration
3) tangential velocity and radial acceleration
4) tangential velocity and transverse acceleration

107. A particle describes uniform circular motion in a circle of radius 2 m, with the angular speed of 2 rad s^{-1}. The magnitude of the change in its velocity in 2s is

1)0m/sec 2) $2\sqrt{2}$ m/sec 3)8m/sec 4)4m/sec

108. A body projected horizontally with a velocity 'v' from a height 'h' has a range 'R'. With what velocity a body is to be projected horizontally from a height h/2 to have the same range ?

1) $\sqrt{2}V$ 2)2V 3)6V 4)8V

109. A bomb is dropped from an aeroplane flying horizontally with a velocity of 720 kmph at an altitude of 980m. Time taken by the bomb to hit the ground is

1)1sec 2)7.2sec 3)14.14sec 4) 0.15sec

110. In between two hills of heights 100m and 92m, there is a valley of breadth 16m. If a vehicle jumps from the first hill to the second one, the minimum velocity of the vehicle is (assume g = 9 m/s^2)

1) 16m/s 2)12m/s 3)9m/s 4)10m/s

111. If a stone of mass 0.05 kg is thrown out a window of a trainmoving at a constant speed of 100 km/h then magnitude of net force acting on the stone is

1) 05N 2)Zero 3)50N 4) 5N

112. When an elevator cabin falls down, the cabin and all the bodies fixed in the cabin are accelerated with respect to

1) ceiling of elevator 2) floor of elevator
3) man standing on earth 4) man standing in the cabin

113. If rope of lift breaks suddenly, the tension exerted by the surface of lift (*a* = acceleration of lift)

1) mg 2) $m(g + a)$ 3) $m(g - a)$ 4) 0

114. A hammer weighing 3 kg strikes the head of a nail with a speed of 2 ms–1 drives it by l cm into the wall. The impulse imparted to the wall is

1) 6Ns 2)3Ns 3)2Ns 4)12Ns

115. The time required to stop a car of mass 800 kg, moving at a speed of 20 ms^{-1} over a distance of 25 m is

1)2s 2)2.5s 3)4s 4)4.5s

116. If *n* bullets each of mass *m* are fired with a velocity *v* per second from a machine gun, the force required to hold the gun in position is

1) $(n + 1)\,mv$ 2) $\frac{mv}{n^2}$ 3) $\frac{mv}{n}$ 4) mnv

117. A 5kg stone falls from a height of 1000m and penetrates 2m in a layer of sanddd. The time of penetration is

1) 14.285 s 2) 0.0285 s 3) 7.146 s 4) 0.285 s

118. A machine gun fires a bullet of mass 40g with a velocity 1200 ms^{-1} . The man holding it can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?

1) One 2)Three 3)Two 4)Four

119. A 2 kg box sits on a 3 kg box which sits on a 5 kg box. The 5 kg box rests on a table top. What is the normal force exerted by the 5 kg box on the 3 kg box?

1) 19.6N 2)29.4N 3)49N 4)98N

120 A 6.0 kg object is suspended by a vertical string from the ceiling of an elevator which is accelerating upward at a rate of2.18m/s^2. . The tension in the string is.

1) 11N 2)70N 3)48N 4) 59N

CHEMISTRY

***SYLLABUS**: Periodic Classification Of Elements, Atomic Structure, Chemical Bonding.*

121. The following sets of quantum numbers represent four electrons in an atom
i) n=4, l=1 ii) n=4, l=0 iii) n=3, l=2, iv) n=3, l=0
the sequence representing increasing order of energy is

1) iv < ii < iii < i 2) ii < iv < i < iii 3) i < iii < ii < iv 4) iii < i < iv < ii

122. If uncertainity in the position of electron is 0.1A0 the uncertinity in its velocity is

1) $5.8\times10^{10} cm/\sec$ 2) $5.8\times10^{8} cm/\sec$ 3) $5.8\times10^{9} cm/\sec$ 4) $5.8\times10^{11} cm/\sec$

123. The number of waves made by an electron moving in an orbit having a maximum magnetic quantum number of +4 is

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

124. A photon has an energy of $5\times10^{-11} erg$. Its wavelength is

1) $4A^0$ 2) $40A^0$ 3) $400A^0$ 4) $4000A^0$

125. If the ionization energy and electron affinity of an element are 275 and 86 K.cal mol^{-1}. Respectively the electronegativity of that element on mullikensec is

1) 2.9 2) 0.0 3) 4.0 4) 1.9

126. Which of the following has the lowest boiling point

1) CH_4 2) H_2O 3) HF 4) C_2H_5OH

127. Match the following in view of highest values

List- 1	List- 2
A) Ionization potential	1) Chlorine
B) Electronegativity	2) Caesium
C) Electron state	3) Helium
D) Oxidation state	4) Fluorine
	5) Osmium

The correct match is

	A	B	C	D
1)	4	3	2	1
2)	3	4	1	5
3)	1	2	3	4
4)	2	1	4	5

128. A sudden jump between the values of second and third ionization energies of an element would be associated with the electronic configuration

1) $1s^2 2s^2 2p^6 3s^2 3p^2$ 2) $1s^2 2s^2 2p^6 3s^2$ 3) $1s^2 2s^2 2p^6 3s^2 3P^1$ 4) $1s^2 2s^2 2p^6 3s^1$

129. Types of Hybridisation of the four C atoms from left to right in the compound
$CH_3 - CH - = C = CH_3$

1) Sp^3, Sp^2, Sp, Sp^2 2) Sp^2, Sp^3, Sp^2, Sp 3) Sp^2, Sp, Sp^2, Sp^3 4) Sp^2, Sp^2, Sp^2, Sp^2

130. The species without dative bond is

1) H_3O^+ 2) NH_4OH 3) CO 4) CO_2

131. The set of diamagnetic molecules are

1) B_2, C_2, N_2 2) O_2, N_2, F_2 3) C_2, N_2, F_2 4) B_2, O_2^{2-}, N_2

132. The correct order of bond length in O_2^+, O_2, O_2^- and O_2^{2-} is

1) $O_2^{2-} > O_2^- > O_2 > O_2^+$ 2) $O_2^+ > O_2 > O_2^- > O_2^{2-}$ 3) $O_2 > O_2^- > O_2^{2-} > O_2^+$ 4) $O_2^- > O_2^{2-} > O_2^+ > O_2$

133. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)} = \frac{h}{2\pi}$

This momentum for an 'S' electron will be given by

1) zero 2) $\frac{h}{2\pi}$ 3) $\sqrt{2}\frac{h}{2\pi}$ 4) $+\frac{1}{2} = \frac{h}{2\pi}$

134. The atomic number of an element is 35. What is the total number of an elements present in all the p – orbitals in the ground state an atom of that element?

1) 6 2) 11 3) 17 4) 23

135. When an excited electron returns from 4th order to 1st orbit, number of spectral lines formation in visible region is

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

136. The first four ionization energy values of element M are 270, 560, 890 and 607 the formula of its oxide is

1) MO_2 2) MO 3) M_2O_3 4) M_3O_2

137. Pair of ions with similar ionic radii

1) Li^+, Mg^{2+} 2) Li^+, Na^+ 3) Mg^{2+}, Ca^{2+} 4) Mg^{2+}, Ca

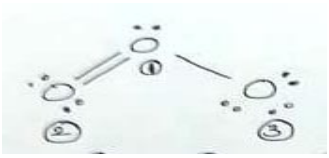
138. In which of the following process energy is released

1) $Na_{(g)} \rightarrow Na^+_{(g)} + e^-$ 2) $O^-_{(g)} + e^- \rightarrow O^{-2}_{(g)}$ 3) $N^{-2}_{(g)} + e^- \rightarrow N^{-3}_{(g)}$ 4) $O_{(g)} + e^- \rightarrow O^-_{(g)}$

139. Metal used as catalyst in the hydrogenation of vegetable oils is

1) Iron 2) Molybdenum 3) Nickel 4) Sodium

140. In O_3 molecule



The formal charges of Oxygen atoms 1, 2, 3 are respectively

1) -1, 0, +1 2) 0, -1, +1 3) 0, +1, -1 4) +1, 0, -1

141. In the periodic table an element with atomic numbers 56 belongs to

1) IIIA group, 6th period 2) IVA group, 5th period
3) IIA group, 6th period 4) IVA group, 6th period

142. The equation corresponding to the wave number of spectral lines in paschen series of hydrogen atom is

1) $R\left[\frac{1}{4^2} - \frac{1}{5^2}\right]$ 2) $R\left[\frac{1}{3^2} - \frac{1}{4^2}\right]$ 3) $R\left[\frac{1}{2^2} - \frac{1}{3^2}\right]$ 4) $R\left[\frac{1}{5^2} - \frac{1}{6^2}\right]$

143. Which one of the following has $d\pi - p\pi$ bonding?

1) NO_3^- 2) SO_3^{-2} 3) BO_3^{-3} 4) CO_3^{-2}

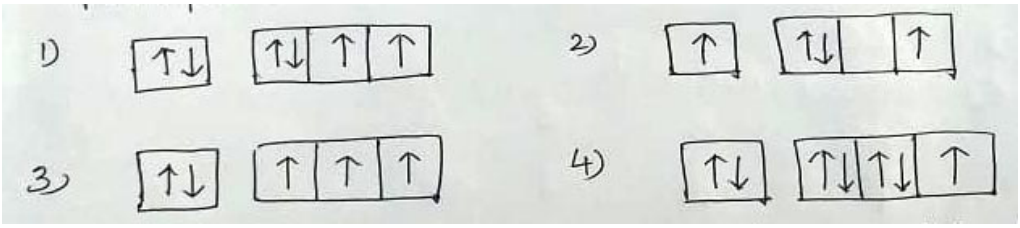
144. Identity the correct statement from the given alternatives

1) Inter molecular hydrogen bonding is not found to occur in 2- hydroxyl benzaldelyde
2) The boiling point of hydrogen iodide (HI) is more than hydrogen fluoride (HF)
3) The dipolemoment of CH_3Cl, is not equal to zero
4) CH_3F has a larger dipolemoment than that of CH_3Cl

145. dsp^2 hydribridisation is observed in

1) Scl_4 2) $\left[Ni(CN)_4\right]^{-2}$ 3) SF_6 4) PCl_5

146. Which of the following does not obey Aufbau's principal?



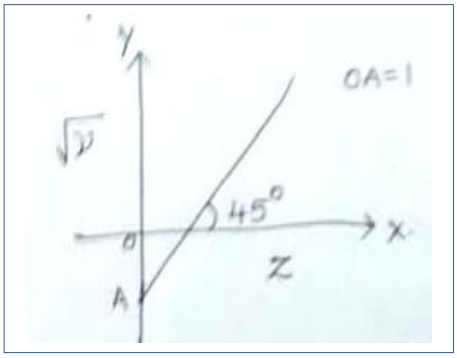
147. The number of radial nodes and nodal planes in '4p' orbital are respectively

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

148. The IUPAC symbol of the element with atomic number 109 is

1) U_{us} 2) U_{up} 3) U_{ne} 4) U_{un}

149. The frequency of the characteristic, X – ray of metal barget 'M' is 2500 cm^{-1} and the graph between $\sqrt{\vartheta}$ vs 'Z' is as follows. Then atomic number of that metal (m) is



1) 50 2) 51 3) 25 4) 49

150. Some oxides are shown in List – I and their nature is shown in List - II

List- 1	**List- 2**
A) MgO	**1) Amphoteric**
B) BeO	**2) Acidic**
C) P_2O_5	**3) Neutral**
D) CO	**4) Basic**

The correct match is

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

151. If the bond length and dipolemoment of a diatermic molecule are 1.25A^0 and 1.0D respectively then what the percentage ionic character of the bond?

1) 10.66 2) 12.33 3) 16.66 4) 19.33

152. The 4f – subshell is successively filled for

1) Rare earths 2) Transition elements 3) Rare gases 4) Alkaline earth metals

153. A hydrogen molecule at 200^{0}C moves at a velocity of 2.2 x 10^5 cm/sec. Its de – Broglie wavelength is in the order of (m = 2 x 1.6 x 10^{-24})

1) 10^4 A^0 2) 1 A^0 3) 10^3 A^0 4) 10 A^0

154. Which one of the following pairs of ions have the same electronic configuration?

1) Cr^{+3}, Fe^{+3} 2) Fe^{+3}, Mn^{2+} 3) Fe^{3+}, CO^{3+} 4) SC^{3+}, Cr^{3+}

155. The most electropositive element is

1) I 2) Mg 3) Cs 4) Li

156. The total number of gaseous elements are

1) 6 2) 9 3) 10 4) 11

157. Which of the following sets of species does not follow octet – rule

1) $CO, PCl_5, PCl_3, AlCl_3$ 2) $AlCl_3, BF_3, PCl_5, SF_6$

3) CO, B_2H_6, NH_3, H_2O 4) $H_2O, NH_3, CO_2, AlCl_3$

158. Which of the following bond has high covalent strength?

1) $Cl-F$ 2) $F-F$ 3) $C-Cl$ 4) $C-F$

159. The rare gas that is most abundant in the atmosphere

1) He 2) Ne 3) Ar 4) Kr

160. Ratio of radii of second and first Bohr orbits of H - atom

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

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SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR EAMCET | **UNIT -1** | **Date: 10-04-2020**

Time: 3 Hours | **Max. Marks: 160 M**

MATHEMATICS

1) 3	**2)** 2	**3)** 4	**4)** 2	**5)** 1	**6)** 2	**7)** 4	**8)** 4	**9)** 2	**10)** 4
11) 2	**12)** 4	**13)** 4	**14)** 2	**15)** 4	**16)** 2	**17)** 3	**18)** 1	**19)** 2	**20)** 2
21) 2	**22)** 2	**23)** 2	**24)** 2	**25)** 1	**26)** 2	**27)** 1	**28)** 2	**29)** 3	**30)** 3
31) 1	**32)** 2	**33)** 2	**34)** 2	**35)** 1	**36)** 3	**37)** 3	**38)** 3	**39)** 2	**40)** 2
41) 1	**42)** 2	**43)** 3	**44)** 3	**45)** 4	**46)** 4	**47)** 4	**48)** 1	**49)** 3	**50)** 2
51) 4	**52)** 3	**53)** 4	**54)** 2	**55)** 1	**56)** 3	**57)** 3	**58)** 2	**59)** 1	**60)** 4
61) 3	**62)** 2	**63)** 2	**64)** 2	**65)** 2	**66)** 3	**67)** 2	**68)** 3	**69)** 2	**70)** 3
71) 2	**72)** 3	**73)** 2	**74)** 3	**75)** 1	**76)** 3	**77)** 3	**78)** 1	**79)** 2	**80)** 3

PHYSICS

81)1	82)1	83)1	84)2	85)3	86)2	87)2	88)1	89)1	90)3
91)3	92)1	93)1	94)1	95)3	96)3	97)3	98)2	99)3	100)4
101)1	102)2	103)1	104)2	105)4	106)3	107)3	108)1	109)3	110)2
111)1	112)3	113)4	114)1	115)2	116)4	117)2	118)2	119)3	120)2

CHEMISTRY

121) 1	122) 2	123) 2	124) 3	125) 1	126) 1	127) 2	128) 2	129) 1	130) 4
131) 3	132) 1	133) 1	134) 3	135) 2	136) 3	137) 1	138) 4	139) 3	140) 4
141) 3	142) 2	143) 2	144) 3	145) 2	146) 2	147) 1	148) 3	149) 2	150) 2
151) 3	152) 1	153) 2	154) 2	155) 3	156) 4	157) 2	158) 4	159) 3	160) 2

HINTS & SOLUTIONS

MATHEMATICS

1. $n\left(m^2-2\right)=\left(\sec\theta+\cos ec\theta\right)\left(2\sin\theta\cos\theta\right)=\dfrac{\sin\theta+\cos\theta}{\sin\theta\cos\theta}2\sin\theta\cos\theta=2m$

2. $\sec\theta+\tan\theta=e^{x}\rightarrow(1)$, $\sec\theta-\tan\theta=e^{-x}\rightarrow(2)$

   $(1)+(2)\Rightarrow\cos\theta\dfrac{2}{e^{x}+e^{-x}}$

3. $\tan A+\cot A=4$

   $\Rightarrow\tan^2 A+\cot^2 A+2\tan A\cot A$

   $\Rightarrow\tan^4 A+\cot^4 A=194$

4. $\tan\left[\alpha+\beta\right)=\dfrac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}=\dfrac{\dfrac{1}{1+\dfrac{1}{2^{x}}}+\dfrac{1}{1+2^{x+1}}}{1-\dfrac{1}{1+2^{x}}\dfrac{1}{1+2^{x+1}}}$

   $=\dfrac{2^{x}+2^{x+x+1}+2^{x}+1}{1+2^{x}+1.2^{x}+2.2^{x+x}-2^{x}}=1$

   $\Rightarrow\alpha+\beta=\dfrac{\pi}{4}$

5. $\dfrac{3\sin^4 x+2\cos^4 x}{6}=\dfrac{1}{5}$

   $\Rightarrow\sin^4 x+2\left(\sin^4 x+\cos^4 x\right)=\dfrac{6}{5}$

   $\Rightarrow\tan^2 x=\dfrac{2}{3}$

6. $B=\dfrac{\pi}{4}\Rightarrow 2B=A+C\Rightarrow A+C=90°$

   $\tan A\tan B\tan C=1$

7. $P+Q=\dfrac{2\sin\theta}{1+\sin\theta+\cos\theta}+\dfrac{\cos\theta}{1+\sin\theta}$

   $=\dfrac{1+2\sin\theta+\sin^2\theta+\cos\theta+\sin\theta\cos\theta}{1+2\sin\theta+\sin^2\theta+\cos\theta+\sin\theta\cos\theta}=1$

8. $\tan\left(45°-12°\right)+\tan 147°+\tan 33°+\tan\left(180°-33°\right)$

   $\Rightarrow\tan 33°-\tan 33°=0$

9. $K_1=\tan 27\theta-\tan 9\theta-\tan 3\theta-\tan\theta$

   $\Rightarrow\tan 27\theta-\tan 9\theta=2\dfrac{\sin 9\theta}{\cos 27\theta}$

   $\Rightarrow K_1=2K_2$

10. $\dfrac{\sin 12°\sin\left(60°-12°\right)\sin\left(60°+12°\right)\cos 36°}{\sin 72°}$

    $\Rightarrow K=8$

11. $\sin 2\theta+\sin 2\phi=\dfrac{1}{2}\rightarrow(1)$, $\cos 2\theta+\cos 2\phi=\dfrac{3}{2}\rightarrow(2)$

    $(1)^2+(2)^2$

    $\Rightarrow 1+\cos 2\left(\theta-\phi\right)=\dfrac{5}{4}\Rightarrow 2\cos^2\left(\theta-\phi\right)=\dfrac{5}{4}$

$\Rightarrow \cos^2[\theta-\phi]=\frac{5}{4}$

12. $674=a^2-2a\left(\frac{1-\tan^2\frac{x}{2}}{1+\tan^2\frac{x}{2}}\right)+1$

$\Rightarrow 25a^2+48a-673\times 25=0$

$\Rightarrow (a-25)(25a+673)=0\Rightarrow a\in z$

$\Rightarrow a=25$

13. $\frac{\sin 55^\circ-\sin 35^\circ}{\sin 10^\circ}=\frac{2\cos 45^\circ\sin 10^\circ}{\sin 10^\circ}=\sqrt{2}$

14. $\left(\frac{\sin\theta}{\sin\phi}\right)=\frac{\tan\theta}{\tan\phi}\Rightarrow\frac{\sin\theta}{\sin\phi}\frac{\sin\theta}{\sin\phi}=\frac{\sin\theta}{\cos\phi}\frac{\cos\phi}{\sin\phi}$

$\Rightarrow\frac{6\tan\phi}{1+\tan^2\phi}=\frac{2\tan\phi}{1+\tan^2\phi}\Rightarrow\tan^2\phi=\frac{1}{3}$

15. $\sqrt{3}=\tan\frac{\pi}{3}=\tan.\frac{\pi}{9}=\frac{3\tan\frac{\pi}{9}-\tan^3\frac{\pi}{9}}{1-3\tan^2\frac{\pi}{9}}$

$\Rightarrow 3k=921\Rightarrow k=307$

16. $\frac{\sin(70^\circ-20^\circ)}{\cos 70^\circ\cos 20^\circ\left(\frac{\sin 50^\circ}{\cos 50^\circ}\right)}=\frac{\cos 50^\circ}{\cos 70^\circ\cos 20^\circ}$

$=\frac{\sin 40^\circ}{\sin 20^\circ\cos 20^\circ}=2$

17. $\frac{1+\tan x}{1-\tan x}=1+\frac{2\tan x}{1+\tan^2 x}\Rightarrow\frac{2\tan x}{1-\tan x}=\frac{2\tan x}{1+\tan^2 x}$

$\Rightarrow 1-\tan x=1+\tan^2 x\Rightarrow\tan x=-1$

18. $\frac{2}{4}\in Q_2\Rightarrow\sin\frac{\alpha}{4}=\sqrt{\frac{1-\cos\frac{\alpha}{2}}{2}}$

$=\sqrt{\frac{1}{2}\left(\frac{24}{25}\right)}=\frac{1}{5\sqrt{2}}$

19. $\cos A=\frac{3}{4}$

$=16\left[\frac{1+\frac{3}{4}}{2}-\left(2\left(\frac{3}{4}\right)^2-1\right)+4\left(\frac{3}{4}\right)^3-3\left(\frac{3}{4}\right)\right]$

$=8+6-18+16+27-36$

$=3$

20. $\sin 3\theta=3\sin\theta-4\sin^3\theta$

Put $\theta=15^\circ$

$\frac{1}{2}=9\sin^2 15^\circ+16\sin^6 15^\circ-24\sin^4 15^\circ-24\sin^4 15^\circ$

$\Rightarrow 32\sin^6 15^\circ-48\sin^4 15^\circ+18\sin^2 15^\circ=1$

21. $\frac{1+\cos 2\theta}{1}-3\sin 2\theta+3\frac{[1-\cos 2\theta]}{2}+2$

$=4-(\cos 2\theta+3\sin 2\theta)$

Least value $=4-\sqrt{10}\left(c-\sqrt{a^2+b^2}\right)$

22. $0\le \sin^2 x\le 1, 0\le \cos^2 x\le 1\Rightarrow 0\le \sin^{20}\theta\le \sin^2 x$

$0<\sin^{20}\theta+\cos^{40}\theta\le \sin^2\theta+\cos^2\theta\Rightarrow 0<f(x)\le 1$

Range $=[0,1]$

23. $3\left[1+\tan^2\theta\right]+12\left[1+\cot^2\theta\right]$

$=15+3\tan^2\theta+12\cot\theta\ge 15+2\sqrt{3\times 12}\ge 27$

24. $1-2\sin^2 x+a\sin x=2a-7$

$\Rightarrow 2\sin^2 x-a\sin x+2a-8=0$

$\Rightarrow -1\le \sin x\le 1\Rightarrow -1\le \frac{a-4}{2}\le 1$

$\Rightarrow 2\le a\le 6$

25. $\left[\sin x+\frac{1}{2}\right]^2+\frac{11}{4}\ge\frac{11}{4}\Rightarrow k=\frac{11}{4}$

$\Rightarrow 4k-3=8$

26. $\frac{1}{4}\cos 3x=\frac{1}{4}\Rightarrow \cos 3x=1$

$0\le x\le 6\pi\Rightarrow 0\le 3x\le 18\pi$

Sum of solutions $=0+\frac{2\pi}{3}+\frac{4\pi}{3}+...+\frac{18\pi}{3}=30\pi$

27. $\sec^2 x-\sec^{10} x=0\Rightarrow \sec^2 x\left[1-\sec^8 x\right]=0$

$\Rightarrow \cos=\pm 1\Rightarrow x=n\pi, n\in z$

$\Rightarrow x\in\{\pi,2\pi,3\pi\}\in(0,10)$

No. of solutions = 3

28. $\cos^7 x=1-\sin^4 x\Rightarrow \cos^7 x=\left(1+\sin^2 x\right)\cos^2 x$

$\Rightarrow x=0,\frac{\pi}{2},-\frac{\pi}{2}$

29. $3\sin^2 x-6\sin x-\sin x+2=0$

But $\sin x\ne 2\Rightarrow \sin x=\frac{1}{3}$

Sinx is positive in 1st , 2nd quadrant

No. of solutions = 2 + 2 + 2 = 6

30. $\cot^2\theta+2\sqrt{3}\cot\theta+\left(\sqrt{3}\right)^2+\cot^2\theta+4\cos ec\theta+8=0$

$\Rightarrow \cot\theta=-\sqrt{3}, \cos ec\theta=-2$

$\Rightarrow \theta=2n\pi+11\frac{\pi}{6} n\in z$

31. $\sec^{-1}2=\alpha\Rightarrow \sec\alpha=2\Rightarrow \tan^2\alpha=3$

$\cos ec^{-1}3=\beta\Rightarrow \cos ec\beta=3\Rightarrow \cot^2\beta=8$

$E=3+8=11$

32. $ax^2+\sin^{-1}\left((x-1)^2+1\right)+\cos^{-1}\left((x-1)^2+1\right)=0$

Is meaning full for x = 1

$\Rightarrow a = -\frac{\pi}{2}$

33. $\sin^{-1}\left(\frac{x}{5}\right) + \cos ec^{-1}\left(\frac{5}{4}\right) = \frac{\pi}{2}$

$\Rightarrow \sin^{-1}\frac{x}{5} + \cos^{-1}\frac{3}{5} = \frac{\pi}{2}$

$\Rightarrow x = 3$

34. $-\sqrt{74} \le 7\cos x + 5\sin x \le \sqrt{74}$

$\Rightarrow k = -\frac{8.6-1}{2} \le k \le \frac{8.6-1}{2} \Rightarrow -4.8 \le k \le 3.8$

No. of values of 'k' is '8'

35. $-\frac{\pi}{2} \le \sin^{-1} x \le \frac{\pi}{2} \Rightarrow -\frac{\pi}{2} \le 2\sin^{-1} a \le \frac{\pi}{2}$

$-\frac{\pi}{4} \le \sin^{-1} a \le \frac{\pi}{4} \Rightarrow -\frac{1}{\sqrt{2}} \le a = \sqrt{2}$

36. $\frac{\sin x}{\cos x} + \frac{1}{\cos x} = 2\cos x \Rightarrow \sin x + 1$

$\Rightarrow x = \frac{\pi}{6}, \frac{5\pi}{6}, x = \frac{3\pi}{2}$ does not

Satisfy given equation no. of solutions = 2

37. $\tan^{-1}\sqrt{x(x+1)}$ is defined if $x(x+1) \ge 0$

$\sin^{-1}\sqrt{x^2+x+1}$ is defined if $0 \le x^2+x+1 \le 1$

$\Rightarrow x^2 + x \le 0 \Rightarrow x(x+1) \le 0 \Rightarrow x = 0, -1$

38. $\sin^{-1} x + \sin^{-1} y = \sin^{-1}\left(x\sqrt{1-y^2} + y\sqrt{1-x^2}\right)$

$\Rightarrow \sin^{-1}\left(\frac{\sqrt{5}+4\sqrt{2}}{9}\right)$

$\Rightarrow x = \frac{\sqrt{5}+4\sqrt{2}}{9}$

39. $\frac{\pi}{2} - \cos^{-1} x + \frac{\pi}{2} - \cos^{-1} y = \frac{2\pi}{3}$

$\Rightarrow \cos^{-1} x + \cos^{-1} y = \frac{\pi}{3}$

40. $\frac{\cos 70°}{\sin 70°} + 4\cos 70° = \frac{\cos 70° + 2(2\sin 70°\cos 70°)}{\sin 70°}$

$= \frac{\sin 80° + \sin 40°}{\sin 70°} = \frac{2\sin 60°\cos 20°}{\cos 20°}$

$= \sqrt{3}$

41. vertex opposite to D is E + F – D

$\Rightarrow (3,5) + (-1,-2) - (6,1) = (-4,2)$

42. G divides so in the ratio 1 : 2

$G = \left(\frac{1.2+2.\frac{5}{2}}{1+2}, \frac{1.1+2.\frac{5}{2}}{1+2}\right) = (3,2)$

43. Let $A = (4,-3), B = (-9,7)$ and $G = (1,4)$

$$\Delta ABG = \frac{1}{2}\begin{vmatrix} 4 & -9 & 1 & 4 \\ -3 & 7 & 4 & -3 \end{vmatrix} = \frac{61}{2}$$

Area of $\Delta ABC = 3$ (area of ΔABG) $= \frac{183}{2}$

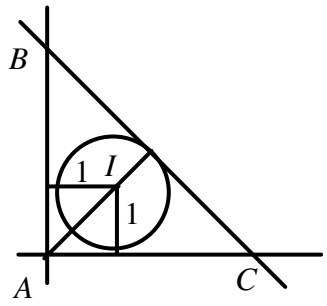
44. let O is the orthocenter of the triangle formed by A,B,C. Then each point is the orthocenter of the triangle formed by the remaining three points

$\Rightarrow$ orthocenter of ΔOAC is $B = (-2,3)$

45. In $\Delta ABC, 2S = 12 \Rightarrow S = 6$

Area of $\Delta ABC = \frac{1}{2}(4)(3) = 6 = \Delta$

$\therefore r = \frac{\Delta}{s} = \frac{6}{6} = 1$



$I = (1,1)$

Now $AI = \sqrt{1+1} = \sqrt{2}$

Distance from A (0, 0) to (1, 1) is $\sqrt{2}$

46. $AP = \sqrt{4+36} = 2\sqrt{10}$; $PB = \sqrt{9+81} = 3\sqrt{10}$

$AP : PB = 2:3$ if Q is the harmonic conjugate of P than AQ : QB = – 2 : 3

$$Q = \left(\frac{3-12}{3-2}, \frac{3-32}{3-2}\right) = (-9,-29)$$

47. Centroid of the triangle $= \left(-\frac{1}{3}, -\frac{5}{3}\right)$

The nine point centre, N divides OG in the ratio 3 : 1 = ON : NG

$$\therefore N = \left(\frac{3\left(-\frac{1}{3}\right)}{3+1}, \frac{3\left(-\frac{5}{3}\right)}{3+1}\right) = \left(-\frac{1}{4}, -\frac{5}{4}\right)$$

48. $A = (k, 2-2k), B = (-k+1, 2k), c = (-4-k, 6-2k)$

Slope of AB = slope of BC

$$\Rightarrow \frac{4k-2}{1-2k} = \frac{6-4k}{-5}$$

$$\Rightarrow -20k + 10 = 6 - 4k - 12k + 8k^2$$

$$k = \frac{1}{2}, -1$$

49. centroid $= \left(\frac{\cos\theta + \sin\theta}{3}, \frac{\sin\theta - \cos\theta}{3}\right)$ lies on y = 2x

$\Rightarrow \tan\theta = -3 \Rightarrow \theta = \tan^{-1}(-3)$

50. let a point on locus be $p(x_1 y_1)$

Slope of $OP = \frac{y_1}{x_1}$, slope of $AP = \frac{y_1 - b}{x_1 - a}$

$\therefore$ locus is $x^2 + y^2 - ax - by = 0$

51. $x_1 = p + a; x_2 = p + 2a, ... x_n = p + a_n$

$\frac{x_1 + x_2 + ... x_n}{n} = p + \frac{a(n+1)}{2}$

$\frac{\alpha - p}{a} = \frac{n+1}{2}, \frac{\beta - p}{b} = \frac{n+1}{2}$

$\frac{\alpha - p}{a} = \frac{\beta - p}{b} \Rightarrow b(\alpha - p) = a(\beta - q)$

$\therefore$ locus of (α, β) is

$b(x - p) = a(y - q)$

52. $x^2 + y^2 = \frac{(t^2 - 1)^2 + 4t^2}{(t^2 + 1)^2} = \frac{(t^2 + 1)^2}{(t^2 + 1)^2} = 1$

53. let p(x, y) be the point

Given that $x = \frac{1}{2}\sqrt{x^2 + y^2}$

$\Rightarrow 3x^2 - y^2 = 0$

Comparing with $ax^2 + bx + c = 0$

$\therefore 3 > 0 > -1 \Rightarrow a > c > b$

54. let $c = (x, y)$ then $A = (x_1, 0); B = (0, y_1)$

Equation to AB is $\frac{x}{x_1} + \frac{y}{y_1} = 1$

$\therefore$ locus is $\frac{x_0}{x} + \frac{y_0}{y} = 1$

55. $x + y = 2(t^2 + 1) \rightarrow (1), x - y = 2t \rightarrow (2)$

From (1) & (2)

$x + y = 2\left[\left(\frac{x - y}{2}\right)^2 + 1\right] \Rightarrow x^2 - 2xy + y^2 - 2x - 2y + 4 = 0$

56. $\Delta POA = 2\Delta POB$

$\frac{1}{2}|4x - 0| = 2\frac{1}{2}|6y - 0|$

$\Rightarrow 16x^2 = 144y^2 \Rightarrow x^2 - 9y^2 = 0$

57. let $p(x_1, y_1)$ be the mid point of AB

Then A = $(2x_1, 0)$ and B = $(0, 2y_1)$

The point (t, 2t) divides AB in the ratio 1 : 2

$t = \frac{4x_1}{3}$ and $2t = \frac{2y_1}{3}$

Eliminating t, the locus of p is 4x = y

58. let m_1, m_2 be the roots then the equation $m_1 m_2 = -1$

$\therefore$ locus is $y^2 + b^2 = -x^2 + a^2 \Rightarrow x^2 + y^2 = a^2 - b^2$

59. $\cos 30° = \frac{OA}{OP} = \frac{1}{OP} \Rightarrow OP = \frac{2}{\sqrt{3}}$

$\Rightarrow x^2+y^2=\left(\frac{2}{\sqrt{3}}\right)^2$

60. $(x+2)^2=-2y+8+4$

$\Rightarrow (x+2)^2=-2(y-6)$ is a parabola

61. $\tan 2\theta=\frac{2h}{a-b}=\frac{4\sqrt{3}}{5-9}=-\sqrt{3}=\tan(120°)$

$\therefore 2\theta=120°\Rightarrow\theta=60°$

62. the transformed equation is

$(x+a)^2+(y+2a)^2-2a(x+a)-4a(y+2a)+a^2=0$

$\Rightarrow x^2+y^2=4a^2$

63. the image of (2, –1) w.r.t y-axis is (–2, –1) $\therefore\theta=-45°$

$x=-2\cos(-45)+(-1)\sin(-45°)=\frac{-2}{\sqrt{2}}+\frac{1}{\sqrt{2}}=-\frac{1}{\sqrt{2}}$

$y=-(-2)\sin(-45)+(-1)\cos(-45)=-\frac{2}{\sqrt{2}}-\frac{1}{\sqrt{2}}=-\frac{3}{\sqrt{2}}$

$\therefore (x,y)=\left(-\frac{1}{\sqrt{2}},-\frac{3}{\sqrt{2}}\right)$

64. $\left(\frac{hf-bg}{ab-h^2},\frac{gh-af}{ab-h^2}\right)=(1,1)$

65. $\frac{1}{2}\tan^{-1}\left(\frac{2\sqrt{3}}{1+1}\right)=\frac{1}{2}\tan^{-1}\left(\sqrt{3}\right)=\frac{1}{2}(60°)=30°$

66. the new equation is $(-x)-2(-y)+3=0$

$x-2y-3=0$

67. The ratio of the sides of a triangle formed by

$a_1x+b_1y+c_1=0, a_2x+b_2y+c_2=0, a_3x+b_3y+c_3=0$ is

$\sqrt{2}\begin{vmatrix}1&0\\0&1\end{vmatrix}:\sqrt{1+0}\begin{vmatrix}0&1\\1&1\end{vmatrix}:\sqrt{1+0}\begin{vmatrix}1&1\\1&0\end{vmatrix}$

$\sqrt{2}:1:1\ \Rightarrow$ triangle is isosceles

68. $\begin{vmatrix}4&3&-1\\1&-1&5\\b&5&-3\end{vmatrix}=0\Rightarrow b=6$

69. A = (8, 0); B = (0, 16), $r=\frac{\Delta}{s}=2$

In centre = (r, r) = (2, 2)

70. The line is passing through centroid

$\therefore G=(1,1)$

71. A = (8, 0) ; B = (0, 12) midpoint of AB is p = (4, 6) perpendicular bisectior of AB is

$\therefore c=\left(-\frac{13}{2},-1\right)$

Area of $\Delta ABC=\frac{1}{2}\begin{vmatrix}8&0&-\frac{13}{2}&8\\0&12&-1&0\end{vmatrix}=91$

72. $\tan\theta=1\Rightarrow\theta=45°$

Equation of line is $\frac{x-1}{\cos 45°}=\frac{y-1}{\sin 45°}=r$

Given $r=5\sqrt{2}$

$\frac{x-1}{\frac{1}{\sqrt{2}}}=\frac{y-1}{\frac{1}{\sqrt{2}}}=5\sqrt{2}$

$\Rightarrow (x,y)=(6,6)$

73. The lines are x + y = 1, x – y = 1, –x + y = 1, –x – y = 1

These lines form a square of side $\sqrt{2}$

Area = $\sqrt{2}$

74. Divide the equation $x+y+1=0$ by $\sqrt{2}$

$\Rightarrow x\cos\left(\pi+\frac{\pi}{4}\right)+y\sin\left(\pi+\frac{\pi}{4}\right)=\frac{1}{\sqrt{2}}$

$\therefore \alpha=\frac{5\pi}{4}$

75. Equation to the line L passing through p (1, 2) is

$\frac{x}{1}+\frac{y}{2}=2\Rightarrow 2x+y=4$

$\perp^r$ distance from (0, 0) to the line L is $=\frac{4}{\sqrt{5}}$

76. The equation to the other diagonal which is $\perp^r$ to $7x-y+8=0$ and passing through $(-4,5)$ is

$x+4+7(y-5)=0$

$\Rightarrow x+7y-31=0\rightarrow(1)$

$\perp^r$ distance of (1) from $(-3,4)=\left|\frac{-3+28-31}{\sqrt{50}}\right|$

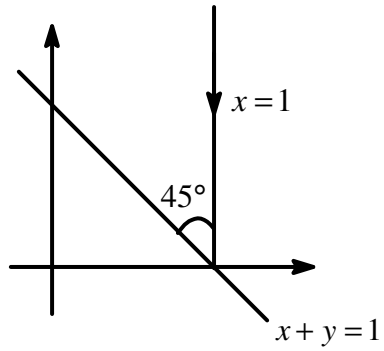
$=\frac{3\sqrt{2}}{5}$

77. $x-\sqrt{3}y=0$ makes 30° with x – axis

$\Rightarrow$ third side is along to y – axis

$\therefore$ vertex = (0, a)

78. Clearly from the figure the reflected ray moves along the x – axis



79. Let $a=2n-1, b=2n+1, c=2n+3$ then $ax-by+c=0$

$2n(x-y+1)-(x+y-3)=0$

Which always passes through the inter section of

$x-y+1=0, x+y-3=0\Rightarrow(x,y)=(1,2)$

80. The point (a, a) lies on y = x …. (1)

Which is $\perp^r$ to the lines $x+y=2$ …. (2) and $x+y=-2$ …. (3)

Hence it can be the point of intersection of (1) & (2) and (1) & (3) is
(1 , 1) (or) (–1, –1)
$\therefore -1 < a < 1 \Rightarrow |a| < 1$

PHYSICS

81) Conceptual
82) Conceptual
83) Force has a dimensional formula MLT^{-2}
84) The work done = force × displacement
unit, $u_1 = Fs$
and $u_2 = 4F \times 4s = 16u$.
85) $\frac{\Delta R}{R} = \frac{\Delta V}{V} + \frac{\Delta I}{I}$
86) conceptual
87) conceptual
88) use $s = ut + \frac{1}{2}at^2$ and velocity v=s/t
89) $V_{avg} = \frac{s_1 + s_2}{t_1 + t_2}$
90) displacement $\vec{s} = \vec{r_2} - \vec{r_1}$
91) velocity $V = \frac{dx}{dt}$
92) conceptual
93) As the coin falls behind him, force due to air must be backwards. Therefore, the train must be accelerating forward.
94) use $s = ut + \frac{1}{2}at^2$
95) use $h = \frac{1}{2}gt^2$
96) use $s_n = u + \frac{a}{2}(2n-1)$
97) $\left|\vec{i} + \vec{j}\right| = \sqrt{1^2 + 1^2} = \sqrt{2}$
$\cos\beta = \frac{1}{\sqrt{2}} = 45^0$
98) If air resistance is ignored, then there is no acceleration in horizontal direction in projectile motion. Hence the particle move with constant velocity in horizontal direction
99) $\overrightarrow{V_{BA}} = \overrightarrow{V_B} - \overrightarrow{V_A}$
100) use $F_R = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$
101) speed of the particle at any instant is $v = \sqrt{v_x^2 + v_y^2}$
102) $v_r = \sqrt{v_b^2 - v_{br}^2}$
103) for maximum range angle of projection $\theta = 45^0$, Range $R = \frac{u^2 \sin 2\theta}{g}$
104) use $R = u\cos\theta \times t$
105) kinetic energy at the top $E = \frac{1}{2}mu^2\cos^2\theta$
106) It has only tangential velocity & radial acceleration or centripetal acceleration
107) angular displacement $\theta = \omega t$

linear velocity $v = r\omega$,change in velocity $\Delta v = 2v\sin\frac{\theta}{2}$

108) range $R = u\sqrt{\frac{2h}{g}}$

109) $T = \sqrt{\frac{2h}{g}}$

110) $R = u\sqrt{\frac{2h}{g}}$

111) After the stone is thrown out of the moving train, the only force acting on it is the force of gravity i.e. its weight.
F = mg = 0.05 × 10 = 0.5 N.

112) When an elevator cabin falls down, it is accelerated down with respect to earth i.e. man standing on earth

113) $P_R = \sqrt{P_1^2 + P_2^2}$ and $m_3 v_3 = P_R$

114) |impulse| = |change in momentum

115) $s = \left(\frac{u+v}{2}\right)t$

116) By Newton's second law of motion $F = n(mv) = nmv$

117) $v = \sqrt{2gh}$

118) $F = \frac{mnv}{t}$

119) $N = (m_1 + m_2)\,g$

120) T=m(g+a)

CHEMISTRY

121. Energy of subshell depends on (n+l) value
1) 4p (4+1) 2) 4s (4+0) 3) 3d (3+2) 4) 3s (3+0)
Greater the (n+l) value of a subshell greater is energy.

122. According to Heisenberg's uncertainity principle$\Delta x.\Delta v \geq h/4\pi m$

$\Delta v = h/4\pi m\Delta x$

$= 6.63\times10^{-27}/4\times3.14\times9.1\times10^{-28}\times0.18\times10^{-8}$

123. If m= +4 , then 'n' should be 5 no.of waves made by an electron =n(principle of quantum Number)

124 . $E=hc/\lambda$
$\lambda = hc/E = 6.6\times10^{-27}\times3\times10^{10}/5\times10^{-11}$

125. E.N= IE(kcal) +EA(kcal)/129 =275+86/129 =2.79

126. CH_4 has lowest boiling point due to the absence of Hydrogen bond.

127. Highest IP -Helium
EN -Fluorine
EA -Chlorine
O.S -Osnium

128. In $1s^2\ 2s^2\ 2p^6\ 3s^2$ configaration more energy is required to remove third electron from completely filled 2nd shell. Sudden large jump between the values of second and third Ip values.

129. $CH_3 — CH = C = CH_2$
Sp^3 sp^2 sp sp^2

130. In Co_2 molecule , there is no dative bond
O = C = O

131. C_2 , N_2 , F_2 are diamagnetic.
132. Bond order α 1/Bond length
133. For 's' electrons l=0
134. Z =35 Electronic configuration
     $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^2$ $3d^{10}$ $4p^5$
     6+6+5 = 17 p electrons
135. no of spectral lines formed in visible region =2.
136. 270, 560, 890 and 6072 kcal
     The above values indicate the element 'M' has '3' electrons in outer most shell (270,560,890 kcal). Formula of oxide of M is M_2O_3
137. Li^+ and Mg^{2+} have similar ionic radii due to diagonal relation ship.
138. $O + e^- \rightarrow O^-$ is first electron in this process only energy is released.
139. Nickel is used as catalyst in the hydrogenation of oils.
141. Z = 56 belongs to 2^{nd} A group and 6^{th} period.
142. In passion series $n_1 = 3$; n_2 =4,5,6-----
143. so_3^{2-} has dπ – pπ bonding between 's' and 'o'.
144. The correct statement is CH_3Cl $\mu \neq 0$, dipolemoment of CH_3Cl is not equal to zero.
145. $[Ni(CN_4)]^{-2}$ square planer complex ,undergoes dsp^2 hybridisation.
147. number of radial nodes = n – l -1
     For 4p orbital 4 -1 -1 = 2
     Number of nodal planes = l
     For 4p orbital l = 1
     Correct option is 2,1.
148. 109 un nil ennium (une)
149. According to Moseley's equation
     $\sqrt{\nu} = a(z - b)$
     $\sqrt{2500} = z - 1$
     $50 = z - 1$
     Z = 51.
150. Mgo - Basic oxide.
     Beo – Amphoteric oxide.
     P_2O_5 – Acidic oxide.
     Co – Neutral oxide.
151. Percentage ionic character = $\mu_{obs}/\mu_{cal} \times 100$
     $= 1.0\ D/4.8 \times 1.25\ D \times 100$
     = 16.66.
152. 4f - subshell is successively filled for rare earths (Lanthanides)
153. de –Broglie's wavelength $\lambda = h/mv = 1A^0$
154. Fe^{+3} configaration $[Ar]3d^5$
     Mn^{+2} configaration $[Ar]3d^5$
     Fe^{+3} and Mn^{+2} have same electronic configuration.
155. Cs is the most electropositive element.
156. There are 11 gaseous elements formed in periodic table (H, He, Ne, Ar, Kr, Xe, Radon, Fluorine, Chlorine Nitrogen and Oxygen).
157. $AlCl_3$ BF_3 have less number of electrons than octet.
158. C – F bond has high covalent strength due to small size and high E.N.
159. Ar is the most abundant noble gas in the atmosphere.
160. $r \alpha n^2$
     $r_1 / r_2 = n_1^2 / n_2^2$ $2^2 / 1^2 = 4/1$ (or) 4.