Sec:SR MPC **Ex. Date:**

Time: 3 Hrs. **EAPCET MODEL EXAM-2** **Max. Marks: 160 Marks**

MATHAMATICS

1. $Co\sec 48^\circ + Co\sec 96^\circ + Co\sec 192^\circ + Co\sec 384^\circ =$

   (a) $4\sqrt{3}$ (b) $-4\sqrt{3}$ (c) 0 (d) 1

2. The possible value of $\sin^6(\theta)+\cos^6(\theta)-3\cos^4(\theta)$ is

   (a) 2 (b) –2 (c) –3 (d) 3

3. $\sqrt{\sin^4 x+4\cos^2 x}-\sqrt{\cos^4 x+4\sin^2 x}=$

   (a) $1-\cos 2x$ (b) $\tan 2x$ (c) $\sin 2x$ (d) $\cos 2x$

4. If $\cos x+\sin x=\frac{1}{2}$ *and* $0<x<\pi$, Then $\tan x=$

   (a) $\frac{1+\sqrt{7}}{4}$ (b) $\frac{1-\sqrt{7}}{4}$ (c) $\frac{4-\sqrt{7}}{3}$ (d) $-\frac{\left(4+\sqrt{7}\right)}{3}$

5. If $z=x+iy$ and $x^2+y^2=1$, then $\frac{1+x+iy}{1+x-iy}=$

   (a) $\bar{z}$ (b) z (c) $z+1$ (d) $z-1$

6. If m,n are respectively the least positive and greatest negative integer values of k such that $\left(\frac{1-i}{1+i}\right)^k=-i,$ then $m-n=$

   (a) 4 (b) 0 (c) 6 (d) 2

7. If $\left(\frac{\cos\theta+i\sin\theta}{\sin\theta+i\cos\theta}\right)^{2024}+\left(\frac{1+\cos\theta+i\sin\theta}{1-\cos\theta+i\sin\theta}\right)^{2025}=x+iy,$ then the value of $x+y$ at $\theta=\frac{\pi}{2}$ is

   (a) 1 (b) –1 (c) 2 (d) 2024

8. In $\Delta ABC,$ if $r=3$ and $R=5$ then $\frac{1}{ab}+\frac{1}{bc}+\frac{1}{ca}=$

   (a) $\frac{1}{30}$ (b) $\frac{12}{15}$ (c) $\frac{1}{15}$ (d) $\frac{5}{36}$

9. If the angles of a triangle are in the ratio $1:2:3,$ the corresponding sides are in the ratio

   (a) $2:\sqrt{3}:1$ (b) $1:\sqrt{3}:2$ (c) 1:2:3 (d) $\sqrt{3}:2:1$

10. An aeroplane is flying at a constant speed, parallel to the horizontal ground at a height of 5 kms. A Person on the ground observed that the angle of elevation of the plane is changed from 15^0 to 30^0 In the duration of 50 seconds, then the speed of the plane (in kmph) is

    (a) 100 (b) 720 (c) 360 (d) 540

11. If $A=\begin{bmatrix}1&1&3\\1&7&9\\2&3&7\end{bmatrix}$ then Tr $(A^2-A)=$

    (a) 0 (b) –12 (c) 152 (d) 125

12. IF $A=\begin{bmatrix}2&2&1\\1&3&1\\1&2&2\end{bmatrix}$ and α,β,γ are the roots of the equation represented by $|A-xI|=0,$ then $\alpha^2+\beta^2+\gamma^2=$

(a) 50 (b) 29 (c) 17 (d) 27

13. The system $x+2y+3z=4, 4x+5y+3z=5, 3x+4y+3z=\lambda$ is consistent and $3\lambda=n+100$, Then n=

(a) –42 (b) –86 (c) 16 (d) –24

14. A string of letters is to be formed by using 4 letters from all the letters of the word "*MATHEMATICS*". The number of ways this can be done such that two letters are of same kind and the other two are of different kind is

(a) 756 (b) 252 (c) 840 (d) 360

15. If a polygon of n sides has 560 diagonals is then n=

(a) 35 (b) 36 (c) 37 (d) 38

16. There are 4 oranges, 5 apples, 7 mangoes in a fruit basket. The number of ways of selecting at least One fruit from among the fruits in the basket is

(a) 210 (b) 240 (c) 209 (d) 239

17. If α,β are the roots of $x^2-5\gamma x-6\delta=0$ and γ,δ are the roots of $x^2-5\alpha x-6\beta=0$, then $\alpha+\beta+\gamma+\delta=$

(a) 0 (b) 125 (c) 144 (d) 180

18. The equation $x^{\frac{3}{4}(\log_2 x)^2+\log_2 x-\frac{5}{4}}=\sqrt{2}$ has

(a) no real roots (b) only one real solutions

(c) exactly two real solutions (d) exactly three real solutions

19. The number of solutions of the equations $x+y+z=1; x^2+y^2+z^2=1; x^3+y^3+z^3=1$ is

(a) 6 (b) 3 (c) 9 (d) 12

20. Let $f:N\to N$ be a function such that $f(x+y)=f(x)+f(y)+xy$ for every $x,y\in N$.

If $f(1)=2$, then $\sum_{k=0}^{10} f(k)=$

(a) 1650 (b) 275 (c) 550 (d) 1025

21. The domain of the real valued function $f(x)=\frac{1}{\sqrt{\log_{0.5}(2x-3)}}+\sqrt{4-9x^2}$ is

(a) $\left[\frac{2}{3},\frac{3}{2}\right)$ (b) Null set (c) $\left[\frac{2}{3},2\right)$ (d) $\left[-\frac{2}{3},\frac{2}{3}\right]$

22. The independent term in the expansion of $(1+x+2x^2)\left(\frac{3x^2}{2}-\frac{1}{3x}\right)^9$ is

(a) $\frac{18}{7}$ (b) $\frac{7}{18}$ (c) $-\frac{7}{18}$ (d) $-\frac{18}{7}$

23. $\frac{1}{81^n}-2n_{c_1}\frac{10}{81^n}+2n_{c_2}\frac{10^2}{81^n}-\ldots+\frac{10^{2n}}{81^n}=$

(a) 0 (b) $(-1)^n$ (c) 1 (d) 81

24. If p_n denotes the product of the binomial coefficients in the expansion of $(1+x)^n$, then $\frac{P_{n+1}}{P_n}=$

(a) $\frac{n+1}{n!}$ (b) $\frac{n^n}{n!}$ (c) $\frac{(n+1)^n}{(n+1)!}$ (d) $\frac{(n+1)^{n+1}}{(n+1)!}$

25. Three numbers are chosen from 1 *to* 30. The probability that they are not three consecutive numbers is

(a) $\frac{1}{145}$ (b) $\frac{142}{145}$ (c) $\frac{143}{145}$ (d) $\frac{144}{145}$

26. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked randomly. The probability that it is neither red nor green is

(a) $1/3$ (b) $3/4$ (c) $7/19$ (d) $8/21$

27. If the position vectors of A,B,C,D are $\hat{i}+2j+2k, 2\hat{i}-j, \hat{i}+j+3k$ and $4j+5k$ respectively, then the Quadrilateral ABCD is a

(a) square (b) rectangle (c) rhombus (d) parallelogram

28. M and N are the mid points of the sides BC and CD of a parallelogram $ABCD$ respectively then $\overline{AM}+\overline{AN}=$

(a) $\frac{1}{3}\overline{AC}$ (b) $\frac{2}{3}\overline{AC}$ (c) $\frac{3}{4}\overline{AC}$ (d) $\frac{3}{2}\overline{AC}$

29. If $A(1,2,3), B(2,3,-1), C(3,-1,-2)$ are the vertices of a triangle ABC, then the direction ratios of the bisector of $\angle ABC$ are

(a) $(4,1,1)$ (b) $(3,5,2)$ (c) $(1,4,1)$ (d) $(2,-3,-5)$

30. Let $(x,y)\in R\times R$ and $\vec{a}=x\hat{i}+2j-k, \vec{b}=6\hat{i}-yj+2k$ be two vectors. If $\left|\vec{a}\times\vec{b}\right|^2+\left|\vec{a}.\vec{b}\right|^2=f(x)g(y)$, Then $f(x)+g(y)-46=0$ represents

(a) A pairs of lines (b) An ellipse (c) A hyperbola (d) A circle

31. If the vectors $2\hat{i}+4\hat{j}-3\hat{k}, -\hat{i}+2\hat{j}+3\hat{k}$ and $p\hat{i}-2\hat{j}+3\hat{k}$ are coplanar, then the unit vector in the Direction of the vector $9p\hat{i}-4\hat{j}+4\hat{k}$ is

(a) $\frac{1}{6}\left(2\hat{i}-4\hat{j}-4\hat{k}\right)$ (b) $\frac{1}{\sqrt{57}}\left(5\hat{i}-4\hat{j}+4\hat{k}\right)$

(c) $\frac{1}{\sqrt{68}}\left(6\hat{i}-4\hat{j}+4\hat{k}\right)$ (d) $\frac{1}{9}\left(-7\hat{i}-4\hat{j}+4\hat{k}\right)$

32. The equation $6x^4-5x^3+13x^2-5x+6=0$ will have

(a) only real roots (b) only complex roots

(c) two real and two complex roots (d) two real and two purely imaginary roots

33. If $a\pm ib$ and $b\pm ai$ are the roots of $x^4-10x^3+50x^2-130x+169=0$, then $\frac{a}{b}+\frac{b}{a}=$

(a) $\frac{25}{12}$ (b) $\frac{5}{2}$ (c) $\frac{13}{6}$ (d) $\frac{34}{15}$

34. If $\sum_{i=1}^{9}(x_i-5)=9$ and $\sum_{i=1}^{9}(x_i-5)^2=45$, then the standard deviation of the nine observations $x_1,x_2,....x_9$ *is*

(a) 2 (b) 4 (c) 3 (d) 9

35. If the variance of the first n natural numbers is 10 and the variance of the first m even natural numbers is 16, then $n:m=$

(a) $9:5$ (b) $7:3$ (c) $11:7$ (d) $5:8$

36. $\cosh^{-1}2=$

(a) $\log\left(2+\sqrt{3}\right)$ (b) $\log\left(2+\sqrt{5}\right)$

(c) $\log\left(2-\sqrt{5}\right)$ (d) $\log\left(2+\sqrt{2}\right)$

37. If $X \square B(9,p)$ is a binomial variate satisfying the equation $p(x=3)=p(x=6)$, then $p(x<3)=$

(a) $\frac{23}{256}$ (b) $\frac{65}{256}$ (c) $\frac{5}{256}$ (d) $\frac{45}{512}$

38. Suppose X has the following probability mass function
$P(X=0)=0.2, P(X=1)=0.5, P(X=2)=0.3$. What $E\left[X^2\right]=?$

(a) 2.89 (b) 1.70 (c) 1.10 (d) 1.21

39. $\frac{\left(\sin\frac{\pi}{8}+i\cos\frac{\pi}{8}\right)^8}{\left(\sin\frac{\pi}{8}-i\cos\frac{\pi}{8}\right)^8}$ is equal to

(a) i (b) $-i$ (c) 1 (d) 2

40. If $z^2+z+1=0$, where z is a complex number, then $\left(z+\frac{1}{z}\right)^3+\left(z^4+\frac{1}{z^4}\right)^3$ is equal to

(a) 1 (b) 0 (c) -1 (d) -2

41. If (α,β) is the external centre of similitude of the circles $x^2+y^2=3$ and $x^2+y^2-2x+4y+4=0$, Then $\frac{\beta}{\alpha}=$

(a) -3 (b) -2 (c) 2 (d) 3

42. If the equation of the circle passing through the point $(8,8)$ and having the lines $x+2y-2=0$ and $2x+3y-1=0$ as its diameters is $x^2+y^2+px+qy+r=0$, then $p^2+q^2+r=$

(a) 244 (b) 100 (c) -44 (d) 44

43. If θ is the angle between the tangents drawn from the point $(1,-1)$ to the circle $x^2+y^2-4x-6y+c=0$ and $\cos\theta=-\frac{7}{25}$, then the radius of the circle is

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

44. The length of the intercept on the line $4x-3y-10=0$ by the circle $x^2+y^2-2x+4y-20=0$

(a) $5\sqrt{31}$ (b) 10 (c) $10\sqrt{31}$ (d) $6\sqrt{31}$

45. If $\int\frac{dx}{(x-1)^{3/2}(x-3)^{1/2}}=\sqrt{f(x)}+c$ then $f(-1)-f(0)=$

(a) -3 (b) -4 (c) -2 (d) -1

46. If $\int\frac{dx}{x^{2022}\left(1+x^{2022}\right)^{1/2022}}=\frac{-\left(1+x^m\right)^{n/m}}{nx^n}+c,$ then $m-n=$

(a) 1 (b) 2 (c) 3 (d) 0

47. If $[.]$ denotes the greatest integer function, then $\int_0^{1000}e^{x-[x]}dx=$

(a) $\frac{e^{1000}-1}{1000}$ (b) $1000(e-1)$ (c) $\frac{e^{1000}-1}{e-1}$ (d) $\frac{e-1}{1000}$

48. If $I_n=\int_0^{\pi/4}\tan^n x\,dx$, then $\frac{1}{I_2+I_4}+\frac{1}{I_3+I_5}+\frac{1}{I_4+I_6}=$

(a) $\frac{1}{I_9+I_{11}}$ (b) $\frac{1}{I_{10}+I_{12}}$ (c) $\frac{1}{I_{12}+I_{14}}$ (d) $\frac{1}{I_{11}+I_{13}}$

49. $\lim_{x\to 0}\frac{x+2\sin x+3\tan x-\tan^3 x}{\sqrt{x^2+2\sin x+\tan x+3}-\sqrt{\sin^2 x-2\tan x-x+3}}$

(a) $2\sqrt{3}$ (b) 10 (c) 25 (d) $\sqrt{17}$

50. The integral value of n for which $\lim_{x\to 0}\frac{(\cos x-1)(\cos x-e^x)}{x^n}$ is a finite non zero real number is

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

51. $\lim_{x\to\infty}\left(\frac{3x^2-2x+3}{3x^2+x-2}\right)^{3x-2}=$

(a) -3 (b) e^{-1} (c) e^{-3} (d) -1

52. Assertion (A): If $y=f(x)=\left(|x|-|x-1|\right)^2$, then $\left(\frac{dy}{dx}\right)_{x=1}=1$

Reason (R): If $\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$ exist, then it is called derivative of $f(x)$ at $x=a$ then,

(a) (A) is true, (R) is true, (R) is correct explanation to (A).
(b) (A) is true, (R) is true, (R) is not the correct explanation to (A).
(c) (A) is true, (R) is false.
(d) (A) is false, (R) is true.

53. By shifting the origin to the point $(2,3)$ through translation of axes, if the equation of the curve $x^2+3xy-2y^2+4x-y-20=0$ is transformed to the form $Ax^2+Bxy+Cy^2+Dx+Ey+F=0$, then $D+E+F=$

(a) -1 (b) 1 (c) -15 (d) 15

54. The area of the triangle formed by the lines represented by $3x+y+15=0$ and $3x^2+12xy-13y^2=0$ Is

(a) $\frac{15\sqrt{3}}{2}$ (b) $15\sqrt{3}$ (c) $\frac{15\sqrt{3}}{4}$ (d) $\frac{15}{\sqrt{3}}$

55. The circumcentre of the triangle formed by the lines $x+y+2=0, 2x+y+8=0$ and $x-y-2=0$ is

(a) $(-5,1)$ (b) $(-4,0)$ (c) $(0,-2)$ (d) $\left(\frac{-8}{3},\frac{-2}{3}\right)$

56. The angle between the curves $y^2=x$ and $x^2=y$ at the point $(1,1)$ is

(a) $\tan^{-1}\left(\frac{4}{3}\right)$ (b) $\tan^{-1}\left(\frac{3}{4}\right)$

(c) 90° (d) 45°

57. The length of the subnormal at any point on the curve $y=\left(\frac{x}{2024}\right)^k$ is constant if the value of k is

(a) 1 (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 0

58. The slope of the tangent to the curve $y=\int_0^x\frac{1}{1+t^3}dt$ at the point, where $x=1$ is

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

59. The locus of the point whose ratio of distance from the origin to its distance from $(-2,-3)$ is $5:7$,is given by…

(a) $24(x^2+y^2)-100x-150y-325=0$

(b) $24(x^2+y^2)+100x+150y-325=0$

(c) $24(x^2+y^2)-100x+150y+325=0$

(d) $2x^2+2y^2=325$

60. The triangle formed by the lines $2x^2+xy-6y^2=0$ and $x+y-1=0$ is

(a) equilateral (b) isosceles (c) right angled (d) scalene

61. If the perpendicular distance from the focus of a parabola $y^2=4ax$ to its directrix is $\frac{3}{2}$, then the Equation of the normal drawn at $(4a,-4a)$ is

(a) $2x+y=3$ (b) $2x-y=9$ (c) $x-2y=9$ (d) $x+2y+3=0$

62. If A_1, A_2, A_3 are the areas of ellipse $x^2+4y^2-4=0$, its director circle and auxiliary circle respectively, then $A_2+A_3-A_1=$

(a) 11π (b) 3π (c) 7π (d) 9π

63. The number of integral values of x satisfying $5x-1<(x+1)^2<7x-3$ is

(a) 0 (b) 1 (c) 2 (d) 3

64. If the eccentricity of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ passing through the point $(4,6)$ is 2, then the equation of the tangent to this hyperbola at $(4,6)$ is

(a) $2x-3y+10=0$ (b) $3x-2y=0$

(c) $x-2y+8=0$ (d) $2x-y-2=0$

65. The equation of the pair of asymptotes of the hyperbola $x^2-2y^2-8x+8y+4=0$ is

(a) $x^2-2y^2-8x+8y-8=0$ (b) $2x^2-4y^2-16x+16y-7=0$

(c) $x^2-2y^2-8x+8y+8=0$ (d) $2x^2-4y^2-16x+16y+9=0$

66. If $A(0,1,2), B(2,-1,3)$ and $C(1,-3,1)$ are the vertices of a triangle, then the distance between its Circumcentre and orthocentre is

(a) $\frac{3}{\sqrt{2}}$ (b) $\frac{3}{2}$ (c) 3 (d) $\frac{9}{2}$

67. The shortest distance between the skew lines $\vec{r}=(2\hat{i}-\hat{j})+t(\hat{i}+2\hat{k})$ and $\vec{\gamma}=(-2\hat{i}+\hat{k})+s(\hat{i}-\hat{j}-\hat{k})$ is

(a) $\frac{3\sqrt{2}}{\sqrt{7}}$ (b) $\frac{3}{\sqrt{7}}$ (c) $\frac{3}{\sqrt{14}}$ (d) $\frac{4}{\sqrt{14}}$

68. The equation of the plane through $(4,4,0)$ and perpendicular to the planes $2x+y+2z+3=0$ and $3x+3y+2z-8=0$ is

(a) $4x+3y+3z=28$ (b) $4x-2y-3z=8$

(c) $4x+2y+3z=24$ (d) $4x+2y-3z=24$

69. The area (in sq. units) of the region given by $R=\left\{(x,y):\frac{y^2}{2}\le x\le y+4\right\}$ is

(a) 16 (b) 18 (c) 24 (d) 30

70. The length of the common chord of the circles $x^2+y^2+3x+5y+4=0$ and $x^2+y^2+5x+3y+4=0$ Is _____units.

(a) 3 (b) 2 (c) 6 (d) 4

71. If $f: R\to R$ is defined by $f(x+y)=f(x)+f(y)\ \forall x,y\in R$ and f(1)=7, then $\sum_{r=1}^{n} f(r)=$

(a) $\frac{3n(n+2)}{4}$ (b) $\frac{n(n-1)}{2}$ (c) $\frac{7n(n+1)}{2}$ (d) $\frac{(n+1)(n+2)}{4}$

72. If the displacement S of a particle travelling along a straight line in t seconds is given by $S=2t^3+2t^2-2t-3,$ then the time taken (in seconds) by the particle to change its direction is

(a) $\frac{1}{3}$ (b) 2 (c) 3 (d) $\frac{1}{2}$

73. If $f(x)=xe^{x(1-x)}, x\in R,$ then $f(x)$ is

(a) increasing on $\left[-\frac{1}{2},1\right]$ (b) decreasing on R

(c) increasing on R (d) decreasing on $\left[-\frac{1}{2},1\right]$

74. The number of turning points of the curve $f(x)=2\cos x-\sin 2x$ in the interval $[-\pi,\pi]$ is

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

75. The difference between the absoulte maximum and absoulte minimum values of the function $f(x)=2x^3-15x^2+36x-30$ on $[-1,4]$ is

(a) 80 (b) 1 (c) 85 (d) 4

76. If the area of a square is 575 square units, Then the approximate value of its side is

(a) 23.9792 (b) 23.7992 (c) 23.8687 (d) 23.7868

77. $\int\frac{3x^9+7x^8}{\left(x^2+2x+5x^8\right)^2}dx=$

(a) $\frac{x^7}{5x^7+x+2}+c$ (b) $\frac{x^7}{2(5x^7+x+2)}+c$

(c) $\frac{1}{2(5x^7+x+2)}+c$ (d) $\frac{-x^7}{2(5x^7+x+2)}+c$

78. if $\frac{-x^2+6x+1}{(x-1)^2(x^2+2)}=\frac{A}{x-1}+\frac{B}{(x+1)^2}+\frac{Cx-3}{x^2+2}$, then A+B+C=

(a) 7 (b) 5 (c) 3 (d) 2

79. $\int_1^5 \left(|x-3|+|1-x|\right)dx =$

(a) 4 (b) 8 (c) 12 (d) 24

80. The set of all real values of x for which $\frac{x^2-1}{(x-4)(x-3)} \geq 1$ *is*

(a) $[-1,1]\cup(3,4)$ (b) $\left[\frac{13}{7},3\right)\cup(4,\infty)$ (c) $\left(-\infty,\frac{13}{7}\right]\cup(3,4)$ (d) $R-[3,4]$

PHYSICS

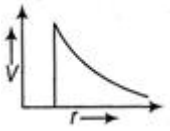
81. A charge of magnitude 3e and mass 2m is moving in an electric field E. The acceleration imparted to the charge is

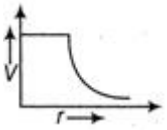
1) 2Ee/3m 2) 3Ee/2m 3) 2m/3Ee 4) 3m/2Ee

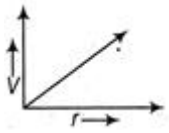
82. A conducting sphere of radius R=20cm is given a charge Q=16μC. What is E at its center?

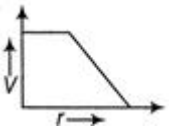
1) $3.6\text{x}10^6$ N/C 2) $1.8\text{x}10^6$ N/C 3) Zero 4) $0.9\text{x}10^6$ N/C

83. . In the case of charged metallic sphere, potential (V) changes with respect to distance (r) from the Centre as

1) 

2) 

3) 

4) 

84. If the circumference of a sphere is 2m, then capacitance of sphere in water would be

1) 2700 pF 2) 2760 pF 3) 2780 pF 4) 2800 pF

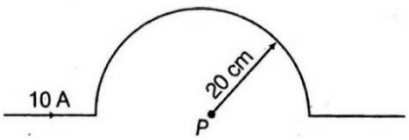
85. A wire of resistance R is stretched to twice of its original length. Its new resistance will be

1) 4R 2) R/9 3) 3R 4) R/3

86. If percentage change in current through a resistor is 1% , then the change in power through it would be

1) 1% 2) 2% 3) 1.7% 4) 0.5%

87. A current of 10A is passing through a long wire which has semicircular loop of the radius 20cm as shown in the figure. Magnetic field produced at the Centre of the loop is



1) 10πμT 2) 5 πμT 3) 4 πμT 4) 2 πμT

88. A proton and an α-particle follow the same circular path in a transverse magnetic field. Their kinetic energies are in the ratio

1) 1:4 2) 1:√2 3) 1:2 4) 1:1

89. A bar magnet has a coercivity $4\text{x}10^3$ Am^{-1}. It is desired to demagnetize it by inserting it inside a solenoid 12cm long and having 60 turns. The current carried by the solenoid should be

1) 8A 2) 6A 3) 4.5A 4) 2A

90. In an inductor of self-inductance L=2mH, current change with time according to relation $I = t^2e^{-t}$. At what time, emf is zero

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

91. A 100mH coil carries a current of 1A. Energy stored in the form of magnetic field is

1) 0.5J 2) 1J 3) 0.05J 4) 0.1J

92. The EM wave with shortest wavelength among the following is

1) Microwaves 2) Ultraviolet rays 3) X-rays 4) Gamma-rays

93. . A tall man of height 6 feet, want to see his full image. Then required minimum length of the mirror will be

1) 12 feet 2) 3 feet 3) 6 feet 4) any length

94. If I_0 is the intensity of the principal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled?
1) 2 I_0 2) 4 I_0 3) I_0 4) $I_0/2$

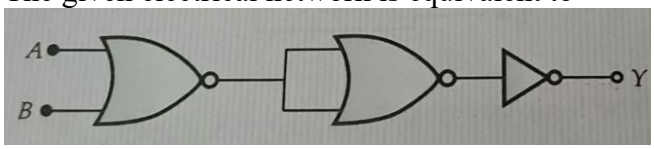
95. . An electron with rest mass m_0 movies with a speed of 0.8c. Its mass when it moves with this speed is
1) m_0 2) $m_0/6$ 3) 5 $m_0/3$ 4) 3 $m_0/5$

96. Hydrogen atom is excited from ground state to another state with principle quantum number equal to 4. Then the number of spectral lines in the emission spectra will be
1) 2 2) 3 3) 5 4) 6

97. The ratio of mass densities of nuclei of ^{40}Ca and ^{16}O is close to
1) 1 2) 2 3) 0.1 4) 5

98. For a common base circuit if $I_C/I_E = 0.98$, then current gain for common emitter circuit will be
1) 49 2) 98 3) 4.9 4) 25.5

99. The given electrical network is equivalent to



1) AND gate 2) OR gate 3) NOR gate 4) NOT gate

100. An oscillator is producing FM waves of frequency 2kHz with a variation of 10kHz. What is the modulation index
1) 0.67 2) 5.00 3) 0.20 4) 1.5

101. . A metal sheet having size of 0.6x0.5 m^2 is heated from 293K to 520^0C. the final area of the hot sheet is [$\alpha = 2x10^{-5}/^0C$]
1) $0.306m^2$ 2) $0.0306m^2$ 3) $3.06m^2$ 4) $1.02m^2$

102. The temperature of an ideal gas is increased from 120K to 480K. If at 120K, the root mean square speed of the gas molecules is 'v', then at 480K it will be
1) 4v 2) 2v 3) v/2 4) v/4

103. Two liquids A and B are at 30^0C and 20^0C respectively. When they are mixed in equal masses, the temperature of the mixture is found to be 26^0C. The ratio of specific heats is
1) 4:3 2) 3:4 3) 2:3 4) 3:2

104. The pressure and density of a diatomic gas ($\gamma = 7/5$) change adiabatically from (P,d) to (P^1,d^1). If $d^1/d = 32$, then P^1/P should be
1) 1/128 2) 32 3) 128 4) 1/32

105. Two identical rods of same metal are first welded in series and then in parallel are maintained at same temperature difference then the ratio of heats conducted in same time is
1) 1:1 2) 1:2 3) 1:4 4) 1:3

106. Let a particle moving in a circle of radius 2m with its speed increased at a rate $2m/s^2$. At an instant, speed of the particle is 2m/s, then its net acceleration will be
1) $2\sqrt{2}$ m/s^2 2) 4 m/s^2 3) 6 m/s^2 4) $4\sqrt{2}$ m/s^2

107. A motor car of mass m travels with a uniform speed v on a convex bridge of radius r. When the car is at the middle point of the bridge, then the force exerted by the car on the bridge is
1) mg 2) mg+mv^2/r 3) mg-mv^2/r 4) mg$\pm mv^2/r$

108. A ball hits the ground and loses 20% of its momentum. Coefficient of restitution is
1) 0.2 2) 0.4 3) 0.6 4) 0.8

109. The radius of gyration of rod of length 'L' and mass 'M' about an axis perpendicular to its length and passing through a point at a distance L/3 from one of its ends is
1) $\frac{\sqrt{7}}{6}L$ 2) $L^2/9$ 3) L/3 4) $\frac{\sqrt{5}}{2}L$

110. The kinetic energy of a satellite of mass m in the orbit closer to earth's surface is (R= radius of earth)
1) mgR/2 2) 2mgR 3) mgR 4) mgR/4

111. If energy E, velocity V and time T are taken as fundamental quantities , the dimensional formula of intensity of radiation is
1) $EV^{-2}T^{-3}$ 2) $EV^{-1}T^{-1}$ 3) $EV^{-1}T^{-2}$ 4) $EV^{-2}T^{-2}$

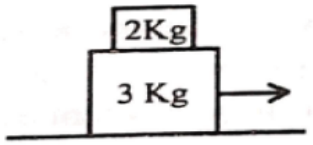
112. A weight W is suspended from the midpoint of a rope with its ends at the same level. As a result, the rope is no longer horizontal. The minimum tension required to completely make the rope straight is
1) W/2 2) W/4 3) Zero 4) Infinity

113. The relation between time t and distance x is $t = ax^2+bx$ where a and b are constants. The acceleration is
1) $-2abv^2$ 2) $2bv^3$ 3) $-2av^3$ 4) $2av^2$

114. A body is projected with velocity u so that its horizontal range is twice the greatest height attained. The value range is
1) $\frac{3u^2}{4g}$ 2) $\frac{4u^2}{5g}$ 3) $\frac{4u^2}{3g}$ 4) $\frac{5u^2}{3g}$

115. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m if a force P is applied at the free end of the rope, the force exerted by the rope on the block is
1) $\frac{Pm}{M+m}$ 2) $\frac{Pm}{M-m}$ 3) P 4) $\frac{PM}{M+m}$

116. A block of mass 2 Kg rests on another block of mass 3 Kg and the second block is on a smooth table. Coefficient of friction between the two block is 0.2. Then the largest force that can be applied on the lower block so that the system moves without sliding off of the upper block is



1) 4.9N 2) 9.8N 3) 14.7N 4) 19.6N

117. A long wire hangs vertically with its upper end clamped, when a torque of 2Nm is applied to the free end, it is twisted through an angle of 30°. Then the potential energy of the twisted wire is
1) π joules 2) π/3 joules 3) π/6 joules 4) π/4 joules

118. In an experiment, the pressure on the top surface of an aeroplane wing is $9x10^4$ Nm^{-2} and that on the bottom surface is $9.1x10^4$ Nm^{-2}. If the area of each surface is 40 m^2, the lift force on the wing is
1) $2x10^4$ N 2) $4x10^4$ N 3) $8x10^4$ N 4) $16x10^4$ N

119. A simple pendulum with a metal bob has a time period T. Now the bob is immersed in a liquid which is non viscous. This time the time period is 4T, then the ratio of densities of metal bob and that of the liquid is
1) 15:16 2) 16:15 3) 1:16 4) 16:1

120. . Two strings with circular cross section and made of same material, are stretched to have same amount of tension. A transverse wave is then made to pass through both the strings. The velocity of the wave in the first string having the radius of cross section R is v_1, and that in the other string having radius of cross section R/2 is v_2. Then v_2/v_1 is
1) $\sqrt{2}$ 2) 2 3) 8 4) 4

CHEMISTRY

121. Three statements are given about mole fraction
i) Mole fraction of a solute + mole fraction of solvent =1
ii) Equal weights of Helium and Methane are present in a gaseous mixture. The mole fraction of He is 4/5
iii) The mole fraction of water in the aqueous solution of NaOH is 0.8. The molality of the solution is nearly 14 mol. kg^{-1}
1) i and ii are correct 2) ii and iii are correct 3) i and iii are correct 4) all are correct

122. H_2S, a toxic gas with rotten egg like smell, is used for the qualitative analysis. If the solubility of H_2S in water at STP is 0.195 m, then Henry's law constant (in atm) is –
1) 285.7 atm 2) 287.7 atm 3) 2857 atm 2) 2877 atm

123. The standard reduction potentials for Zn/Zn^{+2}, Ni^{2+}/ Ni, and Fe^{2+}/Fe are -0.76,0.23 and -0.44 V respectively. The reaction $X + Y^{2+} \leftrightarrow X^{2+} + Y$ will be spontaneous when
1) X = Ni, Y = Fe 2) X = Ni, Y = Zn 3) X = Zn, Y = Ni 4) X = Fe, Y = Zn

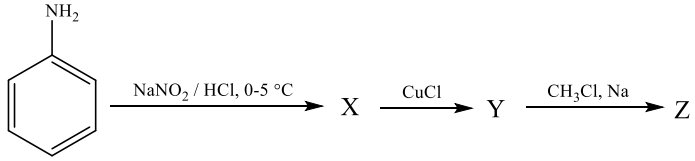
124. 75% of a first order reaction is completed in 32 min. 50% of the reaction would have been completed in
1) 160 min 2) 16 min 3) 60 min 4) 10 min

125. The incorrect statement regarding defects in solid is
1) Frenkel defect is usually favored by large difference in the sizes of cation and anion
2) Frenkel defect is a dislocation defect
3) Trapping of an electron in the lattice leads to the formation of F-center
4) Schottky defects have no effect on the physical properties of solids

126. An example of auto-catalytic reaction is
1) The decomposition of nitroglycerine 2) Thermal reaction between $KClO_3$ and MnO_2
3) Break down of ^{14}C 4) Hydrogenation of vegetable oil using nickel catalyst

127. SnO_2 is shaken with a small amount of NaOH solution to form a colloidal sol of sodium stannate. The sol thus obtained can be coagulated most easily by
1) Na_3PO4 2) $AlCl_3$ 3) $K_4[Fe(CN)_6]$ 4) HCl

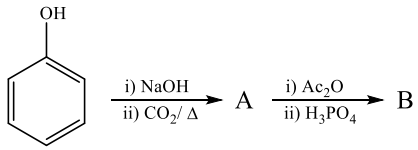
128. The following sequences of reactions final product Z is



1) Toluene 2) Biphenyl 3) 4-Chlorotoulene 4) Ethyl benzene

129. Ethyl chloride on heating with silver cyanide forms a compound X. The functional isomer of X is
1) C_2H_5NC 2) H_3C-NH-CH_3 3) C_2H_5CN 4) $C_2H_5NH_2$

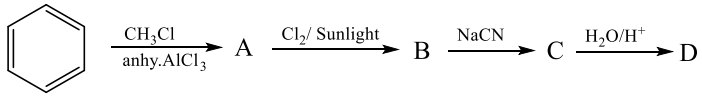
130.

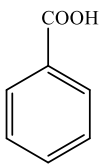


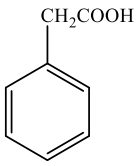
Identify the 'B' in given sequence
1) Methyl orange 2) Phenolphthalein 3) Aspirin 4) Methyl Blue

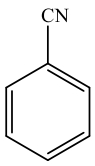
131. Ethyl alcohol forms $CaCl_2.xC_2H_5OH$; $MgCl_2.yC_2H_5OH$; and $CuSO_4.zC_2H_5OH$ when C_2H_5OH reacts with respective anhydrous salts. Then
1) x = 3, y = 3, z = 2 2) x = 3, y = 6, z = 3
3) x = 3, y = 3, z = 3 4) x = 5, y = 4, z = 5

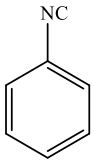
132. In the above sequence of bellow reactions, D is



1) 

2) 

3) 

4) 

133. Statement-I: HCHO and HCOOH can be distinguished by Tollen's test.
Statement-II: Silver mirror is formed when ammoniacal $AgNO_3$ is reduced.
1) Both the statements are true 2) Both the statements are false
3) Statement-I is true but statement-II is false 4) Statement-I is false but statement-II is

134. Chiral C-atoms in open structures of glucose and fructose are:

1) 4 in each 2) 3 in each
3) 4 in glucose and 3 in fructose 4) 3in glucose and 4 in fructose

135. Match the medicines given in Column I with their use given in Column II.

Column-I	Column-II
i) Ranitidine	a) Tranquilizer
ii) Francine	b) Antibiotic
iii) Phenelzine	c) Antihistamine
iv) Chloramphenicol	d) Antiseptic
	e) Antifertility drug

1) i - b, ii - d, iii - a, iv – c 2) i - c, ii - b, iii - a, iv - d
3) i - c, ii - d, iii - a, iv – b 4) i - a, ii - d, iii - c, iv – b

136. Which of the following has maximum pK_b value?
1) $CH_3CH_2NH_2$ 2) Ph-$NHCH_3$ 3) $(CH_3CH_2)_2NH$ 4) Ph-NH_2

137. A nano peptide contains how many peptide linkages?
1) 9 2) 8 3) 10 4) 7

138. The ΔH for the conversion of $C_{(diamond)}$ to $C_{(graphite)}$ when the following reactions are given
$C_{(diamond)} + O_{2\,(g)} \rightarrow CO_{2\,(g)}$; ΔH = -94.5 k.cal
$C_{(graphite)} + O_{2\,(g)} \rightarrow CO_{2\,(g)}$; ΔH = -94.0 k.cal
1) -188.5 k.cal 2) +188.5 k.cal 3) +0.5 k.cal 4) -0.5 k.cal

139. Identify the correct statements from the following.
i) For adiabatic process, $\Delta U = W_{adiabatic}$
ii) Work is a path function.
iii) Volume is an extensive property.
1) i, ii, iii 2) i, iii only 3) ii, iii only 4) i, ii only

140. The equilibrium constants for the below reactions at a certain temperature are K_1, K_2 and K_3 respectively.

i) $H_3PO_{4\,(aq)} \rightleftharpoons H^+_{(aq)} + H_2PO^-_{4\,(aq)}$

ii) $H_2PO^-_{4\,(aq)} \rightleftharpoons H^+_{(aq)} + HPO^{2-}_{4\,(aq)}$

iii) $HPO^{2-}_{4\,(aq)} \rightleftharpoons H^+_{(aq)} + PO^{3-}_{4\,(aq)}$

Then, the equilibrium constant for the reaction

$H_3PO_{4\,(aq)} \rightleftharpoons 3H^+_{(aq)} + PO^{3-}_{4\,(aq)}$ in terms of K_1, K_2 and K_3 is

1) $K_1 + K_2 + K_3$ 2) $\frac{K_1}{K_2 + K_3}$ 3) $\frac{K_3}{K_1.K_2}$ 4) $K_1.K_2.K_3$

141. For which of the reversible reaction $K_p = K_c$
1) $N_{2\,(g)} + 3H_{2\,(g)} \leftrightarrow 2NH_{3\,(g)}$ 2) $2SO_{2\,(g)} + O_{2\,(g)} \leftrightarrow 2SO_{3\,(g)}$
3) $PCl_{3\,(g)} + Cl_{2\,(g)} \leftrightarrow PCl_{3\,(g)}$ 4) $N_{2\,(g)} + O_{2\,(g)} \leftrightarrow 2NO_{(g)}$

142. Consider the following changes I and II

$O_2^- \underset{II}{\longleftarrow} O_2 \underset{I}{\rightarrow} O_2^+$

(A) In (I) bond order increases by 0.5 from the existing value
(B) In (II) bond order decreases by 1.0 from the existing value
(C) In both (I) and (II) magnetic property is not changed
(D) In both (I) and (II) magnetic property is changed

The correct statements about these changes (I) and (II) in accordance with MO theory are
1) A, B and C only 2) A and C only 3) A and D only 4) B and C only

143. In PO_4^{3-}, the average formal charge on each oxygen atom is
1) -0.15 2) -0.25 3) -0.75 4) -3

144. Electronic configurations of four elements A, B, C, & D are given below is:
(A) $1s^2\ 2s^2\ 2p^6 3s^1$ (B) $1s^2\ 2s^2 2p^6\ 3s^2\ 3p^1$
(C) $1s^2\ 2s^2\ 2p^6\ 3s^2$ (D) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$
The correct order of first ionization enthalpy of these elements is:
1) D > B > C > A 2) C > D > B > A 3) C > A > B > D 4) D > C > B > A

145. Which of the following sets of quantum numbers is correct for an electron in 3d-orbital?
1) n = 3, l = 2, m = -3, s = + ½ 2) n = 3, l = 3, m = +3, s = - ½
3) n = 3, l = 2, m = -2, s = + ½ 4) n = 3, l = 2, m = -3, s = - ½

146. If the longest wavelength of spectral line of Paschen series of Li^{2+} ion spectrum is x Å, then the longest wavelength (in Å) of Lyman series of hydrogen spectrum is
1) $\frac{12}{7x}$ 2) $\frac{7x}{12}$ 3) $\frac{20x}{27}$ 4) $\frac{27x}{20}$

147. Identify the correct statements about the following stoichiometric equation.

$$aP_4 + b\bar{O}H + cH_2O \longrightarrow dPH_3 + eH_2PO_2^-$$

I. a + b + c = 5 II. b + c – e = 3 III. The oxidation state of 'P' in $H_2PO_2^-$ is +1.
1) I, II, III 2) I, Il only 3) I, III only 4) II, III only

148. x g of methane was burnt completely in the presence of oxygen. The liberated gases were passed into a solution containing 370 g of $Ca(OH)_2$. The weight of white precipitate obtained was 500. What is the value of x (in g)? (Given: C= 12; H= 1; Ca = 40; O=16 u)
1) 16 2) 80 3) 160 4) 120

149. Given that maximum absorption for d–d transition in $[Ti(H_2O)_6]^{3+}$ occurs at 20300 cm^{-1}, predict where the peak (d – d transition) will occur for $Ti(CN)_6]^{3-}$ and $[TiCl_6]^{3-}$ respectively
1) 23000 cm^{-1}, 32000 cm^{-1} 2) 18000 cm^{-1}, 21300 cm^{-1}
3) 32000 cm^{-1},17300 cm^{-1} 4) 18000 cm^{-1}, 17300cm^{-1}

150. Match List-I with List-II

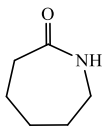
	List – I		List – II
A)	XeO_3	I)	sp^3d; linear
B)	XeF_2	II)	sp^3; pyramidal
C)	$XeOF_4$	III)	sp^3d^3; distorted octahedral
D)	XeF_6	IV)	sp^3d^2; square pyramidal

Choose the correct answer from the options given below:

1) A-II, B-I, C-IV, D-III 2) A-II, B-IV, C-III, D-I
3) A-IV, B-II, C-III, D-I 4) A-IV, B-II, C-I, D-III

151. Which of the following method is not used for the concentration of bauxite ore
1) Serpeck's method 2) Baeyer's method 3) Hoope's method 4) Hall's method

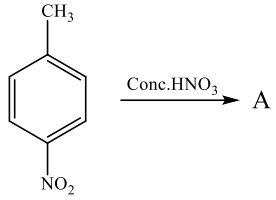
152. Which of the following polymer can be formed by using the following monomer unit?

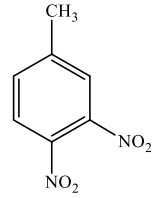


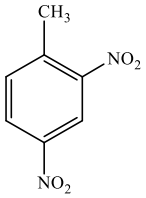
1) Nylon - 6, 6 2) Nylon-2-nylon-6 3) Melamine polymer 4) Nylon-6

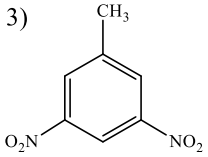
153. Which of the following statements is not correct?
1) Copper liberates hydrogen from acids
2) In its higher oxidation states, Mn forms stable compounds with oxygen and fluorine
3) Mn^{3+} and Co^{3+} are oxidising agents in aqueous solution
4) Ti^{2+} and Cr^{2+} are reducing agents in aqueous solution

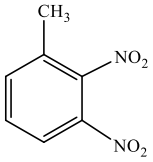
154. What will be the product A in the reaction given below?



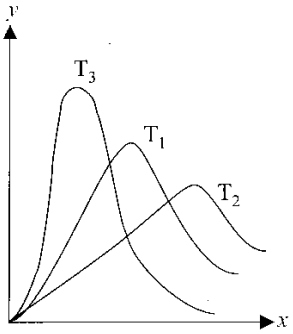
1) 

2) 

3) 

4) 

155. The following graph is obtained for a gas at different temperatures (T_1, T_2, & T_3). What is the correct order of temperature? (on x-axis is velocity; & on y-axis is number of molecules)



1) $T_2 > T_1 > T_3$ 2) $T_2 > T_3 > T_1$ 3) $T_3 > T_1 > T_2$ 4) $T_3 > T_2 > T_1$

156. Match the following:

	List – I (Type of hydride)		List – II (Example)
A)	Electron precise	I)	SiH_4
B)	Saline	II)	H_2O
C)	Electron deficient	III)	MgH_2
D)	Electron rich	IV)	B_2H_6

A B C D A B C D

1) (ii), (iii), (i), (iv) 2) (i), (iii), (iv), (ii)

3) (iv), (ii), (iii), (i) 4) (ii), (i), (iv), (iii)

157. Two alkali halide salts, ACl and BCl gave crimson red and violet in their flame test respectively. A and B are respectively

1) K, Li 2) Li, K 3) Li, Na 4) Na, K

158. The empirical formula weight of 'Z' in the given reaction sequence is

n-Propyl bromide $\xrightarrow[\text{Dry ether}]{\text{Na}}$ X $\xrightarrow[\text{723 K, 20 atm}]{V_2O_5}$ Y $\xrightarrow[\text{UV, 500 K}]{Cl_2}$ Z

1) 47.5 2) 54.5 3) 84.5 4) 48.5

159. Match the following List-I with List-II:

	List – I (Compound)		**List – II (Use)**
A)	Kieselguhr	I)	Chromatographic material
B)	Silica gel	II)	Softening of hard Water
C)	ZSM-5	III)	Filtration plants
D)	Hydrated zeolites	IV)	To convert alcohol directly into gasoline

The correct answer is

1) A-IV, B-III, C-II, D-I 2) A-IV, B-I, C-II, D-III
3) A-III, B-IV, C-I, D-II 4) A-III, B-I, C-IV, D-II

160. A Lewis acid 'X' reacts with $LiAlH_4$ in ether medium to give a highly toxic gas, 'Y'. 'Y' when heated with NH_3 gives a compound known as inorganic benzene. 'Y' burns in oxygen and gives H_2O and 'Z'. The 'Z' is –

1) Basic oxide 2) Acidic oxide 3) Amphoteric acid 4) Neutral oxide