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10112

Series B

MATHEMATICS

1. If $\vec{a}\times(\vec{b}\times\vec{c})=\vec{b}\times(\vec{a}\times\vec{c})$, then $\vec{a}$ and $\vec{b}$ are

(A) equal
(B) perpendicular
(C) $\vec{0}, \vec{0}$
(D) parallel

2. The order of a is 4 in a group $(G,*)$. Then the order of a^4 is equal to

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

3. If $\alpha=\begin{pmatrix}1&2&3&4&5\\3&4&1&5&2\end{pmatrix}$ is a permutation, then $\alpha^{-1}=$

(A) $\begin{pmatrix}1&2&3&4&5\\3&5&1&2&4\end{pmatrix}$
(B) $\begin{pmatrix}1&2&3&4&5\\2&3&4&1&5\end{pmatrix}$
(C) $\begin{pmatrix}1&2&3&4&5\\1&2&3&4&5\end{pmatrix}$
(D) $\begin{pmatrix}1&2&3&4&5\\5&4&3&2&1\end{pmatrix}$

If $\vec{a},\vec{b},\vec{c}$ are mutually perpendicular unit vectors of magnitude a, b, c, then $\vec{a}\cdot(\vec{b}\times\vec{c})$ is

(A) 3
(B) 1
(C) $\sqrt{abc}$
(D) abc

If $z=(2-3i)(4+4i)$, then z is equal to

(A) $8-12i$
(B) $20-4i$
(C) $(2+3i)(4-4i)$
(D) 1

6. If P represents the variable complex number z satisfying $|z-2-3i|=4$, then the locus of P is

(A) a circle
(B) a straight line
(C) an ellipse
(D) a hyperbola

7. If $\mathrm{Re}\left(\frac{z-4}{z-2i}\right)=0$, then the locus of z is

(A) $x^2+y^2+4x+2y=0$
(B) $x^2+y^2-4x-2y=0$
(C) $x^2+y^2=16$
(D) $x^2-y^2+16=0$

The roots of $z^3=1$ are in

(A) $A.P$
(B) $H.P$
(C) $G.P$
(D) a circle $|z|=\frac{1}{2}$

If $|z_1|=|z_2|$ and $\arg z_1+\arg z_2=0$, then

(A) $z_1+z_2=0$
(B) $z_1+\bar{z}_2=0$
(C) $z_1=\bar{z}_2$
(D) $z_1=z_2$

$\lim_{x\to\infty}\frac{5^x-10^x}{28^x-56^x}=$

(A) 0
(B) 1
(C) $\log 2$
(D) $\log\frac{2}{3}$

The least value of $a^2\sec^2 x+b^2\mathrm{cosec}^2 x$ is

(A) $a+b$
(B) $(a+b)^2$
(C) a^2-ab+b^2
(D) a^2+b^2

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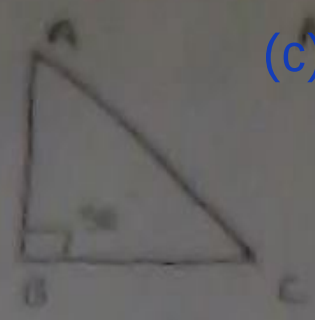
Series B



12. In a right angled triangle ABC, $\angle B = 90^\circ$, $AB + AC = 20cm$. Then the area of $\triangle ABC$ is maximum if $\angle A$ is

(A) 45°
(B) 30°
(C) 60°
(D) 15°

13. The coefficient of x^4 in the MacLaurin's expansion of $\sin x$ is

(A) 0
(B) $\frac{1}{16}$
(C) $\frac{1}{24}$
(D) $\frac{1}{6}$

14. If $f(x)$ and $g(x)$ be two functions such that $f(a) = g(a) = 0$ and $f'(a)$ and $g'(a)$ exist and $g'(a) \neq 0$, then $\lim_{x \to a} \frac{f(x)}{g(x)}$ is equal to

(A) $\frac{f'(a)}{g'(a)}$
(B) $\frac{f(a)}{g'(a)}$
(C) $\frac{f'(a)}{g(a)}$
(D) $f'(a)g'(a)$

5. The centre of the ellipse $3x^2 + 4y^2 - 12x - 8y + 4 = 0$ is

(A) $(-1,-2)$
(B) $(0,0)$
(C) $(1,2)$
(D) $(2,1)$

The second order differential equation whose solution is $y = Ae^x + Be^{-x}$ is

(A) $\frac{d^2y}{dx^2} - x^2y = 0$
(B) $\frac{d^2y}{dx^2} + y = 0$
(C) $\frac{d^2y}{dx^2} + x^2y = 0$
(D) $\frac{d^2y}{dx^2} - y = 0$

$\frac{dy}{dx} = xAe^{x-1} + 0 - xBe^{-x+1}$

17. The transformation $y = vx$ reduces the differential equation $\frac{dy}{dx} = \frac{x^2 + y^2}{2xy}$ into

(A) $x\frac{dv}{dx} = \frac{1 - v^2}{2v}$

(B) $\frac{xdv}{dx} = v^2$

(C) $x\frac{dv}{dx} = \frac{v}{x}$

(D) $xdv = \sqrt{1 + v^2}\,dx$

18. The solution of $\frac{dx}{dy} + \frac{x}{1+y^2} = \frac{\tan^{-1} y}{1+y^2}$ is

(A) $x = \tan^{-1} y + c$

(B) $xy = \tan^{-1} y + c$

(C) $x = \tan^{-1} y - 1 + c$

(D) $\tan^{-1} y - x = 1 - ce^{-\tan^{-1} y}$

The integrating factor of $\frac{dy}{dx} + \frac{3x^2 y}{5+x^3} = \frac{1}{5+x^3}$ is

(A) 1

(B) $5 + x^3$

(C) $5x^3$

(D) $5 - x^3$

The system of equations $2x + 3y = 5$ and $3x - 2y = 1$ has

(A) unique solution

(B) infinite number of solutions

(C) no solution

(D) two solutions

$\Delta = \begin{vmatrix} -x & 1 & -1 \\ -2 & x & 2 \\ 3 & -3 & x \end{vmatrix}$ and the minor of 2 and minor of -2 are equal, then the lue of x is

(A) 1

(B) 2

(C) 3

(D) 0

22. The probability of getting one head in tossing two coins once is

(A) $\frac{1}{4}$ (B) $\frac{2}{3}$

(C) $\frac{1}{2}$ (D) $\frac{1}{3}$

23. The area bounded by the curve $y = \tan x$ and between the lines $x = 0$, $x = \frac{\pi}{4}$ is

(A) $\frac{\log 2}{2}$ (B) $\frac{\log 2}{3}$

(C) $\log 2$ (D) $\frac{\log 2}{\pi}$

24. The point of contact of the tangent $y = 3x + c$ and the parabola $y^2 = 4x$ is

(A) $\left(\frac{1}{3}, \frac{2}{3}\right)$ (B) $\left(\frac{1}{9}, \frac{2}{3}\right)$

(C) $(1, 2)$ (D) $\left(\frac{1}{3}, \frac{2}{9}\right)$

25. If $(G, *)$ is a group, then the solution of the equation $x * a = b$ is

(A) $x = a * b$ (B) $x = a * b^{-1}$

(C) $x = a^{-1} * b$ (D) $x = b * a^{-1}$

26. The solutions of $x^4 + 1 = 0$ are

(A) $\pm 1, \pm\sqrt{2}$ (B) $\pm i, \pm\sqrt{2}$

(C) $\pm 1, \pm i$ (D) $\pm i, \pm 2i$

27. For any two elements a, b, the operation $*$ defined by $a * b = \frac{a+b}{2}$ is closed in

(A) the set of all real numbers
(B) the set of all integers
(C) the set $\{1, -1, i, -i\}$
(D) the set of all natural numbers

28. If every element of a group G has its own inverse, then the order of $a \in G$ is

(A) 1 (B) 4
(C) 2 (D) 8

29. The conjugate axis of the hyperbola $2x^2 - 3y^2 = 6$ is

(A) 2 (B) 4
(C) 6 (D) $2\sqrt{2}$

30. If e_1 and e_2 are the eccentricities of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then

(A) $e_1^2 - e_2^2 = 1$ (B) $e_1^2 + e_2^2 = 1$
(C) $e_1^2 - e_2^2 = 2$ (D) $e_1^2 + e_2^2 = 2$

31. The normal to the rectangular hyperbola $xy = c^2$ at $(-c, c)$ meets the curve again at

(A) $(-c, -c)$ (B) (c, c)
(C) $\left(c, \frac{1}{c}\right)$ (D) $\left(\frac{1}{c}, \frac{1}{c}\right)$

If $\vec{a} = a\vec{i}$, $\vec{b} = a\vec{j}$, $\vec{c} = a\vec{k}$, then $\vec{a} \cdot (\vec{b} \times \vec{c})$ is

(A) 0
(C) $3a$
(B) a^3
(D) $\sqrt{3}\, a^3$

33. Two roots of the equation $\begin{vmatrix} x & 3 & 3 \\ 3 & x & 3 \\ 3 & 3 & x \end{vmatrix} = 0$ are

(A) 3, 6

(B) 3, 3

(C) 3, −3

(D) 3, $\frac{1}{3}$

34. The maximum value of xe^{-x} is

(A) e

(B) $-e$

(C) $\frac{1}{e^2}$

(D) $\frac{1}{e}$

35. If the set $\left\{\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 1 \\ -1 & 0 \end{pmatrix}, \begin{pmatrix} 0 & -1 \\ 1 & -1 \end{pmatrix}\right\}$ forms a group under matrix multiplication, then the inverse of $\begin{pmatrix} -1 & 1 \\ -1 & 0 \end{pmatrix}$ is

(A) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(B) $\begin{pmatrix} -1 & 1 \\ -1 & 0 \end{pmatrix}$

(C) $\begin{pmatrix} 0 & -1 \\ 1 & -1 \end{pmatrix}$

(D) $\begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}$

36. If $\vec{r}$ is the position vector of any point P on a line of force $\vec{F}$, then the moment of $\vec{F}$ about the origin is

(A) $\vec{F} \times \vec{r}$

(B) $\vec{r} \times \vec{F}$

(C) $|\vec{r}|\vec{F}$

(D) $|\vec{F}|\vec{r}$

37. If $1, 1, \sqrt{2}$ are the direction ratios of a vector $\vec{a}$, then the angle between $\vec{a}$ and y-axis is

(A) 0
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$
(D) $\frac{\pi}{2}$

38. If $\vec{a} \times \vec{b} = 0$, then which one of the following is true?

(A) $\vec{a} = 0$
(B) $b = 0$
(C) $\vec{a}$ and $\vec{b}$ are parallel
(D) $\vec{a}$ and $\vec{b}$ are perpendicular

39. If $|z-1| = |z+i|$ represents a straight line, then the slope of the straight line is

(A) 1
(B) -1
(C) $\frac{1}{2}$
(D) $\frac{8}{3}$

40. If α, β are the roots of $x^2 - 2x + 2 = 0$, then $\frac{(\cot\theta - 1 + \alpha)^n - (\cot\theta - 1 + \beta)^n}{(\alpha - \beta)} =$

(A) $\frac{\sin n\theta}{\sin\theta}$
(B) $\frac{\sin^n \theta}{\cos\theta}$
(C) $\frac{\sin n\theta}{\sin^n \theta}$
(D) $\frac{-i\cos n\theta}{\cos^n \theta}$

41. If $s = 5 + 2t - t^2$, then the particle comes to rest when the time t is

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

42. The slope of the normal to the curve $x = a\sin^3\theta$, $y = a\cos^3\theta$ at θ is

(A) $\cos\theta$
(B) $\sin\theta$
(C) $\cot\theta$
(D) $\tan\theta$

43. If $\vec{a},\vec{b},\vec{c}$, are three unit vectors such that $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\frac{\vec{b}}{2}$, then the angle between $\vec{a}$ and $\vec{b}$ is

(A) π (B) $\frac{\pi}{2}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

44. The function $f(x)=\frac{1}{x}$ has a stationary value for

(A) $x=1$ (B) $x=0$
(C) $x=2$ (D) no real finite value of x

45. The curves $x=y^2$ and $xy=k$ cut orthogonally if the value of $4k^2$ is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{1}{4}$ (D) $\frac{1}{6}$

46. If A and B are two non-empty sets with $n\left(A\cap B\right)=m$, then the number of elements common to $A\times B$ and $B\times A$ is

(A) $2m$ (B) $m+1$
(C) m^2 (D) 2^m

47. If $f:A\to B$ and $g:B\to C$ are one-to-one and onto, then

(A) $(g\circ f)^{-1}=f^{-1}\circ g^{-1}$ (B) $(g\circ f)^{-1}=g^{-1}\circ f^{-1}$

(C) $(gf)^{-1}=g\circ f^{-1}$ (D) $(g\circ f)^{-1}=f\circ g^{-1}$

48. If $f : A \to B$ is an onto function, then

(A) $n(A) = n(B)$
(B) $n(A) = 2n(B)$
(C) $n(A) \leq n(B)$
(D) $n(B) < n(A)$

49. Which of the following is true in set theory?

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

50. If C divides A and B in the ratio $m : n$ as well as $p : q$ (internally), then

(A) $m = p$ and $n = q$
(B) $mq = np$
(C) $mp = nq$
(D) $m + p = n + q$

51. A set together with binary operation $*$ is said to be a semi-group if it satisfies the axiom

(A) closure property
(B) associative property
(C) existence of identity elements
(D) commutative property

52. If $G = \{1, \omega, \omega^2\}$ is a group where ω is a complex cube root of unity, then the inverse of ω^2 is

(A) 1
(B) ω
(C) ω^2
(D) $-\omega$

53. The combined equation of asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

(A) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 0$
(B) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$
(C) $x^2 - y^2 = 0$
(D) $x^2 - y^2 - b^2 y^2 = 0$

54. If two dice are thrown once, then the probability of getting same numbers is

(A) $\frac{1}{6}$ (B) $\frac{1}{12}$

(C) $\frac{1}{36}$ (D) $\frac{1}{2}$

55. If $f(x)=k(x-1)^2, 1 \le x \le 3$ is a $p.d.f.$ of a continuous random variable, then k is

(A) $\frac{1}{4}$ (B) 1

(C) 4 (D) $\frac{1}{2}$

56. The projection of $x-$axis on $y-$axis is

(A) 0 (B) 1

(C) $\frac{1}{\sqrt{2}}$ (D) $\frac{-1}{\sqrt{2}}$

57. If $|\vec{a}|=1, |\vec{b}|=2$ and $|\vec{c}|=4$ are mutually perpendicular vectors, then $|\vec{a}+\vec{b}+\vec{c}|=$

(A) 7 (B) $\sqrt{21}$

(C) 21 (D) $\sqrt{7}$

58. If $z=i$, then the value of $z^{100}=$

(A) $1+i$ (B) 1

(C) $-i$ (D) $100i$

59. The value of $\left[\frac{(1+i)}{(1-i)}\right]^8+\left[\frac{(1-i)}{(1+i)}\right]^8$ is

(A) $8i$ (B) 32

(C) -32 (D) 0

60. If $x+\frac{1}{x}=2\cos\alpha$ and $y+\frac{1}{y}=2\cos\beta$, then $\frac{x^{10}}{y^9}+\frac{y^9}{x^{10}}=$

(A) $2\cos(\alpha-\beta)$
(B) $2\cos(10\alpha-9\beta)$
(C) $2\cos(10\alpha+9\beta)$
(D) $2i\sin(10\alpha-9\beta)$

61. The values of x for which the rate of increase of x^3-3x^2+2x is twice the rate of increase of x are

(A) $9, \frac{1}{9}$
(B) $0, 2$
(C) $2, \frac{1}{2}$
(D) $5, \frac{1}{5}$

62. Which one of the following function is strictly decreasing in $\left(0, \frac{\pi}{2}\right)$?

(A) $f(x)=x^3$
(B) $f(x)=\sin x$
(C) $f(x)=\cos x$
(D) $f(x)=\tan x$

63. The local maxima of the function $\sin 2x-x$, $\frac{-\pi}{2}<x<\frac{\pi}{2}$ is

(A) $\frac{\sqrt{3}}{2}-\frac{\pi}{6}$
(B) $\frac{\sqrt{3}+\pi}{2}$
(C) $\frac{\sqrt{3}}{2}$
(D) $\frac{\pi}{2}$

64. The value of c in Lagrange's mean value theorem for the function $f(x)=ax^3+bx^2$, $2\le x\le 8$ is $\frac{16}{3}$, then

(A) $2a+b=0$
(B) $2a-b=0$
(C) $a+b=0$
(D) $a-b=0$

65. The expression of $\frac{1}{1+x}$ is

(A) $1+\frac{x}{1!}+\frac{x^2}{2!}+\ldots\infty$

(B) $1-x+x^2-x^3+\ldots\infty$

(C) $1-\frac{x}{1!}+\frac{x^2}{2!}-\ldots\infty$

(D) $1+x+x^2+x^3+\ldots\infty$

66. The value of $\lim_{x\to 0}(e^x+x)^{1/x}$ is

(A) 0

(B) e^2

(C) e

(D) 1

67. If $u=\cos\left(\frac{y}{x}\right)$, then $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=$

(A) 1

(B) 0

(C) -1

(D) -2

68. The asymptote of the curve $y^2(a-x)=x^2(a+x)$ is

(A) $x=0$

(B) $y=0$

(C) $x=a$

(D) $x=-a$

69. The solution of $xdy+ydx=0$ is

(A) $xy=c$

(B) $x+y=c$

(C) $x=cy$

(D) $x=y+c$

70. The solution of $\frac{dy}{dx}=e^{2x-y}+x^3e^{-y}$ is

(A) $4e^y=2e^{2x}+x^4+c$

(B) $4e^y=x^4+c$

(C) $e^y=e^{2x}+x^4+c$

(D) $e^y+x^4=c$

71. The particular integral of $(4D^2 + 4D + 1)y = 8e^{-x/2}$ is

(A) $\frac{x^2 e^{-x/2}}{2}$

(B) $\frac{x^2}{2}$

(C) $e^{-x/2}$

(D) $x^2 e^{-x/2}$

72. The solution set of the equation $\begin{vmatrix} x+1 & x & x+2 \\ 0 & x+2 & x+3 \\ 0 & 0 & x+3 \end{vmatrix} = 0$ is

(A) $\{-1, -2, -3\}$

(B) $\{1, 2, 3\}$

(C) $\{0, 1, 2\}$

(D) $\{-1, 0, 1\}$

73. $\begin{bmatrix} 1-x & -2 \\ 2 & 6-x \end{bmatrix}$ does not possess an inverse if

(A) $x = 1$ or $x = 6$

(B) $x = 0$ or $x = 2$

(C) $x = 2$ or $x = 5$

(D) x is irrational

74. If $|\vec{a} \times \vec{b}| = \sqrt{10}$, $|\vec{a}| = 2$, $|\vec{b}| = \sqrt{5}$, then the angle between $\vec{a}$ and $\vec{b}$ is

(A) $\frac{\pi}{6}$

(B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{2}$

75. The modulus and argument of $\sqrt{3} - i$ are

(A) $2, \frac{-\pi}{6}$

(B) $2, \frac{\pi}{6}$

(C) $3, \frac{-\pi}{6}$

(D) $3, \frac{\pi}{4}$

76. The locus of a point, sum of whose distances from two fixed points A and B is $r > AB$, is

(A) a line segment
(B) a parabola
(C) an ellipse
(D) a hyperbola

77. The value of $\frac{1}{1.3}+\frac{1}{2.5}+\frac{1}{3.7}+\ldots\infty$ $\left(\text{if } \log 2 = 1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\ldots\right)$ is

(A) $2-\log 2$
(B) $1-2\log 2$
(C) $2-2\log 2$
(D) $1+\log 2$

78. The number of real roots of the equation $e^x = 0$ is

(A) 0
(B) 1
(C) 2
(D) infinitely many

79. If the roots of $x^3+bx^2+cx-1=0$ form an increasing $G.P.$, then

(A) $b+c=0$
(B) $b+c=-1$
(C) $b+c=1$
(D) $c-b=1$

80. The coefficient of x^7 in the expansion of $(x-1)(x-2)\ldots(x-8)$ is

(A) 18
(B) -18
(C) 36
(D) -36

81. The number of divisors of the form $(2n-1)$ $(n=1, 2, \ldots)$ of 1024 is

(A) 0
(B) 10
(C) 6
(D) 8

82. If the graph of the function $y=f(x)$ is the line joining $(-1, 0)$ and $(0, 1)$ in the plane, then $\int_{-1}^{0} f(x)\,dx$ is

(A) 0
(B) 1
(C) $\frac{1}{2}$
(D) 2

83. If $|z-4| < |z+3|$, then the complex number z satisfies

(A) $Im\, z < \frac{1}{2}$ (B) $Im\, z > \frac{1}{2}$

(C) $Re\, z < \frac{1}{2}$ (D) $Re\, z > \frac{1}{2}$

84. If $4x^2 + 56x + 1 + c$ is a perfect square, then c is

(A) 0 (B) 1

(C) 195 (D) 196

85. If $[x]$ denotes the greatest integer less than or equal to x, then $\int_0^n [x]\,dx$ equals

(A) $\frac{n(n+1)}{2}$ (B) $\frac{n(n-1)}{2}$

(C) $\frac{n^2}{2}$ (D) $\frac{(n+1)^2}{2}$

86. If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular vectors of magnitude 2, 3, 5 respectively, then $\left[\vec{a}, \vec{b}, \vec{c}\right]$ is

(A) 30 (B) 6

(C) 15 (D) 10

The area cut off from the hyperbola $y^2 = 4ax$ by $y = mx$ is

(A) $\frac{8a^2}{3m^3}$ (B) $\frac{8a^2}{3m^2}$

(C) $\frac{32a^2}{3m^3}$ (D) $\frac{32a^2}{3m^2}$

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88. If a, b, c are in arithmetic as well as in geometric progression, then a, b, c are

(A) equal to each other
(B) such that $ac = 2b$
(C) such that $a + c = 2b$
(D) such that $abc = 1$

89. The remainder when $x^3 + 2x^2 - 7x + 4$ is divided by $2x - 4$ is

(A) 3
(B) 4
(C) 6
(D) 12

90. If a is a positive real number and the positive integer n increases, then

(A) a^n increases
(B) a^n decreases
(C) a^n remains a constant
(D) a^n increases or decreases or remains a constant depending on 'a'

91. One of the values of $\int \cos^{-1} x \, dx + \int \cos^{-1}\left(\sqrt{1-x^2}\right) dx$ is

(A) πx
(B) $\frac{2x}{\pi}$
(C) $\frac{\pi x}{2}$
(D) $\pi^2 x$

92. The value of $\int_0^{\log 10} \frac{e^x \sqrt{e^x - 1}}{e^x + 8} dx$ is

(A) $6 - \left(6\pi/4\right)$
(B) $4 - \left(\pi/6\right)$
(C) $\left(\pi/6\right)$
(D) $\left(\left(\pi/4\right) - 6\right)$

93. If the points $(-2, -5)$, $(2, -2)$ and $(8, a)$ are collinear, then the value of a is

(A) $\frac{5}{2}$
(B) $-\frac{5}{2}$
(C) $\frac{8}{3}$
(D) $-\frac{8}{3}$

94. The number of normals that can be drawn from a point to a hyperbola (in general) is

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

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

(A) $\frac{\pi}{3}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{6}$
(D) $\frac{\pi}{2}$

96. The period of $\cos^2 x$ is

(A) $\frac{\pi}{2}$
(B) π
(C) 2π
(D) 3π

If $f(x) = \frac{1}{1-x}$, then $f(f(f(x)))$ is

(A) $f(x)$
(B) 1
(C) 0
(D) x

98. If $f\left(\frac{x-2}{x+2}\right) = x$ for all x, then $f(x)$ equals

(A) x (B) $\frac{2x+2}{x-1}$

(C) $\frac{2x+2}{1-x}$ (D) $\frac{x-1}{2x+2}$

99. If $f(x+y, x-y) = xy$, then $f(x, y)$ is equal to

(A) xy (B) $\frac{x^2-y^2}{2}$

(C) $\frac{x^2+y^2}{4}$ (D) $\frac{x^2-y^2}{4}$

100. If $\left(m_i, \frac{1}{m_i}\right)$ are concyclic $(i = 1, 2, 3, 4)$, then $m_1 m_2 m_3 m_4$ is

(A) $\frac{1}{2}$ (B) 1

(C) 2 (D) 4

101. The complex numbers $\sin x + i\cos 2x$ and $\cos x - i\sin 2x$ are conjugates f

(A) $x = \pi$ (B) $n = \frac{\pi}{2}$

(C) $x = 0$ (D) no value of x

102. The function $x^2 + x + 1$ attains its minimum when

(A) $x = \frac{1}{2}$ (B) $x = 2$

(C) $x = 1$ (D) $x = -\frac{1}{2}$

103. If the product of the roots of $x^2 - 3kx + 2e^{2\log k} - 1 = 0$ is 31, then the value of k is

(A) 2
(B) 4
(C) 8
(D) 16

104. If a, b, c, d are positive numbers with $a+b+c+d=1$ and $M=(a+b)(c+d)$, then

(A) $0<M\le 1$
(B) $0<M\le\frac{1}{4}$
(C) $0\le M\le\frac{1}{8}$
(D) $0<M\le\frac{1}{16}$

105. If $\log(x+1)+\log(x-1)=\log 3$, then the value of x is

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

106. If $y=2^{1/\log_x 8}$, then x is

(A) y
(B) y^2
(C) y^3
(D) y^8

If A, G, H are AM, GM, HM of two numbers a and b, then

(A) $G=\sqrt{AH}$
(B) $A=\sqrt{GH}$
(C) $H=\sqrt{AG}$
(D) $AH=G$

If $a_1, a_2, \ldots, a_{2n}$ are in $A.P.$, then $a_1^2-a_2^2+a_3^2-a_4^2+\ldots+a_{2n-1}^2-a_{2n}^2$ is

(A) $\frac{a_1^2-a_{2n}^2}{n}$
(B) $\frac{n}{2n-1}(a_1^2-a_{2n}^2)$
(C) $\frac{2n-1}{n}(a_{2n}^2-a_1^2)$
(D) $n(a_1^2-a_{2n}^2)$

109. If n is odd, then the number of terms in $(x+y)^n + (x-y)^n$ is

(A) $\frac{n}{2}$
(B) $\frac{n+1}{2}$
(C) $\frac{n+2}{2}$
(D) $\frac{n-1}{2}$

110. The value of $\begin{vmatrix} 1+p & 1 & 1 \\ 1 & 1+q & 1 \\ 1 & 1 & 1+r \end{vmatrix}$ is

(A) pqr
(B) $pqr\left(\frac{1}{p}+\frac{1}{q}+\frac{1}{r}\right)$
(C) $pqr\left(1+\frac{1}{p}+\frac{1}{q}+\frac{1}{r}\right)$
(D) $\frac{p+q+r}{pqr}$

111. If ω is the cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is

(A) 0
(B) 1
(C) ω
(D) ω^2

112. If a, b, c are pair wise unequal, then the value of x for which $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ is

(A) 0
(B) a
(C) b
(D) c

113. P is an orthogonal matrix, if

(A) $P = P^T$
(B) $PP^T = I = P^T P$
(C) $P = P^{-1}$
(D) $PP^T = 0$

114. If $A=\begin{bmatrix}0 & 3\\ 2 & 0\end{bmatrix}$ and $A^{-1}=k(adjA)$, then k is

(A) -1
(B) $\frac{1}{6}$
(C) $-\frac{1}{6}$
(D) 1

115. If ${}^{n}C_{r}=84$, ${}^{n}C_{r-1}=36$ and ${}^{n}C_{r+1}=126$, then n is

(A) 3
(B) 6
(C) 9
(D) 12

116. The value of $[1.3.5.....(2n-1)]2^{n}$ is

(A) $2n!/n$
(B) $2n!/n!$
(C) $\frac{2n}{n!}$
(D) $2\frac{(2n)!}{n!}$

117. A card is drawn from a pack of 50 cards numbered 1 to 50. The probability of drawing a card whose number is a square is

(A) $\frac{1}{50}$
(B) $\frac{3}{50}$
(C) $\frac{5}{50}$
(D) $\frac{7}{50}$

118. The probability that a man lives for 10 more years is p and that of his wife is q. Then the probability that neither will live for 10 years is

(A) $(1-p)(1-q)$
(B) pq
(C) $(1-p)q$
(D) $p(1-q)$

119. The value of $\sqrt{3}\operatorname{cosec}20^{\circ}-\sec 20^{\circ}$ is

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

120. In the triangle ABC, $\angle A$ is given by $3\cos A + 2 = 0$. Then the equation whose roots are $\sin A$ and $\tan A$ is

(A) $6x^2 + \sqrt{5}x - 5 = 0$
(B) $6x^2 - \sqrt{5}x + 5 = 0$
(C) $\sqrt{5}x^2 + 6x - 5 = 0$
(D) $\sqrt{5}x^2 - 6x + 5 = 0$

121. If $\sin\theta + \operatorname{cosec}\theta = 2$, then $\sin^2\theta + \operatorname{cosec}^2\theta$ is

(A) 2
(B) 4
(C) -2
(D) -4

122. In a $\triangle ABC$ with abtuse angle $\angle C$, $\sin A = \frac{1}{\sqrt{10}}$, $\sin B = \frac{1}{\sqrt{5}}$. Then $A + B$ is

(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{2}$
(D) π

123. If $\tan A = 2\tan B + \cot B$, then $2\tan(A - B)$ is

(A) $\tan B$
(B) $\cot B$
(C) $\tan A$
(D) $\cot A$

124. If $\cos^{-1}\theta - \sin^{-1}\theta = 0$, then θ is

(A) $\frac{\pi}{2}$
(B) $\frac{1}{\sqrt{2}}$
(C) $\frac{\pi}{4}$
(D) $\frac{1}{2\sqrt{2}}$

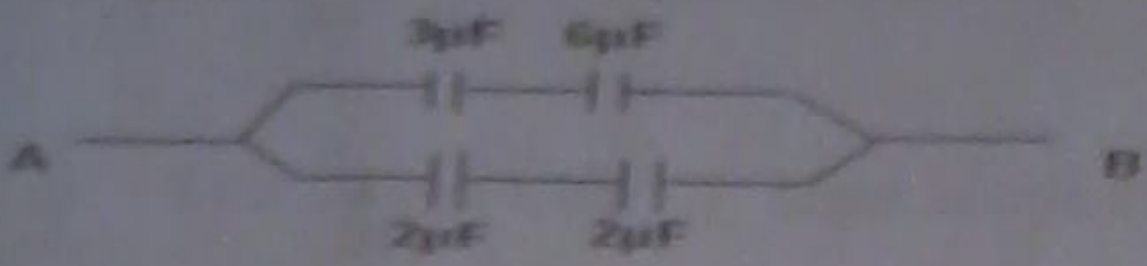
125. The value of $\sin(\cot^{-1} x)$ is

(A) $\sqrt{1 - x^2}$
(B) $\frac{1}{\sqrt{1 - x^2}}$
(C) $\sqrt{1 + x^2}$
(D) $\frac{1}{\sqrt{1 + x^2}}$

126. The unit of permittivity is

(A) $NC^{-1} m^{-2}$
(B) Hm^{-1}
(C) $C^2N^{-1} m^{-2}$
(D) $Nm^2 C^{-2}$

127. In the given circuit, the effective capacitance between A and B will be



(A) 3 μF
(B) 36/13 μF
(C) 13 μF
(D) 7 μF

128. The torque(τ) experienced by an electric dipole placed in a uniform elect field(E) at an angle Θ with the field is

(A) PE cos Θ
(B) – PE cos Θ
(C) PE sin Θ
(D) 2PE sin Θ

129. Resistance of a metal wire of length 10 cm is 2 Ω. If the wire is stretch uniformly to 50 cm, the resistance is

(A) 25 Ω
(B) 10 Ω
(C) 5 Ω
(D) 50 Ω

130. The colour code for a carbon resistor is red-red-black. The resistance of t resistor is

(A) 2.2 Ω
(B) 22 Ω
(C) 220 Ω
(D) 2200 Ω

131. In a thermocouple, the temperature of the cold junction is 20°C and t temperature of inversion is 600°C. The neutral temperature is

(A) 310°C
(B) 320°C
(C) 300°C
(D) 315°C

132. In a tangent galvanometer a current 1 A produces a deflection of 30°. The current required to produce a deflection of 60° is

(A) 3 A
(B) 2 A
(C) $\sqrt{3}$ A
(D) $1/\sqrt{3}$ A

133. Peltier Effect is the converse of

(A) Joule Effect
(B) Raman Effect
(C) Thomson Effect
(D) Seebeck Effect

134. The torque experienced by a rectangular current loop placed perpendicular to uniform magnetic field is

(A) maximum
(B) zero
(C) finite minimum
(D) infinity

135. The magnitude and direction of the magnetic Lorentz force is given by

(A) $\vec{F} = (\vec{v} \times \vec{B})$
(B) $\vec{F} = q/(\vec{v} \times \vec{B})$
(C) $\vec{F} = q(\vec{v} \times \vec{B})$
(D) $\vec{F} = V(\vec{q} \times \vec{B})$

136. In an AC circuit, the current $I = Io \sin\left(\omega t - \frac{\pi}{2}\right)$ lags behind emf $e = Eo \sin\left(\omega t + \frac{\pi}{2}\right)$ by

(A) 0
(B) $\pi/4$
(C) $\pi/2$
(D) π

137. The power loss is less in transmission line when

(A) voltage is less but current is more
(B) both voltage and current are more
(C) voltage is more but current is less
(D) both voltage and current are less

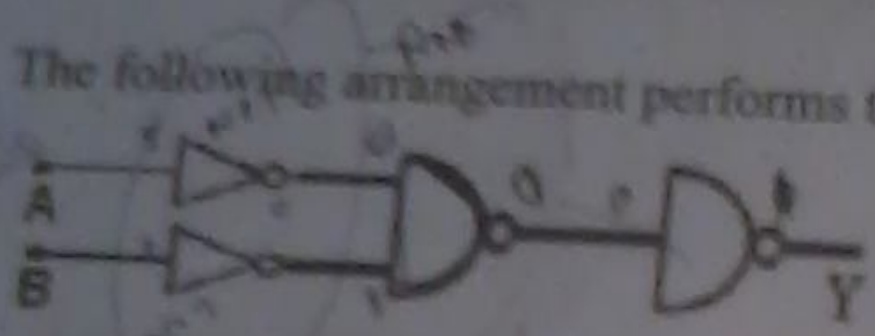
138. In a step-up transformer the output voltage is 11 kV and the input voltage is 220 V. The ratio of number of turns of primary to secondary is

(A) 25 : 1
(B) 1 : 50
(C) 50 : 1
(D) 1 : 25

139. The generator rule is

(A) Fleming's left hand rule
(B) Fleming's right hand rule
(C) Maxwell's right hand corkscrew rule
(D) Right hand palm rule

140. The following arrangement performs the logic function of



(A) AND
(B) OR
(C) NAND
(D) NOR

141. The reactance offered by 300 mH inductor to an AC supply of frequency 50 Hz is

(A) 1046 Ω
(B) 94.2 Ω
(C) 9420 Ω
(D) 104.6 Ω

142. An emf of 12 V is induced when the current in the coil changes at the rate of 40 As^{-1}. The coefficient of self-induction of the coil is

(A) 0.3 H
(B) 0.003 H
(C) 30 H
(D) 4.8 H

143. In an electromagnetic wave, the phase difference between electric field and magnetic field is

(A) 0
(B) $\pi / 4$
(C) $\pi / 2$
(D) π

144. Unpolarised light passes through a tourmaline crystal. The emergent light is analysed by an analyser. When the analyser is rotated through 90°, then intensity of light

(A) remains uniformly bright
(B) remains uniformly dark
(C) varies between maximum and minimum
(D) varies between maximum and dark

145. A ray of light passes from a denser medium into a rarer medium. For an angle of incidence of 45°, the refracted ray grazes the surface of separation of two media. The refractive index of the denser medium is

(A) $\frac{3}{2}$
(B) $\frac{1}{\sqrt{2}}$
(C) $\sqrt{2}$
(D) 2

146. In Raman Effect, if the scattered photon gains energy, it gives rise to

(A) Stoke's line
(B) Anti-Stoke's line
(C) Stoke's and anti-Stoke's line
(D) Rayleigh line

147. In case of Fraunhofer diffraction, the wave front undergoing diffraction is

(A) spherical wave front
(B) cylindrical wave front
(C) elliptical wave front
(D) plane wave front

148. The ratio radii of 4th and 9th dark rings in Newton's rings experiment is

(A) 4 : 9
(B) 2 : 3
(C) 16 : 81
(D) $\sqrt{2} : \sqrt{3}$

149. The wavelength of D_1 and D_2 lines emitted by sodium vapour lamp is

(A) 589.6 nm, 589 nm
(B) 589 nm, 589.6 nm
(C) 589.3 nm, 589 nm
(D) 589 nm, 589.3 nm

150. If the minimum wavelength of X-rays produced in a Coolidge tube is 0.62 Å the operating potential is

(A) 20 kV
(B) 0.2 kV
(C) 2 kV
(D) 10 kV

151. A crystal diffracts monochromatic X – rays. If the angle of diffraction for th second order is 90°, then that for the first order will be

(A) 60°
(B) 45°
(C) 30°
(D) 15°

152. The direction of viscous force in Millikan's oil drop experiment is

(A) always downwards
(B) always upwards
(C) opposite to the direction of motion of the oil drop
(D) either upwards or downwards

153. A photon of frequency γ is incident on a metal surface of threshold frequency The kinetic energy of the emitted photoelectron is

(A) $h(\gamma - \gamma_0)$
(B) $h\gamma$
(C) $h\gamma_0$
(D) $h(\gamma + \gamma_0)$

154. Einstein's photoelectric equation is

(A) $W + h\nu = \frac{1}{2} m v^2_{max}$
(B) $\frac{1}{2} m v^2_{max} = W$
(C) $h\nu + \frac{1}{2} m v^2_{max} = W$
(D) $W + \frac{1}{2} m v^2_{max} = h\nu$

155. The mean life (τ) and half life ($T_{1/2}$) of a radioactive element are related as

(A) $\tau = 2T_{1/2}$
(B) $\tau = \frac{T_{1/2}}{0.6931}$
(C) $\tau = 0.6931\, T_{1/2}$
(D) $\tau = \frac{T_{1/2}}{2}$

156. In a Colpitt's oscillator circuit

(A) capacitive feedback is used
(B) tapped coil is used
(C) no tuned LC circuit is used
(D) no capacitor is used

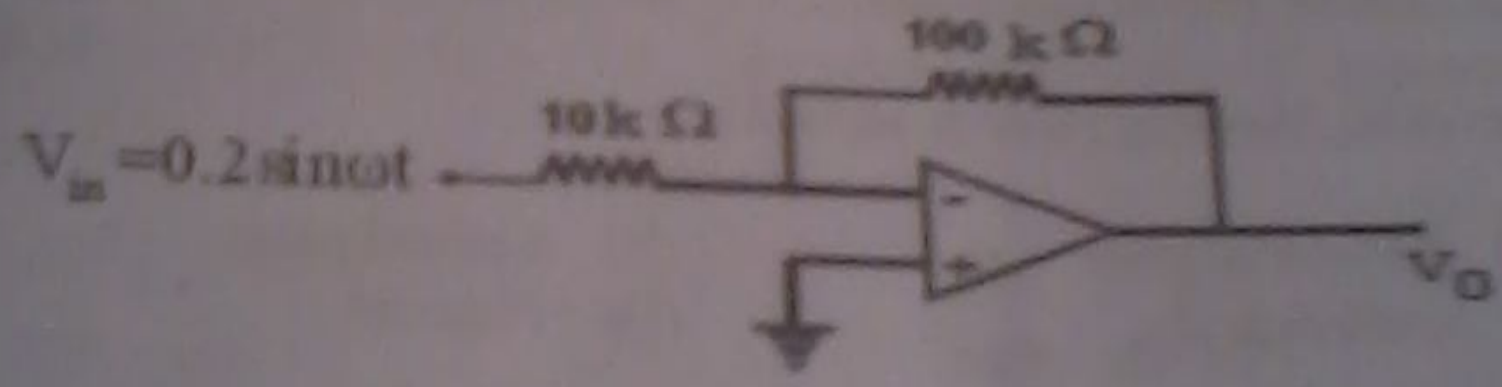
157. The colour of light emitted by a LED depends on

(A) its reverse bias
(B) amount of forward current
(C) its forward bias
(D) type of semiconductor material

158. Barkhausen condition for maintenance of oscillation is

(A) $\beta = \frac{1}{A}$
(B) $A\beta = \infty$
(C) $A = \beta$
(D) $A\beta = \frac{1}{\sqrt{2}}$

159. The output of the given operational amplifier is



(A) $-2 \sin \omega t$
(B) $2 \sin \omega t$
(C) $-2 \sin (\omega t + 10°)$
(D) $2 \sin (\omega t + 10°)$

160. A logic gate which has an output '1', when the inputs are complement to other is

(A) AND
(B) NOR
(C) NAND
(D) EXOR

161. In common emitter (CE) amplifiers, the phase reversal between input and output voltage is

(A) 0° (B) 90°
(C) 270° (D) 180°

162. According to the laws of Boolean algebra, the expression (A+AB) is equal to

(A) A (B) AB
(C) B (D) $\bar{A}$

163. An example for non-sinusoidal oscillator is

(A) Multi vibrator (B) RC oscillator
(C) Colpitts oscillator (D) Crystal oscillator

164. Through which mode of propagation, the radio waves can be sent from one place to another?

(A) ground wave propagation (B) sky wave propagation
(C) space wave propagation (D) All of the above

165. In television, blanking pulse is applied to

(A) horizontal plate (B) vertical plate
(C) control grid (D) filament

166. In communication system, the channel width is the difference between

(A) maximum frequency of USB and minimum frequency of LSB
(B) maximum frequency of USB and maximum frequency of LSB
(C) minimum frequency of USB and minimum frequency of LSB
(D) minimum frequency of USB and maximum frequency of LSB

In television systems, picture elements are scanned using ..... potentials.

(A) saw tooth (B) square wave
(C) sine wave (D) pulses

168. Two charges, $A = 20\times10^{-6}C$ and $B = 10\times10^{-6}C$ are placed at a distance of 30 cm apart. The potential at 15 cm from the charge A is

(A) 1.8 volts
(B) 18 volts
(C) 180 volts
(D) 1800 volts

169. The electric field intensity from a point charge q, at a distance of 200 cm is $400Vm^{-1}$. At what distance, the electric field intensity will be equal to $100Vm^{-1}$?

(A) 0.5 m
(B) 1.0 m
(C) 2.0 m
(D) 4.0 m

170. When a potential difference of 100 volts is applied between the parallel plate of a capacitor whose capacitance is $5\times10^{-8}F$, then the energy stored in the electrostatic potential energy in the capacitor is

(A) $0.5\times10^{-3}J$
(B) $5\times10^{-3}J$
(C) $25\times10^{-3}J$
(D) $50\times10^{-3}J$

171. Two identical spherical balls of diameter 1 cm having charges 5μC and 3 are brought in contact. After separation, the number of electrons on the sphere is

(A) 25×10^{12}
(B) 30×10^{12}
(C) 40×10^{12}
(D) 80×10^{12}

172. When a charge of 1.77μC is placed at the center of a hollow cube of v $1m^3$, then what will be the electric flux passing through each face of the

(A) $0.333\times10^5\ Nm^2C^{-1}$
(B) $0.1999\times10^5\ Nm^2C^{-1}$
(C) $0.1275\times10^5\ Nm^2C^{-1}$
(D) $0.2000\times10^5\ Nm^2C^{-1}$

173. The point charges P and Q are placed 20 cm apart. When P=4Q, then point on the line joining them the electric field is zero?

(A) 2 cm from P
(B) 3 cm from P
(C) 4 cm from P
(D) 6 cm from P

174. A parallel plate capacitor having two conducting plates is separated by a distance of 0.2 cm and has the capacitance of 0.2μF in air. When it is immersed in transformer oil of dielectric constant 5 then its capacitance value will be

(A) 1.0μF
(B) 2.0μF
(C) 4.0μF
(D) 5.0μF

175. Which of the following materials has negative temperature coefficient of resistance?

(A) Copper
(B) Germanium
(C) Lead
(D) Platinum

176. A bread toaster having resistance of 115 ohms was operated at 230 V for 5 minutes to toast a bread slice. The total charge passed through the toaster is

(A) 10 C
(B) 50 C
(C) 150 C
(D) 600 C

177. The temperature coefficient of resistance of a Manganin wire is 0.002 Ω per degree centigrade and its resistance is 7.6 ohm at 300K. When a potential is applied, its temperature increases to 77°C. Now what will be its resistance?

(A) 8.36 ohm
(B) 9.12 ohm
(C) 9.88 ohm
(D) 10.99 ohm

178. Microwave oven cooks food faster without heating the vessel since its principle is

(A) radiation
(B) conduction
(C) convection
(D) water molecules in the food serve as electric dipole

179. When two capacitors of C_1=5μF and C_2=10μF are connected in series and a voltage of 12V is applied from a battery, then the total charge acquired by the network is

(A) 0.3μC
(B) 3.6μC
(C) 36μC
(D) 180μC

180. A galvanometer can be converted into voltmeter by connecting a resistance in ..... with it

(A) high, series
(C) low, series

181. A choke coil has a self inductance of 330 H. When the current in the coil changes at the rate of 33 mA/s then the e.m.f developed is

(A) 100 V
(C) 10 V

182. In a solenoid having a diameter of 1cm, length 40cm and 600 turns per layer of 100 turns is wound over the first layer. What will be the inductance between the coils, if the relative permeability of the core is 900?

(A) 36 mH
(C) 108 mH

183. Lenz's law is a consequence of conservation of

(A) mass
(C) charge

184. The fact that a current carrying conductor is associated with a magnetic field was discovered by

(A) Michael Faraday
(C) Nikola Tesla
(B) Foucault
(D) Christian Oersted

185. There are 1000 turns in the primary of a transformer operating at 230 V and eleven amperes. When the current in the secondary is one ampere, the number of windings in the secondary is

(A) 1000
(C) 11000
(B) 1150
(D) 23000

186. A 2 mW He-Ne laser beam of wavelength 632.8 nm is incident on water having refractive index 1.33. The velocity of the laser beam in water is

(A) $3.0\times10^{8}\,m/s$
(C) $1.84\times10^{8}\,m/s$
(B) $2.26\times10^{8}\,m/s$
(D) $1.50\times10^{8}\,m/s$

187. Frequency range of radio waves lies in the range of ..... Hz

(A) 10^4 to 10^7
(B) 10^9 to 10^{11}
(C) 10^{14} to 10^{17}
(D) 10^{18} to 10^{22}

188. Sodium vapour lamp of wavelength 5896 Å is used in Young's double slit experiment. When the distance between the slits is 0.1 cm and if the screen is placed at 1000 mm, then the fringe width is

(A) 0.2948 mm
(B) 0.5896 mm
(C) 0.2948 cm
(D) 0.5896 cm

189. Newton's rings are formed by placing a convex lens over a glass plate. When a drop of water is introduced between them, then the ring system

(A) remains the same
(B) expands
(C) contracts
(D) first contracts and then expands

190. Photons have

(A) no charge
(B) no charge but have mass
(C) no charge and no mass
(D) both charge and mass

191. Which one of the following statements is not correct in cathode rays?

(A) They possess momentum and kinetic energy
(B) They are positive ions and travel in straight lines
(C) They are deflected by electric and magnetic fields
(D) They produce fluorescence and affect photographic plate

192. ..... X-ray spectra consists of definite, well defined, monochromatic wave length.

(A) Hard
(B) Soft
(C) Continuous
(D) Characteristic

Wave number is equal to

(A) $1/\lambda$
(B) c/λ
(C) λ/c
(D) $1/(c\lambda)$

194. By recording Laue photograph of a single crystal one can get information about the

(A) crystal system
(B) lattice constants
(C) crystal symmetry
(D) lattice defects

195. Half life of a radioactive element is 3 months. What will be the fraction of that element left over after one year?

(A) 75%
(B) 50%
(C) 25%
(D) 6.25%

196. Isobars have same

(A) A but different Z
(B) Z but different A
(C) number of protons but different number of neutrons
(D) number of neutrons but different number of protons

197. de Broglie wavelength of an electron is given by the relation

(A) $h/(2meV)$
(B) $h/\sqrt{(2meV)}$
(C) $\sqrt{(2eV/m)}$
(D) $h/\sqrt{(meE)}$

198. In amplitude modulation ..... of the carrier wave remains constant.

(A) width
(B) frequency
(C) phase
(D) frequency and phase

199. The modulation factor is given by the relation

(A) signal frequency/ signal amplitude
(B) signal amplitude/ signal frequency
(C) signal amplitude/carrier frequency
(D) signal amplitude/carrier amplitude

200. The principle of the microphone is to convert

(A) electrical energy into sound energy
(B) sound energy into electrical energy
(C) electrical energy into mechanical energy
(D) mechanical energy into electromagnetic energy

201. Which combination of atoms can form a polar covalent bond?

(A) hydrogen, hydrogen
(B) hydrogen, bromine
(C) chlorine, chlorine
(D) sodium, bromine

202. Which of the following four elements has the largest atomic radius?

(A) silicon
(B) magnesium
(C) aluminum
(D) beryllium

203. ..... form oxocations

(A) Lanthanides
(B) Actinides
(C) Noble gases
(D) Alkali metals

204. Which of the ions will give colourless aqueous solution?

(A) Ni^{2+}
(B) Fe^{2+}
(C) Cu^{2+}
(D) Cu^{+}

205. Which transition element shows highest oxidation state?

(A) Sc
(C) Os
(B) Ti
(D) Zn

206. The most common oxidation state of lanthanides is

(A) +2
(C) +3
(B) +1
(D) +4

207. The name of $[Pt(NH_3)_2Cl_2]^{2+}$

(A) diamminedichloroplatinum(IV)
(B) diamminedichloroplatinate(IV)
(C) diamminedichloroplatinum
(D) dichlorodiammineplatinum(IV)

206. The electronic configuration of chromium is

(A) [Ar] $3d^5 4s^1$
(B) [Ar] $3d^4 4s^2$
(C) [Ne] $3d^5 4s^1$
(D) [Ne] $3d^4 4s^2 4p^1$

207. The de Broglie wave equation is

(A) $\lambda = h / mv$
(B) $\lambda = hv / m$
(C) $\lambda = m / hv$
(D) $\lambda = v / hm$

208. The uncertainty principle was proposed by

(A) Planck
(B) Heisenberg
(C) Schrodinger
(D) Bohr

209. The unit for magnetic moment is

(A) debye
(B) gauss
(C) Bohr magneton
(D) ergs/sec

210. 'n' used in Bragg's equation is the

(A) density of the crystal
(B) total number of d electrons
(C) interplanar distance in the crystal
(D) wavelength of X-ray

211. For a spontaneous process, at constant T, ΔS is

(A) always positive
(B) always negative
(C) either positive or negative
(D) zero

212. Unit of zero order rate constant is

(A) no unit
(B) L mol^{-1} s^{-1}
(C) s^{-1}
(D) mol L^{-1} s^{-1}

215. Reactions in which the reacting molecules react in more than one way yielding different set of products are called

(A) consecutive reactions
(C) chain reactions
(B) opposing reactions
(D) parallel reactions

216. In the Haber's process for the synthesis of ammonia, traces of molybdenum is added. Molybdenum plays the role of

(A) promoter
(C) additive
(B) inhibitor
(D) catalyst

217. Dispersion of solid in gas is known as

(A) emulsion
(C) solid sol
(B) foam
(D) aerosol

218. When arsenic is introduced to silicon

(A) p-type semiconductor is obtained
(B) n-type semiconductor is obtained
(C) supercapacitor is obtained
(D) a poor conductor is obtained

219. Consider the reaction $2CO\ (g) + O_2 \rightarrow 2CO_2$ at equilibrium. When this reaction is subjected to stress, a change will occur in the concentration of

(A) reactants only
(C) both reactants and products
(B) products only
(D) neither reactants nor products

. The energy of electron in an atom is given by En =

(A) $\frac{-4\pi^2 me^4}{n^2h^2}$
(B) $\frac{-2\pi^2 me^2}{n^2h^2}$
(C) $\frac{-2\pi^2 me^4}{n^2h^2}$
(D) $\frac{-2\pi me^4}{n^2h^2}$

The phenomenon of radioactivity was discovered by

(A) Madam curie
(C) Henry Becquerrel
(B) Pierre curie
(D) Rutherford

222. The phenomenon of Tyndall's effect is not observed in

(A) emulsion
(C) true solution
(B) colloidal solution
(D) smoke

223. When aqueous solution of benzene diazonium chloride is boiled in water, the product formed is

(A) benzyl alcohol
(C) phenol
(B) benzene
(D) phenylhydroxylamine

224. Aniline decolourises bromine water with the formation of

(A) 4-bromoaniline
(C) 2,4-dibromoaniline
(B) 2-bromoaniline
(D) 2,4,6-tribromoaniline

225. Benzoylation of aniline by benzoyl chloride in presence of base is known as

(A) Beckmann reaction
(C) Hoffmann reaction
(B) Schotten-Baumann reaction
(D) Rosenmund reaction

226. Sulphonation of nitrobenzene gives

(A) o-nitrosulphonic acid
(C) p-nitrosulphonic acid
(B) m-nitrosulphonic acid
(D) mixture of three isomers

227. Nitromethane and methyl nitrite are

(A) functional isomers
(C) position isomers
(B) chain isomers
(D) optical isomers

228. Which one is more acidic?

(A) chloroacetic acid
(C) fluoroacetic acid
(B) bromoacetic acid
(D) iodoacetic acid

229. Electrolysis of concentrated aqueous solution of sodium salt of carboxylic ac gives

(A) alcohol
(C) ester
(B) ether
(D) hydrocarbon

230. Which of the following statements is wrong?

(A) 2-Pentanone and 3-pentanone are position isomers
(B) Aqueous solution of formaldehyde is known as formalin
(C) Aldehydes and ketones undergo nucleophilic substitution
(D) Aldehydes act as reducing agents

231. In presence of con. H_2SO_4, three molecules of acetone condense to give

(A) mesitylene
(B) xylene
(C) toluene
(D) naphthalene

232. What happens when benzaldehyde is heated with 50% NaOH ?

(A) $C_6H_5OH + C_6H_5COOH$
(B) $C_6H_5CH_2OH + C_6H_5COOH$
(C) $C_6H_5CH_2OH + C_6H_5OH$
(D) $C_6H_5CH_2OH + C_6H_5COOH + C_6H_5OH$

233. The process of getting acetaldehyde from methyl cyanide by $SnCl_2/HCl$ is known as

(A) Stephen's reaction
(B) Kolbe reaction
(C) Gattermann reaction
(D) Reimer Tiemann reaction

234. Chloro group, with respect to electrophilic attack in aromatic system, is

(A) ortho, para orientation with deactivation
(B) meta orientation with deactivation
(C) meta orientation with activation
(D) ortho, para orientation with activation

235. The empirical formula for glucose is

(A) CHO
(B) $C_6H_{12}O_6$
(C) $C_2H_2O_2$
(D) CH_2O

236. The functional group responsible for the colour of a compound is known as

(A) auxochrome
(B) chromophore
(C) fluorsecence
(D) oxidant

237. Which among the following is not having an asymmetric carbon atom?

(A) 2-chlorobutane
(B) 2-bromo-3-butene
(C) isopropanol
(D) isobutyric acid

238. Tollen's reagent is

(A) ammoniacal cuprous chloride
(B) ammoniacal cuprous oxide
(C) ammoniacal silver chloride
(D) ammoniacal silver nitrate

239. Inversion of sucrose refers to

(A) oxidation of sucrose
(B) reduction of sucrose
(C) hydrolysis of sucrose
(D) polymerisation of sucrose

240. Carbon-carbon bond is shortest in

(A) ethane
(B) benzene
(C) ethylene
(D) acetylene

241. The bond order for the hypothetical He_2 molecule is

(A) zero
(B) one
(C) two
(D) three

242. The hybridisation in SF_6 molecule is

(A) sp^3
(B) d^2sp^3
(C) dsp^3
(D) d^3sp^3

243. Which element should be kept in water?

(A) sodium
(B) phosphorous
(C) mercury
(D) cesium

244. Which of the following is not a 'p block' element?

(A) gallium
(B) thallium
(C) uranium
(D) lead

245. Galena is the ore containing

(A) selenium
(B) lead
(C) aluminum
(D) sodium

246. Which of the following statements is correct?

(A) PCl_5 molecule has square planar shape
(B) PCl_5 molecule has trigonal bipyramidal shape
(C) PCl_5 molecule has tetrahedral shape
(D) PCl_5 molecule has square pyramidal shape

247. The element having the electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6$ is

(A) sulphur
(B) neon
(C) krypton
(D) argon

248. Zinc dissolves in hot NaOH solution forming

(A) sodium-zinc alloy
(B) sodium zincate
(C) zinc hydroxide
(D) zinc oxide

249. What is the oxidation state of chromium in the complex $K_3[Cr(C_2O_4)_3]3H_2O$?

(A) +2
(B) +3
(C) −2
(D) −3

250. Which element has the highest first ionisation energy?

(A) phosphorous
(B) aluminum
(C) silicon
(D) sulphur

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