EAMCET MODEL GRAND TEST

ENGINEERING

INSTRUCTIONS TO CANDIDATES

1. *The Question Paper consists of 160 questions.*
2. *Each question carries one mark. No negative marking for wrong answers.*
3. *Maximum time is 3 hours.*
4. *Use Ball - Point Pen while entering the Hall - Ticket Number and filling in Part - A of the First page.*
5. *Use H.B. Pencil only to darken the circle on OMR Answer Sheet.*
6. *Over - writing or blackening of more than one circle will not count for marks.*
7. *If you wish to change your answer, erase the already darkened circle completely and then darken the appropriate circle.*
8. *Candidates are prohibited from carrying any sheet of paper to the Examination Hall except the Hall - Ticket.*
9. *Do any rough / scratch work on the Test Paper itself.*
10. *Calculators, watches with calculators, pagers & cellular phones will not be allowed into the Examination Hall.*
11. *Candidates have to write suitable answers on the Answer Sheet only.*
12. *Candidates have to return the Answer Sheets and the Question Papers at the time of leaving the Examination Hall.*
13. *Candidates will be to leave the Examination Hall only in the last half - an hour before the close of the Test.*
14. *This Model test paper contains 20 pages.*

MATHEMATICS

1. $\tanh^{-1}\left(\frac{1}{2}\right)+\coth^{-1}(2)=$

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

2. A straight rod of length 9 units slides with its ends A,B always on the X and Y axes respectively. Then the locus of the centroid of the ΔOAB is

   1) $x^2+y^2=3$ 2) $x^2+y^2=9$ 3) $x^2+y^2=1$ 4) $x^2+y^2=81$

3. If $1+\cos\alpha+\cos^2\alpha+.....=2-\sqrt{2}$, then α $(0<\alpha<\pi)$ is

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

4. If $\left|A_{n\times n}\right|=3$ and $\left|adjA\right|=243$, then the value of n is

   1) 4 2) 5 3) 6 4) 7

5. The system of linear equations $x+y+z=2,\ 2x+y-z=3$ and $3x+2y+kz=4$ has unique solution if

   1) $K\neq 0$ 2) $-1<K<1$ 3) $-2<K<2$ 4) $K=0$

6. If $A=\begin{bmatrix}1 & -1\\ 2 & -1\end{bmatrix}, B=\begin{bmatrix}x & 1\\ y & -1\end{bmatrix}$ and $(A+B)^2=A^2+B^2$, then x+y=

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

7. If $m\tan(\theta-30^0)=n\tan(\theta+120^0)$, then $\cos 2\theta$ is

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

8. $\tan 9^0-\tan 27^0-\tan 63^0+\tan 81^0=$

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

9. $\sin^2 x+4\sin x+5$ lies in

   1) $[2,10]$ 2) $[-2,10]$ 3) $[10,15]$ 4) $[5,10]$

10. If $n\in N$, then $n(n+1)(n+2)(n+3)$ is divisible by

    1) 24 2) 36 3) 48 4) 72

11. If $\cos^{-1}x-\cos^{-1}\left(\frac{y}{2}\right)=\alpha$, then $4x^2-4xy\cos\alpha+y^2$ is equal to

    1) $2\sin 2\alpha$ 2) 4 3) $4\sin^2\alpha$ 4) $-4\sin^2\alpha$

12. Domain of the function $f(x)=\sin^{-1}[4x-1]$ is, where $[.]$ is the greatest integer function

    1) $\left[0,\frac{3}{4}\right]$ 2) $\left(0,\frac{3}{4}\right]$ 3) $\left(0,\frac{3}{4}\right)$ 4) $\left[0,\frac{3}{4}\right)$

13. In a triangle ABC, if a=6,b=3 and $\cos(A-B)=\frac{4}{5}$, then $\Delta=$

1) 8 2) 9 3) 12 4) $\frac{15}{2}$

14. In a triangle ABC, if $\tan A:\tan B:\tan C=2:3:4$ then $\sec^2 C=$

1) 17 2) 7 3) 9 4)11

15. In a triangle ABC, if $a\cos^2\frac{C}{2}+c\cos^2\frac{A}{2}=\frac{3b}{2}$, then a,b,c are in

1) A.P 2) G.P 3) H.P 4) A.G.P

16. If the vectors $\bar{a}=\bar{i}-\bar{j}+2\bar{k},\bar{b}=2\bar{i}+4\bar{j}+\bar{k},\bar{c}=\lambda\bar{i}+\bar{j}+\mu\bar{k}$ are mutually orthogonal, then $(\lambda,\mu)=$

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

17. If $|\bar{a}|=|\bar{b}|=|\bar{c}|=1,\ \bar{a}.\bar{b}=\bar{b}.\bar{c}=\bar{c}.\bar{a}=\frac{1}{2}$, then $\left[\bar{a}\times\bar{b}\ \ \bar{b}\times\bar{c}\ \ \bar{c}\times\bar{a}\right]=$

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

18. If the vectors $a\bar{i}+\bar{j}+\bar{k},\bar{i}+b\bar{j}+\bar{k},\bar{i}+\bar{j}+c\bar{k}$ $(a\neq 1,b\neq 1,c\neq 1)$ are coplanar, the value of $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}$ is

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

19. The unit vector perpendicular to the plane determined by the points $P(1,-1,2),Q(2,0,-1)$ and $R(0,2,1)$ is

1) $\frac{2\bar{i}+\bar{j}+\bar{k}}{\sqrt{6}}$ 2) $-\frac{(2\bar{i}+\bar{j}+\bar{k})}{\sqrt{6}}$ 3) $\pm\frac{(2\bar{i}+\bar{j}+\bar{k})}{\sqrt{6}}$ 4) $2\bar{i}+\bar{j}+\bar{k}$

20. If $\bar{i}+2\bar{j}+3\bar{k},3\bar{i}+2\bar{j}+\bar{k}$ are the sides of a parallelogram, then a unit vector parallel to one of the diagonals of the parallelogram is

1) $\frac{\bar{i}+\bar{j}+\bar{k}}{\sqrt{3}}$ 2) $\frac{\bar{i}-\bar{j}+\bar{k}}{\sqrt{3}}$ 3) $\frac{\bar{i}+\bar{j}-\bar{k}}{\sqrt{3}}$ 4) $\frac{-\bar{i}+\bar{j}+\bar{k}}{\sqrt{3}}$

21. Three non zero non collinear vectors $\bar{a},\bar{b},\bar{c}$ are such that $\bar{a}+3\bar{b}$ is collinear with $\bar{c}$, while $3\bar{b}+2\bar{c}$ is collinear with $\bar{a}$, then $\bar{a}+3\bar{b}+2\bar{c}=$

1) $\bar{0}$ 2) $2\bar{a}$ 3) $3\bar{b}$ 4) $4\bar{c}$

22. If $n\in N$, and $f(x)=(a-x^n)^{\frac{1}{n}}$, where a>0, then $(fof)(x)=$

1) a 2) x 3) x^n 4) a^n

23. Angle of rotation of axes in order to eliminate xy-term in the equation $x^2+2\sqrt{3}xy-y^2=2a^2$ is

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

24. If a,b,c form a geometric progression with common ratio r, then the sum of the ordinates of the points of intersection of the line $ax+by+c=0$ and the curve $x+2y^2=0$ is

1) $\frac{r^2}{2}$ 2) $-\frac{r}{2}$ 3) $\frac{r}{2}$ 4) r

25. The ortho centre of the triangle with vertices $\left(2,\frac{\sqrt{3}-1}{2}\right),\left(\frac{1}{2},\frac{-1}{2}\right)$ and $\left(2,-\frac{1}{2}\right)$ is

1) $\left(\frac{3}{2},\frac{\sqrt{3}-3}{6}\right)$ 2) $\left(\frac{5}{4},\frac{\sqrt{3}-2}{4}\right)$ 3) $\left(2,-\frac{1}{2}\right)$ 4) $\left(\frac{1}{2},\frac{1}{2}\right)$

26. If $2x+3y=5$ is the perpendicular bisector of the line segment joining the points $A\left(1,\frac{1}{3}\right)$ and B, then B=

1) $\left(\frac{21}{13},\frac{49}{39}\right)$ 2) $\left(\frac{17}{13},\frac{31}{39}\right)$ 3) $\left(\frac{7}{13},\frac{49}{39}\right)$ 4) $\left(\frac{21}{13},\frac{31}{39}\right)$

27. If the error committed in measuring the radius of the circle is 0.05% then the corresponding error in calculating the area is

1) 0.05% 2) 0.025% 3) 0.25% 4) 0.1%

28. If one of the lines given by $6x^2-xy+4cy^2=0$ is $3x+4y=0$, then c=

1) 1 2) –1 3) 3 4) -3

29. The angle between the pair of straight lines formed by joining the points of intersection of $x^2+y^2=4$ and $y=3x+c$ to the origin is a right angle. Then c^2 is

1) 20 2) 13 3) $\frac{1}{5}$ 4) 5

30. XOZ-plane divides the join of $(2,3,1)$ and $(6,7,1)$ in the ratio

1) 3:7 2) 2:7 3) -3:7 4) -2:7

31. If the direction cosines of two lines are given by $l+m+n=0$ and $l^2+m^2-n^2=0$, the the angle between them is

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

32. If θ is the angle between the line $\frac{x+1}{1}=\frac{y-1}{2}=\frac{z-2}{2}$ and the plane $2x-y+\sqrt{\lambda}z+4=0$ is such that $\sin\theta=\frac{1}{3}$, then the value of $\lambda=$

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

33. $\lim_{X \to -1} \frac{\sqrt{\pi} - \sqrt{\cos^{-1} x}}{\sqrt{x+1}} =$

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

34. $\lim_{x \to \infty} \left(\frac{x+6}{x+1} \right)^{x+4} =$

1) e^4 2) e^6 3) e^5 4) e

35. If $f : R \to R$, defined by

$$f(x) = \begin{cases} \frac{1+3x^2-\cos(2x)}{x^2} & for \quad x \neq 0 \\ k & for \quad x = 0 \end{cases}$$ is continuous at x=0, then k =

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

36. If the mean and variance of a binomial variate x are 8 and 4 respectively then $P(x < 3) =$

1) $\frac{697}{2^{16}}$ 2) $\frac{265}{2^{16}}$ 3) $\frac{265}{2^{15}}$ 4) $\frac{137}{2^{16}}$

37. If $f^1(x) = g(x)$ and $g^1(x) = -f(x)$ for all x and $f(3) = 5 = f^1(3)$, then $f^2(119) + g^2(119) =$

1) 5 2) 25 3) 50 4) 625

38. The distance 's' travelled by a particle in time 't' is given by $s = t^2 - 2t + 5$, then its acceleration is

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

39. If Δ is the area of the triangle forme by the positive x-axis and the normal and tangent to the circle $x^2 + y^2 = 4$ at $\left(1, \sqrt{3}\right)$ then $\Delta =$

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

40. The perimeter of a sector is a constant. If its area is to be maximum, the sectorial angle is

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

41. If $1, \omega, \omega^2$ are the cube roots of unity and if $\alpha = \omega + 2\omega^2 - 3$ then $\alpha^3 + 12\alpha^2 + 48\alpha + 3 =$

1) –63 2) –62 3) –61 4) –60

42. $\left(\frac{1+\cos\frac{\pi}{8}-i\sin\frac{\pi}{8}}{1+\cos\frac{\pi}{8}+i\sin\frac{\pi}{8}}\right)^8 =$

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

43. Two of three values of $(-1)^{1/3}$ are $\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}$ and $\cos\frac{5\pi}{3}+i\sin\frac{5\pi}{3}$, the third value is

1) $\cos\frac{5\pi}{3}-i\sin\frac{\pi}{3}$ 2) $\cos\frac{5\pi}{3}-i\sin\frac{5\pi}{3}$ 3) -1 4) 1

44. The common roots of the equations $z^3+2z^2+2z+1=0, z^{2014}+z^{2015}+1=0$ are

1) ω,ω^2 2) $1,\omega,\omega^2$ 3) $-1,\omega,\omega^2$ 4) $-\omega,-\omega^2$

45. For real values of 'x' the range of $\frac{x^2+2x+1}{x^2+2x-1}$ is

1) $(-\infty,0)\cup(1,\infty)$ 2) $\left[\frac{1}{2},2\right]$ 3) $\left(-\infty,-\frac{2}{9}\right)\cup(1,\infty)$ 4) $(-\infty,-6)\cup(-2,\infty)$

46. If $y=\sin\left(\log_e^x\right)$, then $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}=$

1) $\sin\left(\log_e^x\right)$ 2) $\cos\left(\log_e^x\right)$ 3) y^2 4) -y

47. A random variable X has the probability distribution given below its variance is

X	1	2	3	4	5
P(X=x)	k	2k	3k	2k	k

1) $\frac{5}{3}$ 2) $\frac{10}{3}$ 3) $\frac{16}{3}$ 4) $\frac{4}{3}$

48. The mean of four observations is 3. If the sum of the squares of these observations is 48 then their standard deviation is

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

49. If A,B,C are mutually exclusive and exhaustive events of a random experiment such that $P(B)=\frac{3}{2}P(A)$ and $P(C)=\frac{1}{2}P(B)$ then $P(A\cup C)=$

1) $\frac{6}{13}$ 2) $\frac{7}{13}$ 3) $\frac{10}{13}$ 4) $\frac{3}{13}$

50. The number of 4 digit numbers formed by using the digits $0,2,4,5$ and which are not divisible by 5 is

1) 10 2) 8 3) 6 4) 4

51. If $x=\frac{1}{5}+\frac{1.3}{5.10}+\frac{1.3.5}{5.10.15}+.....+\infty$ then $3x^2+6x=$

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

52. If $|x|<1$ then the coefficient of x^5 in the expansion of $\frac{3x}{(x-2)(x+1)}$ is

1) $\frac{33}{32}$ 2) $\frac{-33}{32}$ 3) $\frac{31}{32}$ 4) $-\frac{31}{32}$

53. Two numbers are choosen at random from $\{1,2,3,4,5,6,7,8\}$ at a time.The probability that smaller of the 2 numbers is less than 4 is

1) $\frac{7}{14}$ 2) $\frac{8}{14}$ 3) $\frac{9}{14}$ 4) $\frac{10}{14}$

54. Two fair dice are rolled. The probability of the sum of digits on their faces to be greater than or equal to 10 is

1) $\frac{1}{5}$ 2) $\frac{1}{4}$ 3) $\frac{1}{8}$ 4) $\frac{1}{6}$

55. The probability that an event does not happen in one trial is 0.8. The probability that the event happens atmost once in three trials is

1) 0.896 2) 0.791 3) 0.642 4) 0.592

56. If α,β,γ are the roots of $x^3+4x+1=0$ then the equation whose roots are $\frac{\alpha^2}{\beta+\gamma},\frac{\beta^2}{\gamma+\alpha},\frac{\gamma^2}{\alpha+\beta}$ is

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

57. Let $f(x)=x^2+ax+b$ where a,b$\in R$ if $f(x)=0$ has all its roots imagenary then the roots of $f(x)+f^1(x)+f^{11}(x)=0$ are

1) real and distinct 2) Imaginary 3) equal 4) rational and equal

58. $\frac{x^2+x+1}{(x-1)(x-2)(x-3)}=\frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x-3}\Rightarrow A+C=$

1) 4 2)5 3) 6 4) 8

59. ${}^{15}P_8=A+8.{}^{14}P_7\Rightarrow A=$

1) ${}^{14}P_6$ 2) ${}^{14}P_8$ 3) ${}^{15}P_7$ 4) ${}^{16}P_9$

60. The value of 'a' for which the equations $x^3+ax+1=0$ and $x^4+ax^2+1=0$ have a common root is

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

61. If the line $y=2x+c$ is a tangent to the circle $x^2+y^2=5$ then a value of c is

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

62. A line segment AM=a moves in the XOY plane such that AM is parallel to the X axis. If A moves along the circle $x^2+y^2=a^2$, then the locus of 'M' is

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

63. If the Lines $3x+4y-14=0$ and $6x+8y+7=0$ are both tangents to a circle, then its radius is

1) 7 2) $\frac{7}{2}$ 3) $\frac{7}{4}$ 4) $\frac{7}{6}$

64. If $(4,2)$ and $(K,-3)$ are conjugate points with respect to $x^2+y^2-5x+8y+6=0$, then $k=$

1) $\frac{28}{3}$ 2) $\frac{-28}{3}$ 3) $\frac{3}{28}$ 4) $\frac{-3}{28}$

65. If the circle $x^2+y^2+8x-4y+c=0$ touches the circle $x^2+y^2+2x+4y-11=0$ externally and cuts the circle $x^2+y^2-6x+8y+k=0$ orthogonally then k =

1) 59 2) -59 3) 19 4) -19

66. If a normal chord at a point 't' on the parabola $y^2=4ax$ subtends a right angle at the vertex, then t=

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

67. The point $(3,4)$ is the Focus and $2x-3y+5=0$ is the diretrix of a parabola. Its length of latus rectum is

1) $\frac{2}{\sqrt{13}}$ 2) $\frac{4}{\sqrt{13}}$ 3) $\frac{14}{\sqrt{13}}$ 4) $\frac{3}{\sqrt{13}}$

68. The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and having its centre at $(0,3)$ is

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

69. The solution of differential equation $\frac{dy}{dx}-2y\tan 2x=e^x\sec 2x$ is

1) $y\sin 2x=e^x+c$ 2) $y\cos 2x=e^x+c$

3) $y=e^x\cos 2x+c$ 4) $y\cos 2x+e^x=c$

70. The product of the lengths of perpendiculars drawn from any point on the Hyperbola $x^2-2y^2=2$ to its asymptotes is

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

71. If $\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x \cos^2 x} dx = A \sin 2x + B$, then A=

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

72. $\frac{dy}{dx} + 2x \tan(x-y) = 1 \Rightarrow \sin(x-y) =$

1) Ae^{-x^2} 2) Ae^{2x} 3) Ae^{x^2} 4) Ae^{-2x}

73. $\int (1-\cos x)\cos ec^2 x dx = f(x) + c \Rightarrow f(x) =$

1) $\tan\frac{x}{2}$ 2) $\cot\frac{x}{2}$ 3) $2\tan\frac{x}{2}$ 4) $\frac{1}{2}\tan\frac{x}{2}$

74. $\int \frac{x+1}{x(1+xe^x)} dx =$

1) $\log\left|\frac{1+xe^x}{xe^x}\right| + c$ 2) $\log\left|\frac{xe^x}{1+xe^x}\right| + c$ 3) $\log\left|xe^x(1+xe^x)\right| + c$ 4) $\log(1+xe^x) + c$

75. An I.F of the equation $(1 + y + x^2 y)dx + (x + x^3)dy = 0$ is

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

76. The Area bounded by the curves $x = -2y^2$ and $x = 1 - 3y^2$ is

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

77. $a > 0, \int_{-\pi}^{\pi} \frac{\sin^2 x}{1+a^x} dx$

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

78. $\int \frac{7x^8 + 8x^7}{(1+x+x^8)^2} dx = f(x) + c \Rightarrow f(x) =$

1) $\frac{x^8}{1+x+x^8}$ 2) $28\log(1+x+x^8)$

3) $\frac{1}{1+x+x^8}$ 4) $\frac{-1}{1+x+x^8}$

79. The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the Hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ coincide then the value of $b^2=$

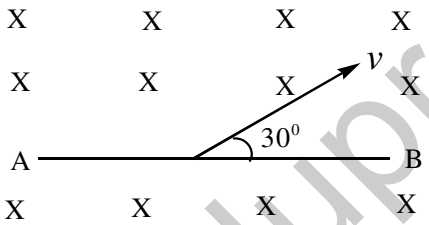
1) 5 2) 7 3) 9 4) 1

80. $\int_0^{\frac{\pi}{4}} \frac{\sin x+\cos x}{3+\sin 2x}dx$

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

PHYSICS

81. A conducting rod AB of length $l=1$ m is moving at a velocity V=4 m/s making an angle 30^0 with its length. A uniform magnetic field B=2T exists in a direction perpendicular to the plane of motion. Then :



1) $V_A-V_B=8V$ 2) $V_A-V_B=4V$ 3) $V_B-V_A=8V$ 4) $V_B-V_A=4V$

82. Two magnets A and B of the same dimensions and mass are made to oscillate in the same magnetic field. A performs 15 vibration per minute and B, 10 vibration per minute. The magnetic moments of the two magnets are in the ratio of

1) $\sqrt{3}/2$ 2) 3/2 3) 9/4 4) 81/16

83. Assume that light of wavelength $6000\,A^0$ is coming from a star. The limit of resolution of a telescope whose objective has diameter of 100 inch is approxmately

1) $2.9\times10^{-9}\,rad$ 2) $2.9\times10^{-7}\,rad$ 3) $2.36\times10^{-7}\,rad$ 4) $7.32\times10^{-9}\,rad$

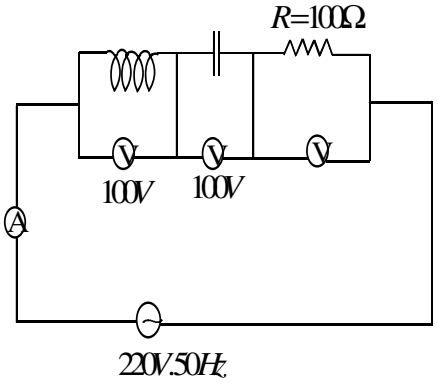
84. If the shift of wavelength of light emitted by a star is towards violet, then this shows that star is

1) stationary 2) moving towards the earth
3) moving away from earth 4) information is incomplete

85. Refractive index of a prism is $\sqrt{7/3}$ and the angle of prism is 60^0. The minimum angle of incidence of a ray that will be transmitted through the prism is

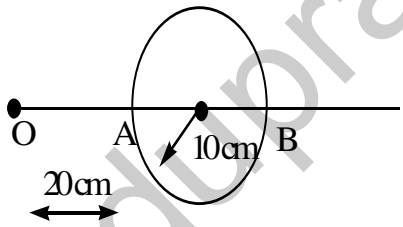
1) 30^0 2) 45^0 3) 15^0 4) 50^0

86. What will be the reading of the AC voltmeter across the resistance and AC amme ter in the circuit shown in the figure?



1) $200V, 2A$ 2) $800V, 2A$ 3) $100V, 2A$ 4) $220V, 2.2A$

87. A glass sphere of radius R=10 cm is kept inside water. A point object O is placed at 20 cm from A as shown in fig. The position and nature of the image when seen from other side of the sphere is (Given $\mu_g = 3/2$ and $\mu_w = 4/3$) (OA=20cm)

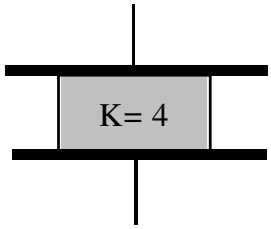


1) 200cm, virtual 2) 100cm, real 3) 100cm, virtual 4) 300cm, virtual

88. The shunt received to convert a galvanometer in to ammeter is $\frac{100}{99}$ times the resistance of ammeter. The maximum current that the ammeter can measure is n times that of galvanometer. The value of n is

1)98 2) 100 3) 1/100 4) 1/98

89. Consider a parallel plate of $10\mu F$ with air filled in the gap between the plates.Now one half of the space between the plates is filled with a dielectric of dielectric constant 4, as shown in the figure. The capacity of the capacitor changes to



1) $25\mu F$ 2) $20\mu F$ 3) $40\mu F$ 4) $5\mu F$

90. A parallel plate capacitor has area of each plate A, the separation between the plates is d. It is charged to a potential V and then disconnected from the battery. How much work will be done in filling capacitor completely with a dielectricconstant k?

1) $\frac{1}{2}\frac{\in_0 AV^2}{d}\left[1-\frac{1}{k^2}\right]$ 2) $\frac{1}{2}\frac{V\in_0 A}{kd}$ 3) $\frac{1}{2}\frac{V^2\in_0 A}{k^2 d}$ 4) $\frac{1}{2}\frac{\in_0 AV^2}{d}\left[1-\frac{1}{k}\right]$

91. The work done in carrying an electron from point A to a point B in an electric field is 10 MJ. The potential difference $(V_B - V_A)$ is then

1) $7.62\times10^{25}V$ 2) $3.42\times10^{25}V$ 3) $2.42\times10^{25}V$ 4) $6.25\times10^{25}V$

92. The equation of a wave on string of linear mass density $0.04\,kg\,m^{-1}$ is given by

$y = 0.02\sin\left[2\pi\left(\frac{t}{0.04(s)} - \frac{x}{0.05(m)}\right)\right]$, The tension in the string is

1) 6.25N 2) 4.0N 3) 0.625N 4) 0.0625N

93. The speed of sound in hydrogen at STP is V. The speed of sound in a mixture containing 3 parts of hydrogen and 2 parts of oxygen at STP will be

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

94. In a transistor circuit base current changes from $30\mu A$ *to* $90\mu A$. If the current gain of the transistor is 30, the change in the collector current is

1) 4 m A 2) 2 m A 3) 3.6 m A 4) 1.8 mA

95. In a negative feedback amplifer, the gain without feedback is 100, feed back ratio is 1/25 and input voltage is 50m V, then gain with feedback is

1) 10 2) 20 3) 30 4) 40

96. Light rays of wavelengths $6000\,A^0$ and of photon intensity 39.6 Watts/m^2 is incident on a metal surface. If only one percent of photons incident on the surface emit photo electrons, then the number of electrons emitted per second per unit area from the surface will be

[Planck constant = $6.64\times10^{-34}\,J-S$; Velocity of light = $3\times10^8\,ms^{-1}$]

1) 12×10^{18} 2) 10×10^{18} 3) 12×10^{19} 4) 12×10^{15}

97. If the momentum of an electron is changed by Pm, then the de Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be

1) $Pm/200$ 2) $Pm/100$ 3) $200\,p_m$ 4) $100\,p_m$

98. Half-lives of two radioactive substances A and B are 20 minutes and 40 minutes respectively. Intially samples A and B have equal number of nuclei. After 80 minutes, the ratio of the remaining number of A and B nuclei is.

1) 19 : 81 2) 4 : 1 3) 1 : 4 4) 1 : 1

99. Assertion: At any junction of a network, algebraic sum of various currents is zero
Reason: At steady state there is no accumulation of charge at the junction.
1) Both (A) and (R) are true and (R) is the correct explanation of A.
2) Both (A) and (R) are true but (R) is not the correct explanation of A.
3) (A) is true but (R) is false 4) (A) is false but (R) is true

100. When two resistances are connected in parallel then the equivalent resistance is $\frac{6}{5}\ \Omega$. When one of the resistance is removed then the effective resistance is $2\ \Omega$. The resistance of the wire removed will be

1) 3 ohm 2) 2 ohm 3) 3/5 ohm 4) 6/5 ohm

101. Neutron was discovered by

1) Chadwick 2) Fermi 3) S.N.Bose 4) Millikan

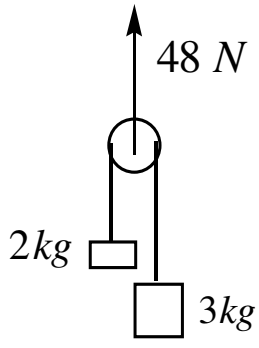
102. In the relation $P = \frac{\alpha}{\beta} e^{\frac{-az}{k\theta}}$ P is the pressure, K is Boltzmann constant, Z is distance and θ is the temperature. The dimensional formulae for β is

1) ML^2T 2) ML^0T^{-1} 3) ML^2T^{-1} 4) $M^0L^2T^0$

103. A body starts from rest with an uniform acceleration. If its velocity after n second is v, then its displacement in the last 2s is

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

104. The figure shows a mass-less pulley that is pulled up with a steady force of 48 N. A light string connecting two masses $2kg$ and $3kg$ is passed over the pulley. If $g = 10m/s^2$, the acceleration of $2kg$ block is



1) $8m/s^2 up$ 2) $2m/s^2 up$ 3) $2m/s^2 down$ 4) $0.4\ m/s^2 down$

105. A part of length of a uniform chain lies on the surface of a table and remaining part is hanging down over the edge of table. If the coefficient of static friction between chain and table is 0.5, the maximum % of length of hanging part of chain so that it does not slip down ($g = 10 ms^{-2}$).

1) 33.33% 2) 40% 3) 50% 4) 66.66%

106. A body projected vertically up with a velocity of $20 ms^{-1}$ returns to the ground with a velocity of $18 ms^{-1}$. The maximum height attained by the is ($g = 10 ms^{-2}$).

1) 12.1 m 2) 20 m 3) 16.2 m 4) 18.1m

107. A pendulum consists of a wooden bob of mass m and length l. A bullet of mass m_1 is fired towards the pendulum with a speed V_1. The bullet emerges out of the bob with a speed $V_1/3$ and the bob just completes motion along a vertical circle, then V_1 is

1) $\left(\frac{m}{m_1}\right)\sqrt{5gl}$ 2) $\frac{3}{2}\left(\frac{m}{m_1}\right)\sqrt{5gl}$ 3) $\frac{2}{3}\left(\frac{m_1}{m}\right)\sqrt{5gl}$ 4) $\frac{m_1}{m}\sqrt{gl}$

108. Two particles of equal masses have velocities $\vec{v}_1 = 2\hat{i}\, m/s$ and $\vec{v}_2 = 2\hat{j}\, m/s$. The first particle has an acceleration $\vec{a}_1 = \left(3\hat{i} + 3\hat{j}\right) m/s^2$, while the acceleration of the other particle is zero. The centre of mass of the two particles moves in a

1) circle 2) parabola 3) straight line 4) ellipse

109. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of $1.5 \times 10^{-2} N$. The length of the slider is 30cm and its weight is neglig ible. The surface tension of the liquid film is :

1) $0.0125 Nm^{-1}$ 2) $0.1 Nm^{-1}$ 3) $0.05 Nm^{-1}$ 4) $0.025 Nm^{-1}$

110. A gas flows with a velocity v along a pipe of cross-sectional area S and bent an angle of 90^0 at a point A. What force does the gas exert on the pipe at A if its density is ρ?

1) $\frac{\sqrt{2}Sv}{\rho}$ 2) $\sqrt{2}Sv^2\rho$ 3) $\frac{\sqrt{3}Sv^2\rho}{2}$ 4) $\sqrt{3}Sv^2\rho$

111. A thin circular metal disc of radius 500.0 mm is set rotating about a central axis normal to its plane. Upon raising its temperature gradually, the radius increase to 507.5 mm. The percentage change in the rotational kinetic energy will be

1) 1.5% 2) -1.5% 3) 3% 4) -3%

112. A ball is projected with a velocity $20\sqrt{3}\, m/s$ at angle 60^0 to the horizontal. The time interval after which the velocity vector will make an angle 30^0 to the horizontal is (take $g = 10 m/s^2$)

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

113. The volume of 1kg of hydrogen gas at N.T.P. is $11.2 m^3$ Specific heat of hydrogen at constant volume is $100.46 J\, kg^{-1}K^{-1}$. Find the specific heat at constant pressure in $J\, kg^{-1}K^{-1}$.

1) 120.2 2) 142.2 3) 163.4 4) 182.3

114. An ice block is projected vertically up with a velocity $20 ms^{-1}$. The amount of ice that melt when it reaches the ground if the mass of ice block is 4.2 kg

1) 2.5 gm 2) 2.5 kg 3) 0.25 kg 4) 0.25 gm

115. The intensity of a plane electromagnetic wave is $5W/m^2$. It is incident on a perfectly reflecting surface. The radiation pressure is

1) $3.33\times10^{-9}\, N/m^2$ 2) $3.33\times10^{-8}\, N/m^2$ 3) $8\times10^{-8}\, N/m^2$ 4) $8\times10^{-9}\, N/m^2$

116. A bullet of mass m is fired upward in a direction of angle of projection 60^0 with an initial velocity u. The angular momentum of this bullet when it is crossing highest point with respect to point of projection is

1) $\frac{2mu^3}{5g}$ 2) $\frac{3mu^3}{8g}$ 3) $\frac{2mu^3}{9g}$ 4) $\frac{3mu^3}{16g}$

117. The acceleration due to gravity at the equator is represented by g_1 and g_2, when earth were at rest and earth spins with time period of 24hour. The time period of rotation of earth at which an object kept at a latitude 60^0 becomes weightless is

1) $2\pi\sqrt{\frac{R}{4g_1}}$ 2) $2\pi\sqrt{\frac{R}{4g_2}}$ 3) $2\pi\sqrt{\frac{R}{2g_1}}$ 4) $2\pi\sqrt{\frac{R}{2g_2}}$

118. When a block of mass 2kg is suspended from a light spring, it elongates by 0.05m. It is pulled further from its equilibrium position by 0.1 m and released. The maximum KE of the block is

1) 3.92 J 2) 1.96 J 3) 0.98 J 4) 19.6 J

119. An engine is working. It takes 100 calories of heat from source and leaves 80 calories of heat to sink. If the temperature of source is 127° C, then the temperature of sink is

1) 147°C 2) 47°C 3) 100°C 4) 247°C

120. Bulk moolulus of water is $2\times0^9\, N/m^2$. The pressure required toincrease the volume of water by 0.1% in N/m^2 is

1) 2×10^9 2) 2×10^{10} 3) 2×10^6 4) 2×10^4

CHEMISTRY

121. A) $K_4\left[Fe(CN)_6\right]$ B) $K_3\left[Cr(CN)_6\right]$ C) $K_3\left[Co(CN)_6\right]$ D) $K_2\left[Ni(CN)_4\right]$

Select the complexes which are diamagnetic

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

122. The volume strength of 1.6N H_2O_2 solution is

1) 3.57 2) 8.96 3) 9.57 4) 5.45

123. Identify wrong statement in the following

1) chlorofluoro carbons are responsible for ozone layer depletion

2) Green house effect is responsible for global warming

3) Ozone layer does not permit I.R radiations from the sun to reach the earth

4) Acid rains is mostly because of oxides of nitrogen and sulphur.

124. The standard enthalpy of formation of graphite is ____

1) zero 2) - ve 3) + ve 4) unpredic table

125. Zinc and copper metals seperately reacted with dilute nitric acid to liberate ---- and ---- gases respectively.

1) O_2,N_2 2) N_2O,NO_2 3)NO,NO_2 4) N_2O,NO

126. Which of the following is incorrect ?

1) O-O bond length in O_3 molecule is 128pm

2) SO_2 molecule is planar triangle

3) Hydrolysis of ClF_3 gives the products HF and $HClO_2$

4) BrF_3 is bent T-shaped molecule

127. The first ionisation energies of four consecutive elements present in the second period of periodic table are 8.3,11.3,14.5 and 13.6eV respectively. Which of these is the IE of nitrogen ?

1) 13.6eV 2) 8.3eV 3) 14.5eV 4) 11.3eV

128. The magnetic moment of a transition metal ion is $\sqrt{15}BM$. Then number of unpaired electrons present in it is

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

129. Statement -I:Superoxides of alkalimetals are paramagnetic.

Statement-II: Superoxides contain O_2^{-2} ion

1) Both Statement-I and Statement-II are correct

2) Both Statement-I and Statement-II are incorrect

3) Statement-I is correct , Statement-II is incorrect

4) Statement-I is incorrect , Statement-II is correct

130. The species C_2

1) has one σ bond and one π bond 2) has both π bonds

3) has both σ bonds 4) does not exist

131. In a polar molecule , the ionic charge is 4.8×10^{-10}esu. If the inter ionic distance is $1A^0$, then the dipolemoment is

1) 0.48 Debye 2) 4.18 Debye 3) 4.8 Debye 4) 41.8 Debye

132. What is the empirical formula of vanadium oxide if 2.74g of metal oxide contains 1.53g of metal? (Atomic weight of vanadium 51).

1) V_2O_3 2) VO 3) V_2O_7 4) V_2O_5

133. The number of radial nodes of 3s and 2p orbitals are respectively.

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

134. 0.5mole of each of H_2, SO_2 and CH_4 are kept in a container. A hole was made in the container. After 3hours, the order of partial pressures in the container will be

1) $P_{SO_2} > P_{H_2} > P_{CH_4}$ 2) $P_{SO_2} > P_{CH_4} > P_{H_2}$

3) $P_{H_2} > P_{SO_2} > P_{CH_4}$ 4) $P_{H_2} > P_{CH_4} > P_{SO_2}$

135. Heat of combustion of methane is -800KJ .What is the heat of combustion of 4×10^{-4}kg of methane?

1) -800KJ 2) -3.2×10^4KJ 3) -20KJ 4) -1600KJ

136. 56g of nitrogen and 8g of hydrogen gas heated in a closed vessel. At equilibrium, 34g of ammonia is present. The equilibrium number of moles of nitrogen, hydrogen and ammonia are respectively

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

137. A solution of sodium sulphate in water is electrolysed using inert electrodes. The products at the cathode and anode are respectively

1) H_2, O_2 2) O_2, H_2 3) O_2,Na 4) O_2, SO_2

138. The activation energy of exothermic reaction $A \rightarrow B$ is 80KJmol^{-1}. The heat of reaction is 200KJ mol^{-1}. The activation energy for the reaction $B \rightarrow A$ (in KJ mole^{-1})

1) 80 2) 120 3) 40 4) 280

139. Gold numbers of protective colloids A,B,C and D are 0.50,0.01,0.10 and 0.005 respectively. The correct order of their protective power is

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

140. LIST-I (Type of ore) | LIST-II (example)

I) oxide ore — A) calamine

II) sulphide ore — B) galena

III) sulphate ore — C)phosphorite

IV) carbonate ore — D) Epsom salt

E) cuprite

Correct match is

1) I-A,II-B,III-C,IV-D 2) I-E,II-B,III-D,IV-A

3) I-B,II-A,III-E,IV-C 4) I-C,II-E,III-B,IV-A

141. The freezing point of a 0.05molal solution of a non electrolyte in water is (K_f for water is 1.86)

1) -0.093^0C 2) 1.86^0C 3) 0.93^0C 4) 0.093^0C

142. Chloramphenicol is

1) Narrow spectrum antibiotic 2) Broad spectrum analgesic

3) Broad spectrum antibiotic 4) Broad spectrum anti septic

143. A=Nylon-6,6, B=Buna-s, C=polythene

Arrange these polymers in increasing order of their intermolecular forces

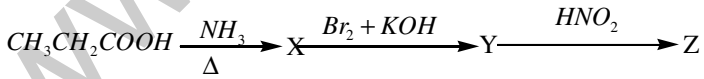
1) A<B<C 2)C<B<A 3)B<C<A 4) A<C<B

144. The pyrimidine bases present in DNA are

1) cytosine and adenine 2) cytosine and guanine

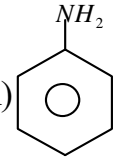
3) cytosine and thymine 4) cytosine and uracil

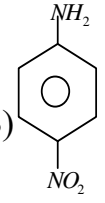
145. Identify the compoundZ.

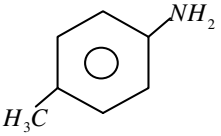


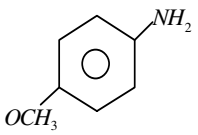
1) CH_3OH 2) $CH_3CH_2NH_2$ 3) CH_3CH_2OH 4) $CH_3CH_2CH_2OH$

146. The correct order of increasing basic nature of the following compounds

A) 

B) 

C) 

D) 

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

147. Iodoform test is not given by

1) 2-pentanone 2) ethanol 3) ethanal 4) 3-pentanone

148. Which of the following does not react with sodium metal?

1) $(CH_3)_2O$ 2) CH_3CH_2OH 3) CH_3COOH 4) C_6H_5OH

149. Ammonical silver nitrate form a white precipitate easily with

1) $CH_3-C\equiv CH$ 2) $CH_3-C\equiv C-CH_3$ 3) $CH_3-CH=CH_2$ 4) $CH_2=CH_2$

150. 0.2g of an organic compound on kjeldahl's analysis gave ammonia enough, to just neutralise $20cm^3$ of $0.1NH_2SO_4$. The percentage of nitrogen in the compound is

1) 24 2) 20 3) 14 4) 70

151. Which one of the following carbanions is least stable ?

1) $CH_3\overline{C}H_2$ 2) $HC\equiv\overline{C}$ 3) $\overline{C}H_3$ 4) $(CH_3)_3\overline{C}$

152. Isomers of propanoic acid are

1) $HCOOC_2H_5$ and CH_3COOCH_3 2) $HCOOC_2H_5$ *and* C_3H_7COOH

3) CH_3COOCH_3 *and* C_3H_7OH 4) C_3H_7OH *and* CH_3COCH_3

153. Order of acidic strength of oxyacids of chlorine

I) $HClO_4$ II) $HClO_3$ III) $HClO_2$ IV) $HClO$

1) I>II>III>IV 2) I>III>II>IV 3) I<II<III<IV 4) I>IV>III>II

154. The pH of a buffer solution is 5. K_a of weak acid used in buffer is $1x10^{-4}$. The ratio of concentration of acid and salt in buffer is

1) 1:100 2) 10:1 3) 1:10 4) 100:1

155. Which of the following aqueous solutions should have the highest boiling point ?

1) 1.0M NaOH 2) 1.0M Na_2SO_4 3) 1.0M NH_4NO_3 4) 1.0MKNO_3

156. Copper crystallises in a F.C.C lattice, the length of the unit cell is $3.63A^0$. The radius of copper atom is

1) $0.6A^0$ 2) $2.9A^0$ 3) $1.28A^0$ 4) $5.7A^0$

157. At 25^0C the molar conductances at infinite dilution for the strong electrolytes NaOH, NaC*l* and $BaCl_2$ are 248×10^{-4},$126x10^{-4}$ and 280×10^{-4} Sm^2 mol^{-1} respectively . Molar conductivity of $Ba(OH)_2$ at infinite dilution is (in Sm^2 mol^{-1})

1) 524×10^{-4} 2) 402×10^{-4} 3) 262×10^{-4} 4) 52.4×10^{-4}

158. Number of lone pair and bond pairs present on Xe of $XeOF_4$molecule is

1) 1,2 2) 1,4 3) 1,6 4) 2,4

159. Denaturation of protein is carried by

A) Change the pH B) Adding urea C) Agitation

1) A only 2) B only 3) A and C 4) A,B and C

160. A metal ball of mass 100g is moving with a velocity of 100m/sec. If the uncertainity in the velocity is estimated as0.01%. Calculate the uncertainity in its position.

1) 5.3×10^{-32}m 2) 5.3×10^{-32}cm 3) 0.53×10^{-32}m 4) 0.53×10^{-32}cm

EAMCET MODEL GRAND TEST

KEY

MATHEMATICS

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

PHYSICS

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

CHEMISTRY

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

EAMCET MODEL GRAND TEST

SOLUTIONS

Mathematics

1. $2\tanh^{-1}\left(\frac{1}{2}\right)=2.\frac{1}{2}\log\left(\frac{1+\frac{1}{2}}{1-\frac{1}{2}}\right)$

   $=\log 3$

2. Let $A(a,0),B(0,b)$ be the ends of the rod on X and Y axis

   $G=\left(\frac{a}{3},\frac{b}{3}\right)=(x,y)$

   $a=3x, b=3y$

   $a^2+b^2=81$

3. $\frac{1}{1-\cos\alpha}=2-\sqrt{2}$

   $1-\cos\alpha=\frac{2+\sqrt{2}}{2}$

   $\cos\alpha=\frac{-1}{\sqrt{2}}$

4. $|AdjA|=243$

   $|A|^{n-1}=243$

   $3^{n-1}=3^5\Rightarrow n-1=5\Rightarrow n=6$

5. $|A|\neq 0$

   $\Rightarrow K\neq 0$

6. $(A+B)^2=A^2+B^2$

   $\Rightarrow AB+BA=0$

   $\Rightarrow 2x-2=0,-y+4=0$

7. $\frac{m}{n}=\frac{\tan(\theta+120^0)}{\tan(\theta-30^0)}$

   By C and D

   $\frac{m+n}{m-n}=\frac{\sin(2\theta+90^0)}{\sin(150^0)}$

8. $=(\tan 9^0+\cot 9^0)-(\tan 27^0+\cot 27^0)$

   $=2\cos ec18^0-2\cos ec54^0$

   $=\frac{2(4)}{\sqrt{5}-1}-\frac{2(4)}{\sqrt{5}+1}$

9. $\sin^2 x+4\sin x+5$

   $=(\sin x+2)^2+1$

   sinx=-1

   sinx=1

10. $F=n(n+1)(n+2)(n+3)$ put n = 1

    $F=1.2.3.4$

    $=4!=24$

11. Conceptual

12. $f(x)=\sin^{-1}[4x-1]\in R$

    $\Leftrightarrow -1\le[4x-1]\le 1$

    $\Leftrightarrow -1\le 4x-1<2$

    $\Leftrightarrow 0\le 4x<3$

    $\Leftrightarrow 0\le x<\frac{3}{4}$

13. $\cos(A-B)=\frac{4}{5}$

    $\frac{1-\tan^2\left(\frac{A-B}{2}\right)}{1+\tan^2\left(\frac{A-B}{2}\right)}=\frac{4}{5}$

    By C and D, $\tan\left(\frac{A-B}{2}\right)=\frac{1}{3}$

    $\tan\left(\frac{A-B}{2}\right)=\frac{(a-b)}{a+b}$ let C/2

    put a=6,b=3

    $\Rightarrow\tan\frac{C}{2}=1\Rightarrow c=90^0$

    $\Delta=\frac{1}{2}ab\sin c$

14. $\tan A = 2k \quad \tan B = 3k \quad \tan C = 4k$

$\sum \tan A = \pi \tan A$

$\Rightarrow k = \sqrt{\frac{3}{8}}$

$\tan C = 4\sqrt{\frac{3}{8}} \Rightarrow \tan^2 C = 6$

15. $a\frac{s(s-c)}{ab} + c\frac{s(s-a)}{bc} = \frac{3b}{2}$

$\Rightarrow 2s = 3b$

16. $\bar{a}.\bar{c} = 0 \Rightarrow \lambda + 2\mu = 1$

$\bar{b}.\bar{c} = 0 \Rightarrow 2\lambda + \mu = -4$

17. $GE = \left[\bar{a}\bar{b}\bar{c}\right]^2$

$$= \begin{vmatrix} 1 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 1 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & 1 \end{vmatrix} = \frac{1}{2}$$

18. $$\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 0$$

Use $R_2 \to R_2 - R_1$

$R_3 \to R_3 - R_1$

19. $\pm \frac{\overline{PQ} \times \overline{PR}}{\left|\overline{PQ} \times \overline{PR}\right|}$

20. Let $\bar{a} = \bar{i} + 2\bar{j} + 3\bar{k}$

$\bar{b} = 3\bar{i} + 2\bar{j} + \bar{k}$

$\bar{a} + \bar{b} = 4\bar{i} + 4\bar{j} + 4\bar{k}$

$\left|\bar{a} + \bar{b}\right| = 4\sqrt{3}$

$\pm \frac{\left(\bar{a} + \bar{b}\right)}{\left|\bar{a} + \bar{b}\right|}$

21. $\bar{a} + 3\bar{b} = t\bar{c}$ -------(1)

$3\bar{b} + 2\bar{c} = s\bar{a}$ ----------(2)

From (1) and (2)

$\bar{a} + s\bar{a} - 2\bar{c} = t\bar{c}$

$\therefore t = -2$

22. $(fof)(x) = f\left[f(x)\right]$

$= f\left(\left(a - x^n\right)^{\frac{1}{n}}\right)$

$= \left[a - \left(\left(a - x^n\right)^{\frac{1}{n}}\right)^n\right]^{\frac{1}{n}}$

$= a - a + x = x$

23. $\theta = \frac{1}{2}\tan^{-1}\left(\frac{2h}{a-b}\right)$

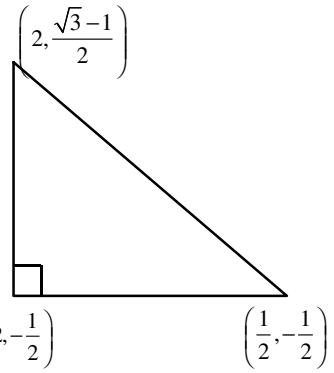
24. Let the terms be a,ar,ar^2 so that b=ar,c=ar^2

The ordinates y of the points of intersection of $ax + by + c = 0$ and $x + 2y^2 = 0$ satisfy

$a\left(-2y^2\right) + by + c = 0$

(OR) $-2ay^2 + ar + ar^2 = 0$

$y_1 + y_2 = \frac{r}{2}$

25. 

H=$\left(2, -\frac{1}{2}\right)$

26. Image formula

27. $\frac{\delta A}{A} \times 100 = 2 \times \frac{\delta r}{r} \times 100$

28. One line is $3x + 4y = 0$

$6x^2 - xy + 4cy^2 = (3x + 4y)(2x - 3y)$

c=-3

29. $x^2+y^2=4\left(\frac{y-3x}{c}\right)^2$

$\angle AOB=90^0$

coeff of $x^2+coeff\ of\ y^2=0$

$1-\frac{36}{c^2}+1-\frac{4}{c^2}=0$

$2=\frac{40}{c}\Rightarrow c^2=20$

30. $-y_1=y_2$

31. Given $l+m+n=0------(1)$

$l^2+m^2-n^2=0-----(2)$

Solving (1) and (2), we get dcs

32. $\frac{1}{3}=\frac{2-2+2\sqrt{\lambda}}{3\sqrt{5+\lambda}}$

$\sqrt{5+\lambda}=2\sqrt{\lambda}$

$5+\lambda=4\lambda$

$3\lambda=5$

33. $\underset{x\to-1}{Lim}\frac{0-\frac{1}{2\sqrt{\cos^{-1}x}}\left(\frac{-1}{\sqrt{1-x^2}}\right)}{\frac{1}{2\sqrt{x+1}}}$

$=\underset{x\to-1}{Lt}\frac{1}{\sqrt{\cos^{-1}x}\sqrt{1-x}\sqrt{1+x}}\times\frac{\sqrt{x}+1}{1}$

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

34. $\underset{e^{x\to\infty}}{Lt}x+4\left[\frac{x+6-x-1}{x+1}\right]$

$=e^5$

35. $\underset{x\to0}{Lt}f(x)=f(0)$

$\underset{x\to0}{Lt}\frac{1+3x^2-\cos2x}{x^2}=k$

$\underset{x\to0}{Lt}\frac{6x+2\sin2x}{2x}=k$

$3+2=k$

36. npq=4,np=8

$p=\frac{1}{2},q=\frac{1}{2},n=16$

$p(x<3)=\frac{^{16}C_0+^{16}C_1+^{16}C_2}{2^{16}}=\frac{137}{2^{16}}$

37. $F(x)=f^2(x)+g^2(x)$

$F^1(x)=2f(x)f^1(x)+2g(x)g^1(x)$

$F^1(x)=0$

F(x) is a constant

$f^2(119)+g^2(119)$

$=f^2(3)+g^2(3)$

$=25+25=50$

38. $V=2t-2$

a=2

39. $\frac{1}{2}y_1^2\left|m+\frac{1}{m}\right|$

$=\frac{1}{2}(3)\left|\frac{-1}{\sqrt{3}}-\sqrt{3}\right|$

$\frac{dy}{dx}=m=-\frac{1}{\sqrt{3}}$

40. Perimeter and sectional constant.

41. $\alpha=w+2w^2-3=w^2-4$

$\Rightarrow w^2=\alpha+4$

$(\alpha+4)^3=w^6=1$

$\therefore\alpha^3+12\alpha^2+48\alpha+63=0$

$\Rightarrow\alpha^3+12\alpha^2+48\alpha+3=-60$

42. $\left(\frac{2\cos^2\frac{\pi}{16}-12\sin\frac{\pi}{16}\cos\frac{\pi}{16}}{2\cos^2\frac{\pi}{16}+12\sin\frac{\pi}{16}\cos\frac{\pi}{16}}\right)^8$

$=\left(\frac{\cos\frac{\pi}{16}-i\sin\frac{\pi}{16}}{\cos\frac{\pi}{16}+i\sin\frac{\pi}{16}}\right)^8=\left(\frac{\cos\frac{\pi}{2}-i\sin\frac{\pi}{2}}{\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}}\right)$

=-1

43. $r^{1/n}cis\left(\frac{2k\pi+\theta}{n}\right)k=0,1,2$

44. The roots of $z^3+2z^2+2z+1=0$ and $z^{2014}+z^{2015}+1=0$ are w and w^2

45. Let $y=\dfrac{x^2+2x+1}{x^2+2x-1}$

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

$b^2-4ac\geq 0$

$y^2-y>0\Rightarrow y(y-1)\geq 0$

$\therefore$ y does not lie between [0,1]

$\Rightarrow y\in(-\infty,0)\cup(1,\infty)$

46. $y=\sin(\log x)$

$xy_1=\cos(\log x)$

$y_1 1+xy_2=-\sin(\log x)\dfrac{1}{x}$

$x^2y_2+xy_1=-y$

47. $\sum p(x=xp)$

$=k+2k+3k+2k+k=1$

$\therefore k=\dfrac{1}{9}$

Variance = $\sum x_l^2 p(x-x_1)^2-(\bar{x})^2=\dfrac{4}{3}$

48. $x_1+x_2+x_3+x_4=12$

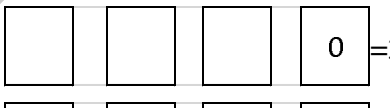
$x_1^2+x_2^2+x_3^2+x_4^2=48$

S.D = $\sqrt{\dfrac{\sum x_l^2}{n}-\mu^2}=\sqrt{\dfrac{48}{4}-9}=\sqrt{3}$

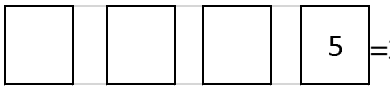
49. $P(A\cup C)=P(A)+P(C)=\dfrac{4}{13}+\dfrac{3}{13}=\dfrac{7}{13}$

50. Total Number of 4 digit numbers using the digits 0,2,4,5=4!-3!=18

The numbers divisible by '5' are



=3!=6



=3!-2!=4

$\therefore$ The numbers not divisible by '5' = 18-10=8

51. $1+x=\left(1-\dfrac{2}{5}\right)^{\frac{-1}{2}}$

$1+x=\left(\dfrac{3}{5}\right)^{\frac{-1}{2}}=\left(\dfrac{5}{3}\right)^{\frac{1}{2}}$

$(1+x)^2=\dfrac{5}{3}\Rightarrow 3x^2+6x=2$

52. $-3x(2-x)^{-1}(1+x)^{-1}$

$=-\dfrac{3}{2}x\left(1-\dfrac{x}{2}\right)^{-1}(1+x)^{-1}$

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

$(1-x+x^2-x^3-.....)$

The coefficient of x^5 is $-\dfrac{33}{32}$

53. $P(E)=1-\dfrac{{}^5C_2}{{}^8C_2}=\dfrac{9}{14}$

54. $P(E)=\dfrac{3+2+1}{36}=\dfrac{1}{6}$

55. P=0.2, q=0.8, n=3

$P(X=0)+P(X=1)=0.896$

56. $y=\dfrac{\alpha^2}{\beta+\gamma}=\dfrac{\alpha^2}{-\alpha}=-\alpha=-x$

Req equation is $(-x)^3+4(-x)+1=0$

$=x^3+4x-1=0$

57. $a^2-4b<0$

$\therefore f(x)+f^1(x)+f^{11}(x)=0$

$x^2+ax+b+2x+a+2=0$

$\Rightarrow x^2+(a+2)x+(a+b+2)=0$

$\therefore \Delta=a^2-4b-4<0$

58. $x^2+x+1=A(x-2)(x-3)+$

$B(x-1)(x-3)+C(x-1)(x-2)$

Put $Pux=1$ $A=\dfrac{3}{2}$

$x=3$ $C=\dfrac{13}{2}$

A+C=8

59. we know that ${}^{n}P_{r} = {}^{n-1}P_{r}$

${}^{r(n-1)}P_{r-1}$

$\Rightarrow n = 15, r = 8$

$A = {}^{(n-1)}P_{r} = {}^{14}P_{8}$

60. Let α be the common root

Then $\alpha^3 + a\alpha + 1 = 0 - - - - - (1)$

and $\alpha^4 + a\alpha^2 + 1 = 0 - - - - - (2)$

(1) α -(2) $\Rightarrow \alpha - 1 = 0$

$\alpha = 1$

Then from (1) 1+a+1=0

$\alpha = -2$

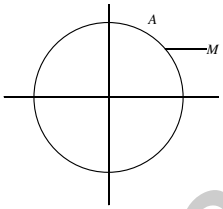
61. $\dfrac{|2(0) - 0 + c|}{\sqrt{1+4}} = \sqrt{5} \Rightarrow c = \pm 5$

62. $A = (a\cos\theta, a\sin\theta)$,

$M = (a\cos\theta + a, a\sin\theta) = (x, y)$

Locus of 'M' is $(x-a)^2 + y^2 = a^2$

$\Rightarrow x^2 + y^2 - 2ax = 0 \Rightarrow x^2 + y^2 = 2a^x$



63. $2r = \left|\dfrac{7+28}{10}\right| \Rightarrow r = \dfrac{7}{4}$

64. Conjugate points then $S_{12} = 0$

$4K - 6 - \dfrac{5}{2}(4+K) + 4(2-3) + 6 = 0$

$\Rightarrow K = \dfrac{28}{3}$

65. $c_1 = (-4, 2), c_2 = (-1, -2)$

$r_1 = \sqrt{20-c} \quad r_2 = 4$

$\sqrt{20-c} + 4 = 5 \Rightarrow 20 - c = 1$

$\therefore c = 19$

By orthogonal condition

$8(-3) + (-4)(4) = c + k$

$\Rightarrow k = -59$

66. Normal chord of the parabola $y^2 = 4ax$ at 't' sub tends a right angle at vertex then

$t^2 = 2 \Rightarrow t = \sqrt{2}$

67. Length of L.R = 2x $\perp lar$ distance from 'S' to 'L' = $\dfrac{2}{\sqrt{13}}$

68. Focus = (ae,0) = $\left(\sqrt{a^2 - b^2}, 0\right) = \left(\sqrt{2}, 0\right)$

radius = distance Between Focus and (0,3) = 4

69. I.F = cos2x solution is

$y\cos 2x = \int e^x dx$

$\Rightarrow y\cos 2x = e^x + c$

70. $\dfrac{x^2}{2} - \dfrac{y^2}{1} = 1$

$= \dfrac{a^2b^2}{a^2+b^2} = \dfrac{2}{3}$

71. $\dfrac{(\sin^4 x - \cos^4 x)(\sin^4 x + \cos^4 x)}{1 - 2\sin^2 x\cos^2 x}$

$= \int \dfrac{-\cos 2x(1 - 2\sin^2 x)(\cos^2 x)}{1 - 2\sin^2 x\cos^2 x} dx$

$= \dfrac{-\sin 2x}{2} + c$

$\therefore A = -\dfrac{1}{2}$

72. Put x-y=z

73. $\int \dfrac{1-\cos x}{\sin^2 x} dx = \int \dfrac{1}{1+\cos x} dx$

$= \int \dfrac{1}{2}\sec^2\dfrac{x}{2} dx = \tan\dfrac{x}{2} + c$

74. Put $xe^x = t$

75. $\dfrac{dy}{dx} + \dfrac{1}{x + x^3} + \dfrac{y}{x} = 0$

$\therefore I.F = e^{\int \frac{1}{x} dx} = e^{\log x} = x$

76. $f(y) = y^2 - 1$

$\therefore Area = \dfrac{\Delta^{\frac{3}{2}}}{6a^2} = \dfrac{8}{6} = \dfrac{4}{3}$

77. $2I = \int_{-\pi}^{\pi} \sin^2 x dx \Rightarrow I = \frac{\pi}{2}$

78. $\frac{d}{dx}\left(\frac{x^8}{1+x+x^8}\right) = \frac{7x^8+8x^7}{\left(1+x+x^8\right)^2}$

79. $16 - b^2 = \frac{144}{25} + \frac{81}{25} \Rightarrow b^2 = 7$

80. $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{4 - (\sin x - \cos x)^2} dx = \frac{1}{4}\log 3$

Put $\sin x - \cos x = t$

Physics

81. $e = Blv\sin\theta = (2)(1)(4)\left(\frac{1}{2}\right) = 4v$

$\because e = V_A - V_B = 4V$

82. $T = 2\pi\sqrt{\frac{1}{MB}} \Rightarrow T \propto \frac{1}{\sqrt{M}}$

$\Rightarrow \frac{M_1}{M_2} = \left(\frac{T_2}{T_1}\right)^2 = \left(\frac{v_1}{v_2}\right)^2 = \left(\frac{15}{10}\right)^2 = \frac{9}{4}$

83. $\lambda = 6000\text{A}^0 = 6000\times10^{-10}\,m$

$\Delta\theta = \frac{1.22\lambda}{a}$

$= \frac{1.22\times6000\times10^{-10}}{2.54} = 2.9\times10^{-7}\,rad$

84. λ decreases $\Rightarrow$ it moves towards earth

85. $r_2 < \theta_c; A - r_1 < \theta_c; \quad r_1 > A - \theta_c$

$\sin r_1 > \sin(A - \theta_c)$

$\frac{\sin i}{\mu} > \sin(A - \theta_c)$

$\sin i > \mu(\sin A\cos\theta_c - \cos A\sin\theta_c)$

$\sqrt{\frac{7}{3}}\left(\frac{\sqrt{3}}{2}\sqrt{1-\frac{3}{7}} - \sqrt{\frac{3}{7}}\cdot\frac{1}{2}\right) = 1 - \frac{1}{2} = \frac{1}{2}$

$\sin i > \frac{1}{2}(or) i > 30^0$

86. $V_L = V_C = 100 volt$

$\text{emf} = \sqrt{(V_L - V_C)^2 + V_R^2} = \sqrt{0 + V_R^2} = V_R = 220V$

$i = \frac{V_R}{R} = \frac{220}{100} = 2.2A$

87. A ray of light starting from O gets refracted twice. The ray of light is travelling in a direction from left to right. Hence, the distance measured in this direction are taken positive.Applying

$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$, twice with proper signs.

We have, $\frac{3/2}{v} - \frac{4/3}{-20} = \frac{3/2 - 4/3}{10}$

Or $v = -30cm$

Now, the first image I_1 acts as an object for the second surface, where

$BI_1 = u = -(30 + 20) = -50cm$

$\frac{4/3}{v'} - \frac{3/2}{-50} = \frac{4/3 - 3/2}{-10}$

$\therefore v^1 = -100cm$, i.e., the final image I_3 is virtual and is formed at a distance of 100 cm (towards left) from B.

88. $R_A = \frac{GS}{G+S}$

Given

$S = \frac{100}{99}R_A\ shunt, S = \frac{G}{n-1}$

$S = \frac{100}{99}\frac{G.S}{G+S}$

$100G = 99G + 99S$

$G = 99S$

$S = \frac{G}{99}$

$$n=\frac{i}{ig}=\frac{i}{\frac{S}{G+S}i}=\frac{G+S}{S}$$

$$=\frac{G+\frac{G}{99}}{\frac{G}{99}}=\frac{\frac{100}{99}G}{\frac{G}{99}}=100$$

89. $C^1=\frac{\varepsilon_0 A}{2d}+\frac{k\varepsilon_0 A}{2d}$

$$\frac{C}{2}(1+K)=\frac{10\times10^{-6}\times5}{2}=25\mu F$$

90. $U_1=\frac{1}{2}CV^2$

$$U_2=\frac{1}{2}KC\left(V/K\right)^2$$

$$W=U_1-U_2=\frac{1}{2}CV^2\left(1-1/K\right)$$

$$W=\frac{1}{2}\frac{\in_0 A}{d}V^2\left(1-1/K\right)$$

91. $V_B-V_A=\frac{W}{q}=\frac{10\times10^6}{1.6\times10^{-19}}=6.25\times10^{25}\,volts$

92. $T=V^2\mu=\left(\frac{\omega}{k}\right)^2\mu$

93. $\rho_M=\frac{\rho_1V_1+\rho_2V_2}{V_1+V_2}$, $V\propto\frac{1}{\sqrt{\rho}}$

$$=\frac{3(2)+2(32)}{5}=14$$

$$\frac{V_{H_2}}{V_M}=\sqrt{\frac{14}{2}}=\sqrt{7}$$

$$\therefore V_M=\frac{V}{\sqrt{7}}$$

94. $\beta=\frac{\Delta I_C}{\Delta I_B}\Rightarrow\Delta I_C=\beta\Delta I_B=1.8mA$

95. Gain with feedback

$$A_f=\frac{A}{1+\beta A}=\frac{100}{1+(1/25)\times100}=20$$

96. $I=\frac{E}{At}=\frac{NhC}{At\lambda}$

$$\frac{N}{At}=\frac{1\lambda}{hc}=\frac{39.6\times6000\times10^{-10}}{6.64\times10^{-34}\times3\times10^8}=12\times10^{19}$$

97. $\frac{\Delta\lambda}{\lambda}=\frac{-\Delta P}{P}\Rightarrow\frac{-0.5}{100}=\frac{-P_m}{P}\Rightarrow P=200\,P_m$

98. $\frac{N}{N_0}=\left(\frac{1}{2}\right)^n$

for $A\ n=\frac{80}{20}=4\frac{N}{N_0}=\left(\frac{1}{2}\right)^4$

for $n=\frac{80}{40}=2\frac{N}{N_0}=\left(\frac{1}{2}\right)^2$

$$\frac{NA}{NB}=\frac{1/16}{1/4}=1/4$$

99. Kirchhoff 's current law

100. $\frac{R_1R_2}{R_1+R_2}=\frac{6}{5}$ If is removed $R_1=2\Omega$

$$\frac{2R_2}{2+R_2}=\frac{6}{5}\Rightarrow5R_2=6+3R_2\Rightarrow R_2=3\Omega$$

101. James Chadwick

102. $P=\frac{\alpha}{\beta}e^{\frac{-\alpha z}{k\theta}}$, $\frac{\alpha z}{K\theta}=1$, by using

dimensional methods $\alpha=\frac{k\theta}{Z}=MLT^{-2}$

$$[p]=\frac{[\alpha]}{[\beta]}\Rightarrow[\beta]=\frac{[\alpha]}{[P]}=\frac{MLT^{-2}}{ML^{-1}T^{-2}}=L^2$$

103. As $v=0+na\Rightarrow a=\frac{v}{n}$

$\Rightarrow S_n = \frac{1}{2}an^2$ and distance travelled in (n-2)

second is $S_{n-2} = \frac{1}{2}a(n-2)^2$

So, distance travelled in the last 2s is

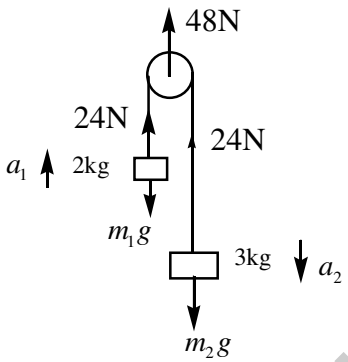
$$S_n - S_{n-2} = \frac{1}{2}an^2 - \frac{1}{2}a(n-2)^2$$

$$= \frac{a}{2}\left[n^2 - (n-2)^2\right]$$

$$= \frac{a}{2}\{n+(n-2)\}\{n-(n-2)\}$$

$$= \frac{2v(n-1)}{n}$$

104.



$$2 \times a_1 = 24 - 2 \times 10 \quad (\because 24 > m_1 g)$$

$$a_1 = 2m/s^2 \uparrow$$

105. $\mu = \frac{l}{L-l} \Rightarrow \frac{l}{L} \times 100\% = \frac{\mu}{\mu+1} \times 100\%$

$$= \frac{0.5}{0.5+1} \times 100\% = 33.3\%$$

106. As speed of reaching ground is not equal to speed of projection, resistance of air to be considered whose effect is same during ascent and descent. Loss in energy=2

(work done against air resistance during ascent)

$$\frac{1}{2}mu^2 = mgh_{\max} + W_{against\ air\ resistance\ during\ ascent}$$

from energy conservation

$$\frac{1}{2}mu^2 = mgh_{\max} + W_{against\ air\ resistance\ during\ ascent}$$

$$mgh_{\max} = \frac{1}{2}mu^2 - \frac{1}{4}m\left(u^2 - v^2\right) = \frac{m\left(u^2+v^2\right)}{4}$$

$$h_{\max} = \frac{\left(u^2+v^2\right)}{4g} = \frac{400+324}{40} = 18.1m$$

107. From momentum conservation

$$m_1V_1 + 0 = m_1\frac{V_1}{3} + mV \Rightarrow V = \frac{2}{3}\left(\frac{m_1}{m}\right)V_1$$

To complete the vertical circle

$$V = \frac{2}{3}\left(\frac{m_1}{m}\right)V_1 = \sqrt{5gl} \Rightarrow V_1 = \frac{3}{2}\left(\frac{m}{m_1}\right)\sqrt{5gl}$$

108. $\vec{v}_{com} = \frac{m_1\vec{v}_1 + m_2\vec{v}_2}{m_1+m_2}$

$$\frac{\vec{v}_1 + \vec{v}_2}{2} = \left(\hat{i} + \hat{j}\right)m/s$$

Similarly,

$$\vec{a}_{com} = \frac{\vec{a}_1 + \vec{a}_2}{2} = \frac{3}{2}\left(\hat{i} + \hat{j}\right)m/s^2$$

Since, $\vec{v}_{com}$ is parallel to $\vec{a}_{com}$ the path will be a straight line.

109. $F = 2Tl = W$

$$\Rightarrow T = \frac{W}{2l} = \frac{1.5 \times 10^{-2}}{2 \times 30 \times 10^{-2}} = 0.025N/m$$

110. Take x-axis along the flow and y-axis perpendicular to it.

$$\vec{v}\,initial = v\hat{i}; \vec{v}\,final = v\hat{j}$$

$$\therefore \qquad \Delta\vec{v} = v\hat{j} - v\hat{i}$$

$$\left|\Delta \vec{v}\right| = \sqrt{\left(v^2 + v^2\right)} = \sqrt{2}v$$

Force exerted on the pipe

$$= \frac{m\Delta v}{t} = \frac{\rho \times S \times l}{t} \times \Delta v$$

$$= \rho Sv \times \sqrt{2}v = \sqrt{2}Sv^2\rho$$

111. $K.E = \frac{L^2}{2I} \Rightarrow KE \propto \frac{1}{R^2} \Rightarrow \frac{\Delta KE}{KE} = \frac{-2\Delta R}{R}$

$$\frac{\Delta KE}{KE} = -2 \times \frac{7.5}{500} = -0.03$$

$$\frac{\Delta KE}{KE} = \times 100\% = -0.03 \times 100\% = -3\%$$

112. $\tan 30^0 = \frac{v_y}{v_x} = \frac{u_y - gt}{u_x}$

$$= \frac{\left(20\sqrt{3}\sin 60^0\right) - 10t}{\left(20\sqrt{3}\cos 60^0\right)}$$ or 10=30-10t

t = 2s

113. $\frac{C_P}{C_V} = \gamma$

$$C_P = \gamma \times C_V = \frac{7}{5} \times 100.46 \approx 142.2 J/kg/k$$

114. $\frac{1}{2}mv^2 = J\Delta mL_1$

$$\frac{1}{2} \times 4.2 \times 400 = 1 \times \Delta m \times 80 \times 4.2 \times 10^3$$

$$\Delta m = \frac{4}{2 \times 8 \times 10^2} = 0.25 \times kg = 2.5 gm$$

115. $P = \frac{2I}{C} = \frac{2 \times 5}{3 \times 10^8} = 3.33 \times 10^{-8} N/m^2$

116. Angular momentum about a point $P(x, y)$ with respect to the point of projection is

$$L = mv_y x - mv_x y$$

$$= -m\left[u\cos\theta\right]\left[\frac{u^2 \sin^2\theta}{2g}\right] = \frac{3mu^3}{16g}$$

117. $g_2 = g_1 - R\omega^2$ (at equator)

$g_{60^0} = g_1 - R\omega^2 \cos^2 60^0 = 0$ (given)

$$\omega^2 = \frac{4g_1}{R}$$

$$\therefore T = 2\pi\sqrt{\frac{R}{4g_1}}$$

118. $(KE)_{\max} = \frac{1}{2}m\omega^2 A^2$

$$= \frac{1}{2}KA^2 \qquad \left(\because m\omega^2 = K\right)$$

$$= \frac{1}{2}\left(\frac{mg}{x}\right)A^2 = \frac{1}{2} \times \frac{2 \times 9.8}{0.05} \times (0.1)^2$$

$$= 98 \times 2 \times 0.1 \times 0.1 = 1.96 J$$

119. $Q_1/Q_2 = T_1/T_2$

$$\frac{100}{80} = \frac{T_1}{T_2} = \frac{400}{T_2}$$

$$T_2 = \frac{400}{100} \times 80 = 320\text{K}$$

$$\therefore T_2 = 47^o C$$

120. $K = 2 \times 10^9 N/m^2$

$\Delta V = 0.1\%$ of

$$V = V \times 10^{-3}; \frac{\Delta V}{V} = 10^{-3}$$

$$K = \frac{PV}{\Delta V} \Rightarrow K = \frac{P}{\left(\frac{\Delta V}{V}\right)}$$

$$2 \times 10^9 = \frac{P}{10^{-3}} \Rightarrow P = 2 \times 10^6 N/m^2$$

Chemistry

121. A) Fe^{2+} ion has no unpaired electrons
C) Co^{3+} ion has no unpaired electrons
D) Ni^{+2} ion has no unpaired electrons

122. Volume strength =5.6xnormality

123. O_3 does not permit UV

124. Conceptual

125. $4Zn+10HNO_3 \rightarrow 4Zn(NO_3)_2+5H_2O+N_2O\uparrow$

$3Cu+8HNO_3 \rightarrow 3Cu(NO_3)_2+4H_2O+2NO\uparrow$

126. Conceptual

127. N has stable electronic configuration

128. The spin only magnetic moment $\mu=\sqrt{n(n+2)}B.M$

If n==3

$\mu=\sqrt{15}$ BM

129. Superoxide ion is O_2^- contain one unpaired electron

130. Presence of four electrons in two Pi molecular obitals

131. Dipolemoment $\mu=\delta\times l$

132. Equivalent weight of metal $=\frac{weight\ of\ metal}{weight\ of\ oxygen}\times 8$

Eq.wt of vanadium $=\frac{1.53}{1.23}\times 8$

$=10.11$g

Valency of vanadium $=\frac{atomic\ weight}{Eq.wt.}$

$=\frac{51}{10.11}=5$

Formula $=V_2O_5$

133. No.of radial nodes =(n-*l*-1)

134. After 3 hours, the moles of the gases remaining in the container $SO_2 > CH_4 > H_2$

$\because p \propto n$

partial pressures in the container, $SO_2 > CH_4 > H_2$

135. $16gCH_4 \rightarrow 800KJ$

$4\times10^{-1}gCH_4 \rightarrow ?$

$\frac{4\times10^{-1}\times800}{16}=20KJ$

136. $N_2+3H_2 \rightleftharpoons 2NH_3$

	initial :	2	4
0			
	eq	1	1
2			$(\because x=1)$

137 At anode : $2H_2O \rightarrow 4H^+ + O_2\uparrow + 4e^-$

at cathode : $2H_2O+2e^- \rightarrow 4OH^- + H_2\uparrow$

138. $\Delta H=(E_a)_f-(E_a)_b$

139 Protective power $\propto \frac{1}{gold\ number}$

140. Conceptual

141. $\Delta T_f = K_f \times molality$

$\Delta T_f = 1.86\times0.05$

$\Delta T_f = 0.093^0C$

$\therefore$ Freezing point of solution = -0.093^{0}C

142. Broad spectrum antibiotic

143. Higher for Nylon –6, 6

144. Conceptual

145. $X=CH_3CH_2CONH_2$

$Y=CH_3CH_2NH_2$

$Z=CH_3CH_2OH$

146. $-OCH_3$ increases : $-NO_2$ decreases

147. 3-pentanone does not contain

$CH_3-\overset{O}{\overset{\|}{C}}-group$

148. Absence of acidic hydrogens

149. Tollen's test for 1-yne

150. percentage of nitrogen $=\frac{1.4\times N\times V}{wt.of\ .compound}$

151. 3° carbanion is less stable

152. Both esters

153. Higher with higher oxidation state of chlorine

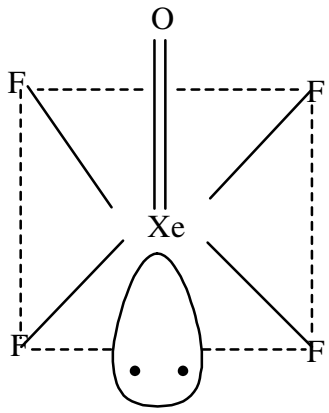
154. $pH = p^{Ka} + \log \frac{[salt]}{[acid]}$

155. Boiling point $\propto \frac{1}{vapour\ pressure}$

156. $r = \frac{a}{2\sqrt{2}}$

157. $\wedge_m^0 Ba(OH)_2 = 2\wedge_m^0 (NaOH) + \wedge_m^0 (BaCl_2) - 2\wedge_m^0 (NaCl)$

158.



159. All cause denaturation

160. $\Delta x = \frac{h}{4\pi m.\Delta v}$