EAMCET-2011 ENGINEERING–MATHS

1. $\lim\limits_{x\to 8}\dfrac{\sqrt{1+\sqrt{1+x}}-2}{x-8}=$

1) $\dfrac{3}{2}$ 2) $\dfrac{1}{4}$ 3) $\dfrac{1}{24}$ 4)

2. If $|x|$ denotes the greatest integer not exceeding x and if the function f defined by

$$f(x)=\begin{cases}\dfrac{a+2\cos x}{x^2} & (x<0)\\ b\tan\dfrac{\pi}{[x+4]} & (x\geq 0)\end{cases}$$ is continuous at x= 0, then the ordered pair (a, b) =

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

3. If y = (1 + x) (1 +x^2) (1 + x^4)..... $\left(1+x^{2^n}\right)$, then $\left(\dfrac{dy}{dx}\right)_{x-0}=$

1) 0 2) $\dfrac{1}{2}$ 3) 1 4) 2

4. If $\cos^{-1}\left(\dfrac{x^3-y^2}{x^2+y^2}\right)=k$ (a constant), then $\dfrac{dy}{dx}=$

1) $\dfrac{y}{x}$ 2) $\dfrac{x}{y}$ 3) $\dfrac{x^2}{y^2}$ 4) $\dfrac{y^2}{x^2}$

5. If $f(x)=|x|+|\sin x|$ for $x\in\left(-\dfrac{\pi}{2},\dfrac{\pi}{2}\right)$, then its left hand derivative at x = 0 is

1) 0 2) –1 3) –2 4) –3

6. If $y=\dfrac{\log_e x}{x}$ and $z=\log_e x$, then $\dfrac{d^2y}{dz^2}+\dfrac{dy}{dz}=$

1) e^{-z} 2) $2e^{-z}$ 3) ze^{-z} 4) $-e^{-z}$

7. If $1^0=\alpha$ radius then the approximate value of cos (60^0 1') is

1) $\dfrac{1}{2}+\dfrac{\alpha\sqrt{3}}{120}$ 2) $\dfrac{1}{2}-\dfrac{\alpha}{120}$ 3) $\dfrac{1}{2}-\dfrac{\alpha\sqrt{3}}{120}$ 4) $\dfrac{1}{2}+\dfrac{\alpha}{120}$

8. If the distance 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

9. The length of the substangent at any point (x_1,y_1) on the curve y = 5^x is

1) 5^{x_1} 2) $y_1.5^{x_1}$ 3) $\log_e 5$ 4) $\dfrac{1}{\log_e 5}$

10. $u=u(x,y)=\sin(y+ax)-(y+ax)^2\Rightarrow$

1) $u_{xx}=a^2.u_{yy}$ 2) $u_{yy}=a^2u_{xx}$ 3) $u_{xx}=-a^2.u_{yy}$ 4) $u_{yy}=-a^2u_{xx}$

11. $\int\left(\sqrt{\frac{a+x}{a-x}}+\sqrt{\frac{a-x}{a+x}}\right)dx=$

1) $2\sin^{-1}\left(\frac{x}{a}\right)+c$ 2) $2a\sin^{-1}\left(\frac{x}{a}\right)+c$ 3) $2\cos^{-1}\left(\frac{x}{a}\right)+c$ 4) $2a\cos^{-1}\left(\frac{x}{a}\right)+c$

12. 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

13. $\int\frac{1+\cos 4x}{\cot x-\tan x}dx=$

1) $-\frac{1}{4}\cos 4x+c$ 2) $\frac{1}{8}\cos 4x+c$ 3) $\frac{1}{4}\sin 4x+c$ 4) $-\frac{1}{8}\cos 4x+c$

14. The area (in square units) of the region bounded by the curves $x = y^2$ and $x = -3 - 2y^2$ is

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

15. If $I_n=\int_0^{\pi/4}\tan^n\theta d\theta$ for n = 1, 2, 3, ... then $I_{n-1}+I_{n+1}=$.....

1) 0 2) 1 3) $\frac{1}{n}$ 4) $\frac{1}{n+1}$

16. Let $f(0)=1, f(0.5)=\frac{5}{4}, f(1)=2, f(1.5)=\frac{13}{4}$ and $f(2)=5$. Using Simpson's rule $\int_0^2 f(x)dx=$

1) $\frac{14}{3}$ 2) $\frac{7}{6}$ 3) $\frac{14}{9}$ 4) $\frac{7}{9}$

17. The solution of the differential equation $\frac{dy}{dx}=\frac{y}{x}+\frac{\varphi(y/x)}{\varphi'(y/x)}$ is

1) $x\varphi\left(\frac{y}{x}\right)=k$ 2) $\varphi\left(\frac{y}{x}\right)=kx$ 3) $y\varphi\left(\frac{y}{x}\right)=k$ 4) $\varphi\left(\frac{y}{x}\right)=ky$

18. If y = y(x) is the solution of the differential equation $\left(\frac{2+\sin x}{y+1}\right)\frac{dy}{dx}+\cos x=0$ with y(0) = 1, then $y\left(\frac{\pi}{2}\right)=$

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

19. If $f:[2,\infty)\to B$ defined by $f(x) = x^2 - 4x + 5$ is a bijection, then B=

1) $[0,\infty)$ 2) $[1,\infty)$ 3) $[4,\infty)$ 4) $[8,\infty)$

20. If $f:R\to R$ is defined by $f(x)=\left[\frac{x}{5}\right]$ for $x\in R$, when [y] denotes the greatest integer not exceeding y, then $\{f(x):|x|<71\}=$

1) {–14, –13,....., 0, ..., 3, 14} 2) {–14, –13,....., 0, ..., 14, 15}

3) {–15, –14,....., 0, ..., 14, 15} 4) {–15, –14,....., 0, ..., 13, 14}

21. If a, b and n are natural numbers then $a^{2n-1} + b^{2n-1}$ is divisible by

1) a + b 2) a – b 3) $a^3 + b^3$ 4) $a^2 + b^2$

22. A bag contains n white and n black balls. Pairs of balls are drawn at random without replacement successively, until the bag is empty. If the number of ways in which each pair consists of one white and one black ball is 14,400, then n =

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

23. The number of five digit numbers divisible by 5 that can be formed using the numbers 0, 1, 2, 3, 4, 5 without repetition is

1) 240 2) 216 3) 120 4) 96

24. $^{15}P_8 = A + 8.{}^{14}P_7 \Rightarrow A =$

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

25. If $^{(n-1)}C_3 + {}^{(n-1)}C_4 > {}^{n}C_3$, then the minimum value of n is

1) 5 2) 6 3) 7 4) 8

26. If the coefficient of r th and (r+1)th terms in the expansion of $(3+7x)^{29}$ are equal, then r =

1) 14 2) 15 3) 18 4) 21

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

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

28. $\sum_{n=1}^{\infty}\frac{2n}{(2n+1)!}=$

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

29. If a > 0 and $b^2 – 4ac = 0$, then the curve $y = ax^2 + bx + c$

1) cuts the x-axis 2) touches the x-axis and lies below it

3) lies entirely above the x-axis 4) touches the x-axis and lies above it

30. If tanA and tanB are the roots of the quadratic equation $x^2 – px + q = 0$, then $\sin^2(A + B) =$

1) $\frac{p^2}{p^2+q^2}$ 2) $\frac{p^2}{(p^2+q^2)}$ 3) $1-\frac{p^2}{(1-q^2)}$ 4) $\frac{p^2}{p^2+(1-q^2)}$

31. 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

32. If x is real, then the value of $\frac{x^2-3x+4}{x^2+3x+4}$ lies in the interval

1) $\left[\frac{1}{3},3\right]$ 2) $\left[\frac{1}{5},5\right]$ 3) $\left[\frac{1}{6},6\right]$ 4) $\left[\frac{1}{7},7\right]$

33. $A(\alpha,\beta)=\begin{pmatrix}\cos\alpha & \sin\alpha & 0\\ -\sin\alpha & \cos\alpha & 0\\ 0 & 0 & e^{\beta}\end{pmatrix}\Rightarrow[A(\alpha,\beta)]^{-1}=$

1) $A(-\alpha,\beta)$ 2) $A(-\alpha,-\beta)$ 3) $A(\alpha,-\beta)$ 4) $A(\alpha,\beta)$

34. If A is a matrix such that $\begin{pmatrix}2 & 1\\ 3 & 2\end{pmatrix}A\begin{pmatrix}1 & 1\end{pmatrix}\begin{pmatrix}1 & 1\\ 0 & 0\end{pmatrix}$ then A =

1) $\begin{pmatrix}1 & 1\\ 0 & 1\end{pmatrix}$ 2) $\begin{pmatrix}2 & 1\end{pmatrix}$ 3) $\begin{pmatrix}1 & 0\\ -1 & 1\end{pmatrix}$ 4) $\begin{pmatrix}2\\ -3\end{pmatrix}$

35. $A=\begin{pmatrix}1 & 0 & 1\\ 0 & 1 & 1\\ 0 & 1 & 0\end{pmatrix}\Rightarrow A^2-2A=$

1) A^{-1} 2) $-A^{-1}$ 3) I 4) –I

36. $\begin{vmatrix}24 & 25 & 26\\ 25 & 26 & 27\\ 26 & 27 & 27\end{vmatrix}=$

1) 0 2) –1 3) 14) 2

37. Let $z=a-\frac{i}{2};a\in R$. Then $|i+z|^2-|i-z|^2=$

1) 2 2) –2 3) 4 4) –4

38. The locus of the complex number z such that $\arg\left(\frac{z-2}{z+2}\right)=\frac{\pi}{3}$ is

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

39. $\frac{(1+i)^{2011}}{(1-i)^{2009}}=$

1) –1 2) 1 3) 2 4) –2

40. If $f:\mathbb{R}\to\mathbb{R}$ is defined by $f(x)=7+\cos(5x+3)$ for $x\in\mathbb{R}$, then the period of f is

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

41. $\cos A=\frac{3}{4}\Rightarrow 32\sin\left(\frac{A}{2}\right)\sin\left(\frac{5A}{2}\right)=$

1) 7 2) 8 3) 13 4) 11

42. If $f(x)=\sin^6 x+\cos^6 x$ for $x\in R$, then f(x) lies in the interval

1) $\left[\frac{7}{8},\frac{5}{4}\right]$ 2) $\left[\frac{1}{2},\frac{5}{8}\right]$ 3) $\left[\frac{1}{4},1\right]$ 4) $\left[\frac{1}{4},\frac{1}{2}\right]$

43. The most general value of θ which satisfies both the equations $\tan\theta=-1$ and $\cos\theta=\frac{1}{\sqrt{2}}$ is

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

44. $\left(\tan^{-1}x\right)^2+\left(\cot^{-1}x\right)^2=\frac{5\pi^2}{8}\Rightarrow x=$

1) –1 2) 1 3) 0 4) $\pi\sqrt{\frac{5}{8}}$

45. For $0<x\le\pi$, $\sinh^{-1}\left(\cot x\right)=$

1) $\log\left(\cot\frac{x}{2}\right)$ 2) $\log\left(\tan\frac{x}{2}\right)$ 3) $\log\left(1+\cot x\right)$ 4) $\log\left(1+\tan x\right)$

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

1) an arithmetic progression 2) a geometric progression
3) a harmonic progression 4) an arithmetico-geometric progression

47. In a triangle ABC if $\frac{\cos A}{a}=\frac{\cos B}{b}=\frac{\cos C}{c}$, then ΔABC is

1) Right-angled 2) Isoscles right-angled 3) Equilateral 4) Scalene

48. The angle of elevation of a stationary cloud from a point 2500 m above a lake is 15^0 and from the same point the angle of depression of its reflection in the lake is 45^0. The height (in meters) of the cloud above the lake given that $\cot 15^0=2+\sqrt{3}$, is

1) 2500 2) $2500\sqrt{2}$ 3) $2500\sqrt{3}$ 4) 5000

49. The magnitude of the projection of the vector $\bar{a}=4\bar{i}-3j+2\bar{k}$ on the line which makes equal angles with the coordinate axes is

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

50. If the vectors $\bar{i}-2x\bar{j}-3y\bar{k}$ and $\bar{i}+3x\bar{j}+2y\bar{k}$ are orthogonal to each other, then the locus of the point (x, y) is

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

51. For any vector $\bar{r}$, $\bar{i}\times\left(\bar{r}\times\bar{i}\right)+\bar{j}\times\left(\bar{r}\times\bar{j}\right)+\bar{k}\left(\bar{r}\times\bar{k}\right)=$

1) $\bar{0}$ 2) $2\bar{r}$ 3) $3\bar{r}$ 4) $4\bar{r}$

52. If the vectors $\overline{AB}=-3\bar{i}+4\bar{k}$ and $\overline{AC}=5\bar{i}-2\bar{j}+4\bar{k}$ are the sides of a triangle ABC, then the length of the median through A is

1) $\sqrt{14}$ 2) $\sqrt{18}$ 3) $\sqrt{25}$ 4) $\sqrt{29}$

53. If $|\bar{a}|=1,|\bar{b}|=2$ and the angle between $\bar{a}$ and $\bar{b}$ is 120^0, then $\left\{\left(\bar{a}+3\bar{b}\right)\times\left(3\bar{a}-\bar{b}\right)\right\}^2=$

1) 425 2) 375 3) 325 4) 300

54. Let $\bar{u}=2\bar{i}+\bar{j}-\bar{k}$ and $\bar{w}=\bar{i}+3\bar{k}$. If $\bar{u}$ is any unit vector then the maximum value of the scalar triple product $\left(\bar{u}\bar{v}\bar{w}\right)$ is

1) 1 2) $\sqrt{10}+\sqrt{6}$ 3) $\sqrt{59}$ 4) $\sqrt{60}$

55. A class has fifteen boys and five girls. Suppose three students are selected at random from the class. The probability that there are two boys and one girl is

1) $\frac{35}{76}$ 2) $\frac{35}{38}$ 3) $\frac{7}{76}$ 4) $\frac{35}{72}$

56. Seven white balls and three black balls are randomly arranged in a row. The probability that no two black balls are placed adjacently is

1) $\frac{1}{2}$ 2) $\frac{7}{15}$ 3) $\frac{2}{15}$ 4) $\frac{1}{3}$

57. Let A and B be events in a sample space S such that P(A) - 0.5, P(B) = 0.4 and $P(A \cup B) = 0.6$. Observe the following lists:

List I	List II
i) $P(A \cap B)$	(a) 0.4
ii) $P(A \cap \overline{B})$	(b) 0.2
iii) $P(\overline{A} \cap B)$	(c) 0.3
iv) $P(\overline{A} \cap \overline{B})$	(d) 0.1

	(i)	(ii)	(iii)	(iv)		(i)	(ii)	(iii)	(iv)
(1)	(a)	(b)	(c)	(d)	(2)	(c)	(b)	(d)	(a)
(3)	(c)	(b)	(a)	(d)	(4)	(c)	(a)	(b)	(d)

58. The probability distribution of a random variable X is given below:

X=x	0	1	2	3
P(X=x)	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$

Then the variance of X is

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

59. The probability that an individual suffers a bad reaction from an injection is 0.001. The probability that out of 2000 individuals exactly there will suffer bad reaction is

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

60. The locus of a point such that the sum of its distances from the points (0,2) and (0, -2) is 6, is

1) $9x^2 - 5y^2 = 45$ 2) $5x^2 + 9y^2 = 45$ 3) $9x^2 + 5y^2 = 45$ 4) $5x^2 - 9y^2 = 45$

61. The number of points P(x,y) with natural numbers as coordinates that lie inside the quadrilateral formed by the lines 2x + y =2, x = 0, y = 0 and x + y = 5 is

1) 12 2) 10 3) 6 4) 4

62. The image of the point (3, 8) in the line x + 3y = 7 is

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

63. The line joining the points A (2, 0) and B (3, 1) is rotated through and angle of 45^0, about A in the anticlockwise direction. The coordinates of B in the new position

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

64. If one of the lines in the pair of straight lines given by $4x^2 + 6xy + ky^2 = 0$ bisects the angle between the coordinate axes, then $k \in$

1) {-2, -10} 2) -2, 10} 3) {-10,2} 4) 2, 10}

65. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a pair of parallel lines then $\sqrt{\frac{g^2 - ac}{f^2 - bc}} =$

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

66. If s and p are respectively the sum and the product of the slope of the lines $3x^2 - 2xy - 15y^2 = 0$, then s : p =

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

67. 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

68. 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) $x^2 + y^2 = 2ax + 2ay$

69. 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) $\frac{7}{6}$

70. If the cirlce $x^2 + y^2 + 8x - 4y + c = 0$ touches the circle $x^2 + y^2 - 6x + 8y + k = 0$ orthogonally then k =

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

71. The point of contact of the circles $x^2 + y^2 + 2x + 2y + 1 = 0$ and $x^2 + y^2 - 2x + 2y + 1 = 0$ is

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

72. If a chord of the parabola $y^2 = 4x$ passes through its focus and makes an angle θ with the X-axis, then its length is

1) $4\cos^2\theta$ 2) $4\sin^2\theta$ 3) $4\,\mathrm{cosec}^2\theta$ 4) $4\sec^2\theta$

73. If the straight line y = mx + c is parallel to the axis of the parabola $y^2 = lx$ and intersects the parabola at $\left(\frac{c^2}{8}, c\right)$ then the length of the latus rectum is

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

74. The eccentricity of the ellipse $x^2 + 4y^2 + 2x + 16y + 13 = 0$ is

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

75. The angle between the asymptotes of the hyperbola $x^2 - 3y^2 = 3$ is

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

76. The polar equation of the line perpendicular to the line $\sin\theta - \cos\theta = \frac{1}{r}$ and passing through the point $\left(2, \frac{\pi}{6}\right)$ is

1) $\sin\theta + \cos\theta = \frac{\sqrt{3}+1}{r}$ 2) $\sin\theta - \cos\theta = \frac{\sqrt{3}+1}{r}$

3) $\sin\theta + \cos\theta = \frac{\sqrt{3}-1}{r}$ 4) $\cos\theta - \sin\theta = \frac{\sqrt{3}}{r}$

77. The ratio in which the line joining (2, -4, 3) and (-4, 5, -6) is divided by the plane 3x +2y +z - 4 = 0 is

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

78. If the angles made by a straight line with coordinate axes are $\alpha, \frac{\pi}{2}-\alpha, \beta$ then β =

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

79. A plane passes through (2, 3, -1) and is perpendicular to the line having direction ratios 3, -4, 7. The perpendicular distance from the origin to this plane is

1) $\frac{3}{\sqrt{74}}$ 2) $\frac{5}{\sqrt{74}}$ 3) $\frac{6}{\sqrt{74}}$ 4) $\frac{13}{\sqrt{74}}$

80. The radius of the circle given by $x^2+y^2+z^2+2x-2y-4z-19=0=x+2y+2z+7$, is

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

ANSWERS

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

EAMCET-2011 ENGINEERING–PHYSICS

81. Some physical quantities are given in the List I and the related units are given in the List II. Match the correct pairs in the lists :

List - I	List- II
a) Magnetic field intensity	e)A - m
b) Magnetic flux	f) Wb m^{-2}
c) Magnetic pole strength	g) Wb
d) Magnetic induction	h) Am^{-1}
	i) Am^2

The correct match is

1)a - e, b - f, c - g, d - i 2) a - h, b - g, c - e, d - f 3) a - h, b - e, c - i, d - f 4) a - f, b - g, c - e, d - h

82. A fully charged capacitor has a capacitance 'C'. It is discharged through a small coil of resistance wire, embedded in a block of specific heat 's' and mass 'm' under thermally isolated conditions. If the temperature of the block is raised by 'ΔT', the potential difference V across the capacitor initially is :

1) $\left(\frac{2ms\Delta T}{C}\right)^2$ 2) $\left(\frac{2ms\Delta T}{C}\right)^{1/2}$ 3) $\left(\frac{2ms\Delta T}{C}\right)$ 4) $2ms\,\Delta T.C$

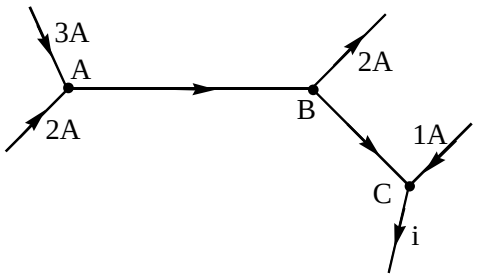
83. Two identical condensers M and N are connected in series with a battery. The space between the plates of M is coimpletely filled with a dielectric medium of dielectric constant 8 and copper plate of thickness $\frac{d}{2}$ is introduced between the plates of N. (d is the distance between the plates). The potential differences across M and N are, respectively, in the ratio .

1) 1 : 4 2) 4 :1 3) 3 : 8 4) 1 : 6

84. The electric current i in the circuit shown is

1) 6A 2) 2A

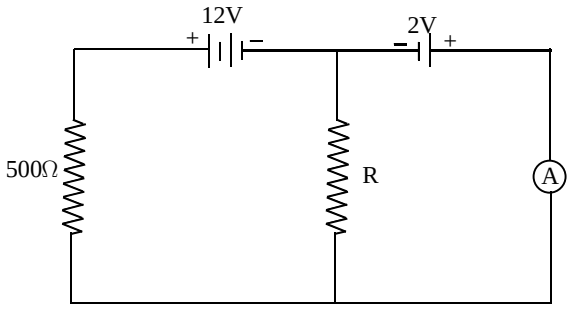
3) 3A 4) 4A



85. In the circuit shown below, the ammeter reading is zero. Then the value of the resistance R is

1) 50Ω 2) 100Ω

3) 200Ω 4) 400Ω



86. The thermo e.m.f. of a hypothetical thermocouple varies with the temperature θ of hot junction as $E = a\theta + b\theta^2$ in volts, where the ratio a/b is 700°C. If the cold junction is kept at 0°C, then the neutral temperature is

1) 700°C 2) 1400°C 3) 390°C

4) No neutral temperature is possible for this thermocouple

87. Match the following and find the correct pairs

List - I	**List - II**
a) Fleming's left hand rule	**e) Direction of induced current**
b) Right hand thumb rule	**f) Magnitude and direction of magnetic induction**
c) Biot-Savart law	**g) Direction of force due to magnetic induction**
d) Fleming's right hand rule	**h) Direction of magnetic lines due to current**

1) a - g, b - e, c -f, d -h 2) a - g, b - h, c -f, d - e 3)a - f, b - h, c -g, d - e 4) a - h, b - g, c - e, d - f

88. A constant voltage of 25V is applied to a series L-R circuit at t = 0,by closing a switch. What is the potential difference across the resistor and the inductor at time t = 0 ?

1)0V, 25V 2) 12.5V, 12.5 V 3) 10V, 15V 4) 25V, 0V

89. The sensitivity of a galvanometer is 60 divisions/Amp. When a shunt is used, its sensitivity becomes 10 divisions/Amp. If the galvanometer is of resistance 20Ω, the value of shunt used is

1) 4Ω 2) 5Ω 3) 20Ω 4) 2Ω

90. Two photons of energy 2.5eV and 3.5 eV fall on a metal surface of work function 1.5 eV. The ratio of the maximum velocities of the photoelectrons emitted from the metal surface is

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

91. Calculate the wavelength of the K_α line for z = 31 when $a = 5\times10^7\,Hz^{1/2}$ for a characteristic X-ray spectrum

1) $1.33\,\overset{0}{A}$ 2) 1.33 nm 3) $133\times10^{-10}\,m$ 4) 133 nm

92. If 200 MeV of energy is released in the fission of one nucleus of $^{235}_{92}U$, the number of nuclei that must undergo fission to release an energy of 1000J is

1) 3.125×10^{13} 2) 6.25×10^{13} 3) 12.5×10^{13} 4) 3.125×10^{14}

93. In a p-n junction diode the thickness of depletion layer is $2\times10^{-6}\,m$ and barrier potential is 0.3V. The intensity of the electric field at the junction is

1) $0.6\times10^{-6}\,Vm^{-1}$ from n to P side 2) $0.6\times10^{-6}\,Vm^{-1}$ from P to n side

3) $1.5\times10^{5}\,Vm^{-1}$ from n to P side 4) $1.5\times10^{5}\,Vm^{-1}$ from P to n side

94. The dimensional formula of $\frac{1}{2}\mu_0 H^2$ (μ_0 – permeability of free space and H-magnetic field intensity) is

1) MLT^{-1} 2) ML^2T^{-2} 3) $ML^{-1}T^{-2}$ 4) ML^2T^{-1}

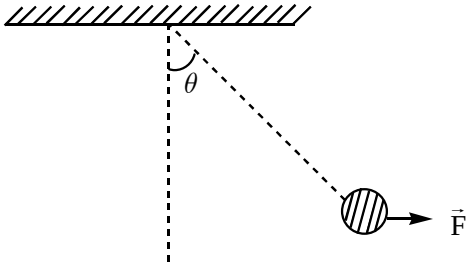
95. A certain vector in the xy plane has an x component of 4m and a y component of 10m. It is then rotated in the xy plane so that its x- component is doubled. Then its new y -component is (approximately)

1) 20m 2) 7.2m 3) 5.0 m 4) 4.5 m

96. A police party is moving in a jeep at a constant speed v. They saw a thief at a distance x on a motor-cycle which is at rest. The moment the police saw the thief, the thief started at constant acceleration α. Which of the following relation is true if the police is able to catch the thief ?

1) $v^2 < \alpha x$ 2) $v^2 < 2\alpha x$ 3) $v^2 \geq 2\alpha x$ 4) $v^2 = \alpha x$

97. A 1N pendulum bob is held at an angle θ from the vertical by a 2N horizontal force $\vec{F}$ as shown in the figure. The tension in the string supporting the pendulum bob (in Newtons) is



1) $\cos\theta$ 2) $\frac{2}{\cos\theta}$

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

98. The maximum tension a rope can withstand is 60 kg wt. The ratio of maximum acceleration with which two boys of masses 20kg and 30 kg can climb up the rope at the same time is

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

99. A ball is let fall from a height h_0. It makes n collisions with the earth. After 'n' collisions it rebounds with a velocity 'v_n' and the ball rises to a heigth h_n, then coefficient of restitution is given by

1) $e=\left[\frac{h_n}{h_0}\right]^{1/2n}$ 2) $e=\left[\frac{h_0}{h_n}\right]^{1/2n}$ 3) $e=\frac{1}{n}\sqrt{\frac{h_n}{h_0}}$ 4) $e=\frac{1}{n}\sqrt{\frac{h_0}{h_n}}$

100. A circular disc of radius 'R' is removed from a bigger circular disc of radius '2R' such that the circumferences of the discs touch. The centre of mass of the new disc is at a distance 'αR' from the centre of the bigger disc. The value of 'α' is

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

101. A uniform chain of length L is lying the horizontal table. If the coefficient of friction between the chain and the table top is 'μ', what is the maximum length of the chain that can hang over the edge of the table without distrubing the rest of the chain on the table ?

1) $\frac{L}{(1+\mu)}$ 2) $\frac{\mu L}{(1+\mu)}$ 3) $\frac{L}{1-\mu}$ 4) $\frac{\mu L}{(1-\mu)}$

102. Two uniform circular discs having the same mass and the same thickness but different radii are made from different materials. The disc with the smaller rotational ineria is

1) The one made from the more dense material 2) The one made from the less dense material
3) The disc with the larger angular velocity 4) The disc with the larger torque

103. A thin hollow sphere of mass 'm' is completely filled with a liquid of mass 'm'. When the sphere rolls with a velocity 'v', kinetic energy of the system is (neglect friction):

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

104. Assertion (A) : An astronaut inside a massive spaceship orbiting around the earth will experience a finite but small gravitational force.

Reason (R) : The centripetal force necessary to keep the spaceship in orbit around the earth is provided by the gravitational force between the earth and the spaceship

1) A and R are true and R is the correct explanation of A.
2) A and R are true and R is not the correct explanation of A.
3) A is true, R is false. 4) A is false, R is true.

105. A simple harmonic oscillator sonsists of a particle of mass 'm' and an ideal spring with constant 'k'. The particle oscillates with a time period 'T'. The spring is cut into two equal parts. If one part oscillates with the same particle, the time period will be :

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

106. Two blocks of masses 1 kg and 2 kg are connected by a metal wire going over a smooth pulley. The breaking stress of metal is $\frac{40}{3\pi}\times10^6\,\mathrm{Nm}^{-2}$. What should be the minimum redius of wire used if it should not break? $\left(g=10\mathrm{ms}^{-2}\right)$

1) 0.5 mm 2) 1 mm 3) 1.5 mm 4) 2 mm

107. If two soap bubbles of different radii are connected by a tube, then:

1) Air flows from bigger bubble to the smaller bubble till sizes become equal
2) Air flows from bigger bubble to the smaller bubble till sizes are interchanged
3) Air flows from smaller bubble to bigger
4) There is no flow of air

108. A large open tank has two holes in the wall. One is a square hole of side 'L' at a depth 'y' from the top and the other is a circular hole of radius R at a depth '4y' from the top. When the tank is completely filled with water, the quantities of water flowing out per second from the two holes are the same. Then value of R is :

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

109. A non - conducting body floats in a liquid at 20^0C with $\frac{2}{3}$ of its volume immersed in the liquid. When liquid temperature is increased to 100^0C, $\frac{3}{4}$ of body's volume is immersed in the liquid. Then the coefficient of real expansion of the liquid is neglecting the expansion of container of the liquid :

1) $15.6\times10^{-4}\,{}^0\mathrm{C}^{-1}$ 2) $156\times10^{-4}\,{}^0\mathrm{C}^{-1}$ 3) $1.56\times10^{-4}\,{}^0\mathrm{C}^{-1}$ 4) $0.156\times10^{-4}\,{}^0\mathrm{C}^{-1}$

110. An insulated cylinderical vessel filled with an insulated piston of negligible weight and neglegible thickness at the mid point of the vessel. The cylinder contains a gas at $0^{0|}$C, the piston moves through a length of 5 cm. Length of the cylinderical vessel in cm is :

1) 13.65 2) 27.3 3) 38.6 4) 64.6

111. A reversible engine converts one-sixth of the heat supplied into work. When the temperature of the sink is reduced by 62^0C, the efficiency of the engine is doubled. The temperatures of the sourece and sink are :

1) 99^0C, 37^0C 2) 80^0C, 37^0C 3) 95^0C, 37^0C 4) 90^0C, 37^0C

112. During an adiabatic process, the pressure of a gas is proportional to the cube of its temperature. The value of C_p/C_v for that gas is :

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

113. Two slabs A and B of different material but of the same thickness are joined end to endto form a cmposite slab. The thermal conductivities of A and B are 'k_1' and 'k_2' respectively. A steady temperature difference of 12^0C is maintained across the composite slab. If $k_1=\frac{k_2}{2}$, the temperature difference across slab A is :

1) 4^0C 2) 6^0C 3) 8^0C 4) 10^0Cs

114. The wavelengths of two sound notes in air are $\frac{40}{195}$ m and $\frac{40}{193}$ m. Each note produces 9 beats per second separately with a third note of fixed frequency. The velocity of sound in air in m/s is :

1) 360 2) 320 3) 300 4) 340

115. Two uniform stretched strings A and B, made of steel are vibrating under the same tension. If the first overtone of A is equal to the second overtone of B and if the radius of A is twice that of B, the ratio of the lengths of the strings is :

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

116. The focal length of a lens of dispersive power 0.45 which should be placed in contact with a convex lens of focal length 84 cm and dispersive power 0.21 to make the achromatic combination from the two lenses, in cm is :

1) 45 2) 90 3) 180 4) -180

117. Which of the following statements are true in the context of a Compound Microscope?

(A) Each lens produces a virtual and inverted image

(B) The obfective has a very short focal length

(C) The eyepiece is used as a simple magnifying glass

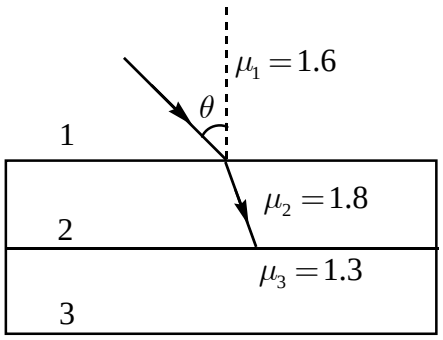
(D) The objective and eyepiece are convex and concave lenses respectively

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

118. A ray of light refracts from medium 1 into a thin layer of medium 2, crosses the layer and is incident at the critical angle on the interface between the medium 2 and 3 as shown in the figure. If the angle of incidence of ray is θ, the value of θ is :

1) $\sin^{-1}\left(\frac{8}{9}\right)$ 2) $\sin^{-1}\left(\frac{13}{18}\right)$

3) $\sin^{-1}\left(\frac{13}{16}\right)$ 4) $\sin^{-1}\left(\frac{8}{13}\right)$



119. In the Young's double slit experiment, the resultant intensity at a point on the screen is 75% of the maximum intensity of the bright fringe. Then the phase difference between the two interfering rays at that point is

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

120. If a bar magnet of pole strength m and magnetic moment M is cut equally 5 times parallel to its axis and again 3 times perpendicular to its axis then the pole strength and magnetic moment of each piece are respectively.

1) $\frac{m}{20}, \frac{M}{4}$ 2) $\frac{m}{5}, \frac{M}{20}$ 3) $\frac{m}{6}, \frac{M}{24}$ 4) $\frac{m}{5}, \frac{M}{24}$

81) **2**	82) **2**	83) **1**	84) **4**	85) **2**	86) **4**	87) **2**	88) **1**	89) **1**	90) **4**
91) **1**	92) **1**	93) **3**	94) **3**	95) **2**	96) **3**	97) **3**	98) **0**	99) **1**	100) **2**
101) **2**	102) **1**	103) **3**	104) **2**	105) **3**	106) **2**	107) **3**	108) **1**	109) **1**	110) **2**
111) **1**	112) **4**	113) **3**	114) **1**	115) **3**	116) **4**	117) **2**	118) **3**	119) **3**	120) **3**

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121. The order of pH of 0.200 M solutions of NH_4NO_3, $NaNO_3$ and Na_2CO_3 is

1) $NH_4NO_3 < Na_2CO_3 < NaNO_3$ 2) $NH_4NO_3 < NaNO_3 < Na_2CO_3$

3) $Na_2CO_3 < NaNO_3 < NH_4NO_3$ 4) $NaNO_3 < NH_4NO_3 < Na_2CO_3$

122. Which one of the following pairs represents the intensive properties ?

1) Specific heat and temperature 2) Entropy and density

3) Enthalpy and mole fraction 4) Heat and temperature

123. According to Langmuir adsorption isotherm, the amount of gas adsorbed by unit surface area is (a, b, k and n are constant ; P = present of gas)

1) kP^n 2) $\frac{1+bP}{ap}$ 3) $k,P^{1/n}$ 4) $\frac{aP}{1+bP}$

124. Calcium carbide is hydrolyzed using heavy water, What are the products formed ?

1) $Ca(OH)_2$, C_2D_2 2) $Ca(OD)_2$, C_2D_2 3) $Ca(OD)_2$, CD_4 4) $Ca(OH)_2$, CD_2

125. The reactivity of Ca, Sr, Mg and Ba with water follow the order :

1) Sr > Ba > Mg > Ca 2) Ba > Sr > Ca > Mg 3) Ca > Mg > Ba > Sr 4) Sr > Ca > Mg > Ba

126. Electronegativity of group 13 elements follow the order

1) B > Ga Al > Tl > In 2) B > Tl > Ga > Al > In 3) B > TI > In > Ga Al 4) B > Al > Tl > In > Ga

127. What is the empirical fromula of sheet silicates ?

1) $\left(Si_2O_5\right)_n^{2n-}$ 2) $\left(SiO_3\right)_n^{2n-}$ 3) $\left(SiO_3\right)_n^{n-}$ 4) $\left(Si_2O_7\right)_n^{3n-}$

128. The gases evolved in the decomposition of lead nitrate are

1) N_2O_3, NO 2) NO_2, O_2 3) N_2O_3, O_2 4) N_2O, O_2

129. Which of the following statements are correct ?

I) Monoclinic sulphur contains S_8 molecules II) Sulphur forms SF_6 SF_4, SF_2 and S_2F_2

III) Peroxo group is present in $H_2S_2O_6$

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

130. Bond energy of F_2 Cl_2 and Br_2 follow the order

1) F – F > Cl – CI > Br – Br 2) Cl – Cl > Br – Br > F – F

3) Br – Br > CI – Cl > F _ F 4) CI – CI > F – F > Br – Br

131. A mixture of He, Ne, Kr and Xe is cooled. Which one of them condenses first ?

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

132. The solutionof X haaving excess caustic potash is used to detect ammonia. Which of the following is X ?

1) K_2 $[HgI_4]$ 2) $[Co(NH_3)_6]Cl_3$ 3) $K_3[Fe(NCS)_6]$ 4) $[Co(NH_3)_5SO_4]Br$

133. Which of the following metallurgical process does not involve heating ?

1) Smelting 2) Calcination 3) Roasting 4) Leaching

134. Which one of the following is not a green - house gas ?

1) CO_2 2) N_2O 3) O_3 4) N_2

135. The reagent used to detect phosphorous in an organic compound is

1) $FeSO_4$ 2) $AgNO_3$ 3) $(NH_4)_2MoO_4$ 4) $BaCl_2$

136. Which one of the following alkenes gives only ethanal on ozonolysis ?

1) Propene 2) 2 - Butene 3) 1 - Butene 4) 2 - Pentene

137. Which one of the following does not give precipitate with ammonical cuprous chloride ?

1) $H_3C-CH_2-C\equiv CH$ 2) $H_3C-C\equiv CH$

3) $HC\equiv CH$ 4) $H_3C-C\equiv C-CH$

138. The number of stereoisomers possible for H_3C–CH(OH) – CH(OH) – CH_3 is

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

139. $C_2H_5-OH \xrightarrow{PCl_5} A \xrightarrow{AgNO_2} B$ **. Identify A and B**

1) C_2H_5 – Cl, C_2H_5 – O – C_2H_5 2) C_2H_6, C_2H_5 – O – C_2H_5

3) C_2H_5 – Cl, C_2H_5 – ONO 4) C_2H_6, $C_2H_5NO_2$

140. Assertion (A): Ethanol boils at lower temperature than ethane.

Reason (R) : The molecular weight of ethanol is higher than that of ethane.

The correct answer is :

1) Both A and R are true and R is the correct explanation of A

2) Both A and R are true and R is not the correct explanation of A

3) A is true but R is not true 4) A is not true but R is true

141. Which compound is formed when a mixture of calcium acetate and calcium formate is heated ?

1) $H_3C-\overset{\overset{O}{\|}}{C}-CH_3$ 2) $H_3C-\overset{\overset{O}{\|}}{C}-O-\overset{\overset{O}{\|}}{C}-CH_3$ 3) HCHO 4) H_3C – CHO

142. Identify X in the following : $H_3CCO_2H \xrightarrow[(ii)\Delta]{(i)NH_3} X$

1) H_3CCN 2) $H_3CCO_2NH_4$ 3) $(H_3CCO)_2O$ 4) H_3CCONH_2

143. Carbylamine test is used to detect which one of the following

1) C_6H_5CHO 2) $C_6H_5CO_2H$ 3) $C_6H_5NH_2$ 4) C_6H_5OH

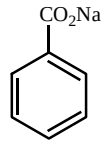
144. Proteins are :

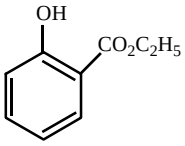
1) Polysaccharides 2) Polynucleotides 3) Polypeptides 4) Triglycerides

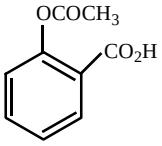
145. Scurvy is caused by the deficiency of which vitamin?

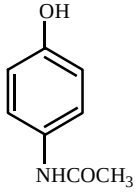
1) C 2) B_1 3) D 4) B_2

146. Which one of the following is a food preservative?

1) 

2) 

3) 

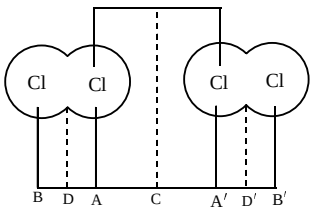
4) 

147. The number of radial nodes present in the radial probability distribution curves for the orbital wave function with quantum numbers n = 4, *l* = 0 nad m = 0 is

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

148. If the uncertainty in velocities of two particles A and B with mass 1.0 x 10^{-27} kg and 1.0 x 10^{-31} kg respectively is the same, the ratio of uncertainty in the positions of A and B is

1) 1000 : 1 2) 10,000 : 1 3) 1 : 1000 4) 1 : 10,000

149. 

With reference to the diagram given, the van der Waals radius is equal to

1) $A-A'$ 2) B – A 3) B – D 4) A – C

150. In which one of the following, the bond angle is the lowest?

1) $H_3\overset{\oplus}{O}$ 2) $\overset{\oplus}{N}H_4$ 3) F_2O 4) $BC\ell_3$

151. In the Born–Haber cycle of the given reaction $Na_{(s)} + \frac{1}{2}C\ell_{2(g)} \longrightarrow NaC\ell_{(s)}$ the number of endothermic and exothermic stages respectively are

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

152. A metal nitride contains 28% nitrogen by weight. The molecular formula of metal nitride is M_3N_2. What is the atomic weight of metal?

1) 72 2) 64 3) 100 4) 24

153. Which one of the following statements is not correct?

1) The fraction of total number of molecules of a gas having most probable velocity increases with an increase in temperature of the gas

2) The concentration of an ideal gas at 100 K and 0.0821 atm. of pressure is 1.0 x 10^{-2} mol. lit^{-1} (R = 0.0821 lit. atm. $mol^{-1}.K^{-1}$)

3) If the rms velocity of an ideal gas at T(K) is 'C' cm. s^{-1}, its rms velocity at 4T(K) is '2C' cm.s^{-1}

4) The average kinetic energy of gas molecules is proportional to their absolute temperature

154. In acidic medium, 100 ml of 0.01 M $KMnO_4$ solution oxidizes 100 ml of H_2O_2 solution. The volume of 0.01 M $KMnO_4$ required to oxidize the same volume of H_2O_2 in alkaline medium in ml. is

1) $\frac{300}{2}$ 2) $\frac{300}{5}$ 3) $\frac{500}{3}$ 4) $\frac{500}{2}$

155. A solution of 10 g of a non-volatile binary electrolyte (mol.wt. = 100) in 500 g of water freezes at –0.74^{0}C. What is the degree of ionisation? (k_f of water = 1.85 K molality^{-1})

1) 50% 2) 75% 3) 100% 4) 0%

156. For the electrochemical cell $M\left|M^+\right|\left|X^-\right|X$, $E^\circ\left(M^+/M\right) = 0.44\,V$ and $E^\circ\left(X/X^-\right) = 0.33\,V$. Which one of the following is true for this data?

1) $M + X \rightarrow M^+ + X^-$ is a spontaneous reaction 2) $M^+ + X^- \rightarrow M + X$ is a spontaneous reaction

3) E_{cell} = 0.77 V 4) E_{cell} = – 0.77 V

157. In electrochemical corrosion, the metal undergoing corrosion:

1) Acts as anode 2) Acts as cathode 3) Undergoes reduction 4) Liquefies

158. If the length of the unit cell is 5 A^0, the smallest distance in, A^0 between the two neighbouring metal atoms in a face centred cubic lattice is

1) 2.50 2) 5.00 3) 7.07 4) 3.535

159. Match the following

List I	**List II**
A) Arrhenius equation	**i) Free energy change**
B) Slowest step in a reaction mechanism	**ii) conc^{-1}.time^{-1}**
C) Rate constant of a II order reaction	**iii) conc^{-1}. time^{-1}**
D) The possibility of a reaction depends on	**iv) Rate determining step**
	v) $k = A.e^{-E_a/RT}$

The correct answer is

	A	**B**	**C**	**D**		**A**	**B**	**C**	**D**
1)	v	i	iii	iv	2)	v	iv	iii	ii
3)	v	iv	ii	i	4)	iii	iv	ii	i

160. At T(K), the partial pressures of SO_2, O_2 and SO_3 are 0.662, 0.100 and 0.331 atm. respectively for the reaction $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_3$ at equilibrium. What is the partial pressure in atm. of O_2 when the equilibrium partial pressures of SO_2 and SO_3 are equal at the same temperature?

1) 0.4 2) 0.8 3) 0.25 4) 2.5

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