MATHEMATICS

1. If $|x+5| \geq 10$ then

   1) $x \in (-15, 5]$ 2) $x \in (-5, 5]$

   3) $x \in (-\infty, -15] \cup [5, \infty)$ 4) $x \in [-\infty, -15] \cup [5, \infty)$

2. Everybody in a room shakes hands with everybody else.The total number of Handshakes is 45. The total number of persons in the room is

   1) 9   2) 10   3) 5   4) 15

3. The constant term in the expansion of $\left[x^2 - \dfrac{1}{x^2} \right]^{16}$ is

   1) 16_{C_8} 2) 16_{C_7} 3) 16_{C_9} 4) $16_{C_{10}}$

4. If P(n) : "$2^{2n} - 1$ is divisible by k for all n $\in N$" is true, then the value of 'k' is

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

5. The equation of the line parallel to the line $3x - 4y + 2 = 0$ and passing through (- 2, 3) is

   1) $3x - 4y + 18 = 0$ 2) $3x - 4y - 18 = 0$

   3) $3x + 4y + 18 = 0$ 4) $3x + 4y - 18 = 0$

6. If $\left[\dfrac{1-i}{1+i} \right]^{96} = a + ib$ then (a,b) is

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

7. The distance between the foci of a hyperbola is 16 and its eccentricity is $\sqrt{2}$. Its equation is

   1) $x^2 - y^2 = 32$ 2) $\dfrac{x^2}{4} - \dfrac{y^2}{9} = 1$ 3) $2x^2 - 3y^2 = 1$ 4) $y^2 - x^2 = 32$

8. The number of ways in which 5 girls and 3 boys can be seated in a row so that no two boys are together is

   1) 14040   2) 14440   3) 14000   4) 14400

9. If a, b, c are three consecutive terms of an AP and x, y, z are three consecutive Terms of a GP, then the value of $x^{b-c} . y^{c-a} . z^{a-b}$

   1) 0   2) xyz   3) – 1   4) 1

10. The value if $\lim\limits_{x \to 0} \dfrac{|x|}{x}$ is

1) 1   2) -1   3) 0   4) does not exist

11. Let $f(x) = x - \dfrac{1}{x}$ then f'(-1) is

     1) 0   2) 2   3) 1   4) – 2

12. The negation of the statement "72 is divisible by 2 and 3" is

     1) 72 is not divisible by 2 or 72 is not divisible by 3

     2) 72 is divisible by 2 or 72 is divisible by 3

     3) 72 is divisible by 2 and 72 is divisible by 3

     4) 72 is not divisible by 2 and 3

13. The probability of happening of an event A is0.5 and that of B is 0.3.

     If and A and B are mutually exclusive events, then the probability of neither

     A nor B is

     1) 0.4   2) 0.5   3) 0.2   4) 0.9

14. In a simultaneous throw of a pair of dice, the probability of getting a total more

     Than 7 is

     1) $\dfrac{7}{12}$ 2) $\dfrac{5}{36}$ 3) $\dfrac{5}{12}$ 4) $\dfrac{7}{36}$

15. If A and B are mutually exclusive events, given that $P(A) = \dfrac{3}{5}, P(B) = \dfrac{1}{5}$, then

     P(AorB) is

     1) 0.8   2) 0.6   3) 0.4   4) 0.2

16. Let $f, g : R \to R$ be two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x \, \forall x \in R$

     Then (fog) (x) for x<0 is

     1) 0   2)4x   3) -4x   4) 2x

17. A is a set having 6 elements. The number of distinct functions from A to A

     Which are not bijections is

     1) 6! - 6   2) $6^6 - 6$ 3) $6^6 - 6!$ 4) 6!

18. Let $f : R \to R$ be difined by $f(x) = \begin{cases} 2x & ; & x > 3 \\ x^2 & ; & 1 < x \le 3 \\ 3x & : & x \le 1 \end{cases}$ then $f(-1) + f(2) + f(4)$ is

     1) 9   2) 14   3) 5   4) 10

19. If $\sin^{-1} x + \cos^{-1} y = \dfrac{2\pi}{5}$, then $\cos^{-1} x + \sin^{-1} y$ is

1) $\dfrac{2\pi}{5}$ 2) $\dfrac{3\pi}{5}$ 3) $\dfrac{4\pi}{5}$ 4) $\dfrac{3\pi}{10}$

20. The value of the expression $\tan\left[\dfrac{1}{2}\cos^{-1}\dfrac{2}{\sqrt{5}}\right]$ is

     1) $2-\sqrt{5}$ 2) $\sqrt{5}-2$ 3) $\dfrac{\sqrt{5}-2}{2}$ 4) $5-\sqrt{2}$

21. If $A=\begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$, then $A^n = 2^k A$, where k =

     1) 2^{n-1} 2) n+1   3) n – 1   4) 2(n – 1)

22. If $\begin{bmatrix} 1 & +1 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} 2 \\ 4 \end{bmatrix}$, then the values of x and y respectively are

     1) – 3, - 1   2) 1,3   3) 3,1   4) – 1,3

23. If $A=\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then AA`=

     1) A   2) Zero matrix   3) A`   4) I

24. If x, y, $z\in R$, then the value of determinant $\begin{vmatrix} \left(5^x+5^{-x}\right)^2 & \left(5^x-5^{-x}\right) & 1 \\ \left(6^x+6^{-x}\right)^2 & \left(6^x-6^{-x}\right)^2 & 1 \\ \left(7^x+7^{-x}\right)^2 & \left(7^x-7^{-x}\right) & 1 \end{vmatrix}$ is

     1) 10   2) 12   3) 1   4) 0

25. The value of determinant $\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$ is

     1) $a^3+b^3+c^3$ 2) 3abc

     3) $a^3+b^3+c^3-3abc$ 4) $a^3+b^3+c^3+3abc$

26. If $(x_1,y_1),(x_2,y_2)$ and (x_3,y_3) are the vertices of a triangle whose area is 'k'

     Square units, then $\begin{vmatrix} x_1 & y_1 & 4 \\ x_2 & y_2 & 4 \\ x_3 & y_3 & 4 \end{vmatrix}^2$ is

     1) $32k^2$ 2) $16k^2$ 3) $64k^2$ 4) $48k^2$

27. Let A be a square matrix of order 3×3, then $|5A|=$

     1) $5|A|$ 2) $125|A|$ 3) $25|A|$ 4) $15|A|$

28. If $f(x) = \begin{cases} \dfrac{\sqrt{1+kx} - \sqrt{1-kx}}{x} & if \ -1 \le X < 0 \\ \dfrac{2x+1}{x-1} & if \ 0 \le X \le 1 \end{cases}$ is continuous at x= o, then the value of k is

    1) k =1 2) k = - 1 3) k=0 4) k=2

29. If $\cos y = x\cos(a+y)$ with $\cos a \ne \pm 1$, then $\dfrac{dx}{dy}$ is equal to

    1) $\dfrac{\sin a}{\cos^2(a+y)}$ 2) $\dfrac{\cos^2(a+y)}{\sin a}$ 3) $\dfrac{\cos a}{\sin^2(a+y)}$ 4) $\dfrac{\cos^2(a+y)}{\cos a}$

30. If $f(x) = |\cos x - \sin x|$, then $f'\left[\dfrac{\pi}{6}\right]$ is equal to

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

31. If $y = \sqrt{x+\sqrt{x+\sqrt{x+...\infty}}}$, then $\dfrac{dy}{dx} =$

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

32. If $f(x) = \begin{cases} \dfrac{\log_e x}{x-1} & ;x \ne 1 \\ k & ;x = 1 \end{cases}$ is continuous at x=1, then the value of k is

    1) e 2) 1 3) -1 4) 0

33. Approximate change in the volume V f a cube of side x meters caused by increasing The side by 3% is

    1) $0.09x^3 m^3$ 2) $0.03x^3 m^3$ 3) $0.06x^3 m^3$ 4) $0.04x^3 m^3$

34. The maximum value of $\left[\dfrac{1}{x}\right]^x$ is

    1) e 2) e^e 3) $e^{1/e}$ 4) $\left[\dfrac{1}{e}\right]^{1/e}$

35. $f(x) = x^x$ has stationary point at

    1) $x = e$ 2) $x = \dfrac{1}{e}$ 3) $x = 1$ 4) $x = \sqrt{e}$

36. The maximum area of a rectangle inscribed in the circle $(x+1)^2 + (y-3)^2 = 64$ is

    1) 64 sq. units 2) 72 sq. units 3) 128 sq. units 4) 8 sq. units

37. $\int \dfrac{1}{1+e^x} dx$ is equal to

1) $\log_e \left[\dfrac{e^x + 1}{e^x} \right] + c$

2) $\log_e \left[\dfrac{e^x - 1}{e^x} \right] + c$

3) $\log_e \left[\dfrac{e^x}{e^x + 1} \right] + c$

4) $\log_e \left[\dfrac{e^x}{e^x - 1} \right] + c$

38. $\displaystyle\int \dfrac{1}{\sqrt{3 - 6x - 9x^2}}\, dx$ is equal to

1) $\sin^{-1} \left[\dfrac{3x + 1}{2} \right] + c$

2) $\sin^{-1} \left[\dfrac{3x + 1}{6} \right] + c$

3) $\dfrac{1}{3} \sin^{-1} \left[\dfrac{3x + 1}{2} \right] + c$

4) $\sin^{-1} \left[\dfrac{2x + 1}{3} \right] + c$

39. $\displaystyle\int e^{\sin x} \cdot \left[\dfrac{\sin x + 1}{\sec x} \right] dx$ is equal to

1) $\sin x \cdot e^{\sin x} + c$

2) $\cos x \cdot e^{\sin x} + c$

3) $e^{\sin x} + c$

4) $e^{\sin x}(\sin x + 1) + c$

40. $\displaystyle\int_{-2}^{2} |x \cos \pi x|\, dx$ is equal to

1) $\dfrac{8}{\pi}$

2) $\dfrac{4}{\pi}$

3) $\dfrac{2}{\pi}$

4) $\dfrac{1}{\pi}$

41. $\displaystyle\int_{0}^{1} \dfrac{dx}{e^x + e^{-x}}$ is equal to

1) $\dfrac{\pi}{4} - \tan^{-1}(e)$

2) $\tan^{-1}(e) - \dfrac{\pi}{4}$

3) $\tan^{-1}(e) + \dfrac{\pi}{4}$

4) $\tan^{-1}(e)$

42. $\displaystyle\int_{0}^{1/2} \dfrac{dx}{(1 + x^2)\sqrt{1 - x^2}}$ is equal to

1) $\dfrac{1}{\sqrt{2}} \tan^{-1} \sqrt{\dfrac{2}{3}}$

2) $\dfrac{2}{\sqrt{2}} \tan^{-1} \left(\dfrac{3}{\sqrt{2}} \right)$

3) $\dfrac{\sqrt{2}}{2} \tan^{-1} \left(\dfrac{3}{2} \right)$

4) $\dfrac{\sqrt{2}}{2} \tan^{-1} \left(\dfrac{\sqrt{3}}{2} \right)$

43. The area of the region bounded by the curve y = cos x between x=0 and x=π is

1) 1 sq. unit   2) 4 sq. unit   3) 2 sq. units   4) 3 sq. units

44. The area bounded by the line y = x, x-axis and ordinates x= -1 and x=2 is

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

45. The degree and the order of the differential equation $\dfrac{d^2 y}{dx^2} = 3\sqrt{1+\left(\dfrac{dy}{dx}\right)^2}$

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

46. The solution of the differential equation $x\dfrac{dy}{dx} - y = 3$ represents of a family of

    1) straight lines   2) circles   3) parabolas   4) ellipses

47. The integrating factor of $\dfrac{dy}{dx} + y = \dfrac{1+y}{x}$ is

    1) xe^x 2) $xe^{1/x}$ 3) $\dfrac{e^x}{x}$ 4) $\dfrac{x}{e^x}$

48. If $\left|\vec{a}\times\vec{b}\right|^2 + \left|\vec{a}.\vec{b}\right|^2 = 144$ and $\left|\vec{a}\right| = 4$, then the value of $\left|\vec{b}\right|$ is

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

49. If $\left|\vec{a}\right|$ and $\left|\vec{b}\right|$ are mutually perpendicular unit vectors, then $\left(3\vec{a}+2\vec{b}\right).\left(5\vec{a}-6\vec{b}\right)=$

    1) 5   2) 3   3) 6   4) 12

50. If the vectors $a\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + b\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + c\hat{k}$ are coplanar $(a \neq b \neq c \neq 1)$, then the
   Value of $abc - (a+b+c)$

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

51. If $\vec{a} = \hat{i} + \lambda\hat{j} + 2\hat{k}; \vec{b} = \mu\hat{i} + \hat{j} - \hat{k}$ are orthogonal and $\left|\vec{a}\right| = \left|\vec{b}\right|$ then $(\lambda, \mu) =$

    1) $\left(\dfrac{1}{4}, \dfrac{7}{4}\right)$ 2) $\left(\dfrac{7}{4}, \dfrac{1}{4}\right)$ 3) $\left(\dfrac{1}{4}, \dfrac{9}{4}\right)$ 4) $\left(\dfrac{-1}{4}, \dfrac{9}{4}\right)$

52. The image of the point (1,6,3) in the line $\dfrac{x}{1} = \dfrac{y-1}{2} = \dfrac{z-2}{3}$ is

    1) (1,0,7)   2) (7,0,1)   3) (2,7,0)   4) (-1, -6, -3)

53. The angle between the lines 2x = 3y = - z and 6x = - y = - 4z is

    1) $0°$ 2) 45   3) $90°$ 4) $30°$

54. The value of k such that the line $\dfrac{x-4}{1} = \dfrac{y-2}{1} = \dfrac{z-k}{2}$ lies on the plane 2x − 4y +z=7 is

    1) − 7   2) 4   3) − 4   4) 7

55. The locus represented by xy +yz = 0 is

    1) a pair of perpendicular lines   2) a pair of parallel lines

3) a pair of parallel planes   4) a pair of perpendicular planes

56. The feasible region of an LPP is shown in the figure. If $z = 3x + 9y$, then the Minimum value of z occurs at
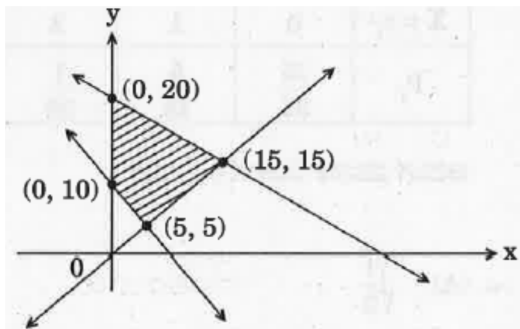
    1 (5, 5)   2) (0, 10)   3) (0, 20)   4) (15, 15)

57. For the LPP; maximize $z = x + 4y$ subject to the constraints $x + 2y \leq 2$, $x + 2y \geq 8$, $x, y \geq 0$

    1) $z \max = 4$ 2) $z \max = 8$ 3) $z \max = 16$ 4) Has no feasible solution

58. For the probability distribution given by

$X = x_i$	0	1	2
P_i	$\dfrac{25}{36}$	$\dfrac{5}{18}$	$\dfrac{1}{36}$

The standard deviation (σ) is

    1) $\sqrt{\dfrac{1}{3}}$ 2) $\dfrac{1}{3}\sqrt{\dfrac{5}{2}}$ 3) $\sqrt{\dfrac{5}{36}}$ 4) None of the above

59. A bag contains 17 tickets numbered from 1 to 17. A ticket is drawn at random, Then another ticket is drawn without replacing the first one. The probability that both the tickets may show even number is

    1) $\dfrac{7}{34}$ 2) $\dfrac{8}{17}$ 3) $\dfrac{7}{16}$ 4) $\dfrac{7}{17}$

60. A flashlight has 10 batteries out of which 4 are dead. If 3 batteries are selected Without replacement and tested, then the probability that all 3 are dead is
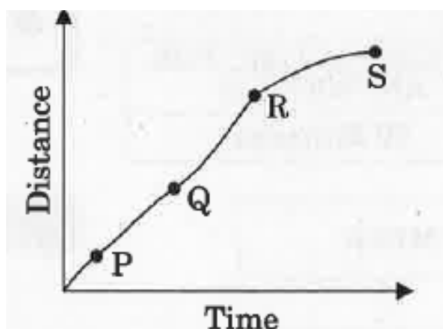
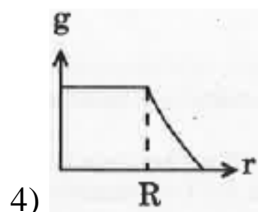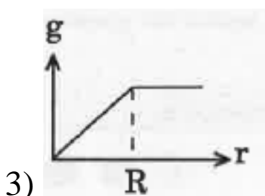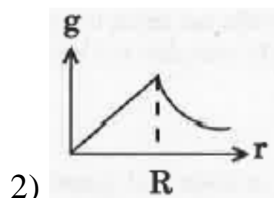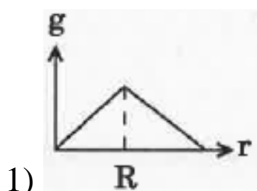   1) $\dfrac{1}{30}$ 2) $\dfrac{2}{8}$ 3) $\dfrac{1}{15}$ 4) $\dfrac{1}{10}$

PHYSICS

61. A particle shows distance-time curve as shown in the figure. The maximum
    Instantaneous velocity of the particle is around the point

    1) P   2) S   3) R   4) Q

62. Which of the following graphs correctly represents the variation of 'g' on the Earth?

63. A cup of tea cools from $65.5°C$ to $62.5°C$ in 1 minute in a room at $22.5°C$. How
    Long will it take to cool from $46.5°C$ to $40.5°C$ in the same room?

    1) 4 minutes   2) 2 minutes   3) 1 minute   4) 3 minutes

64. The dimensions of the ratio magnetic flux (ϕ) and permeability (μ) are

    1) $\left[M^0L^1T^0A^1\right]$ 2) $\left[M^0L^{-3}T^0A^1\right]$ 3) $\left[M^0L^1T^1A^{-1}\right]$ 4) $\left[M^0L^2T^0A^1\right]$

65. A mass 'm' on the surface of the Earth is shifted to a target equal to the radius
    Of the earth . If 'R' is the radius and 'M' is the mass of the earth, then work done
    In this process is

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

66. First overtone frequency of a closed pipe of length 'l_1' is equal to the 2nd harmonic

    Frequecy of an open pipe of length 'l_2' The ratio $\dfrac{l_1}{l_2} =$

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

67. The resistance $R = \dfrac{V}{I}$ where $V = (100 \pm 5)V$ and $I = (10 \pm 0.2)A$. The percentage error in R is

1) 5.2% 2) 4.8% 3) 7% 4) 3%

68. A block rests on a rough inclined plane making an angle of $30°$ with the horizontal The coefficient of static friction between the block and the plane is 0.8. If the Frictional force on the block is 10 N, the mass of the block is $\left(g = 10ms^{-2}\right)$

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

69. Two particles of masses m_1 and m_2 have equal kinetic energies. The ratio of their Momenta is

1) $m_1 : m_2$ 2) $m_2 : m_1$ 3) $\sqrt{m_1} : \sqrt{m_2}$ 4) $m_1^2 : m_2^2$

70. The pressure at the bottom of a liquid tank is not proportional to the

1) Acceleration due to gravity

2) Density of the liquid

3) Height of the liquid

4) Area of the liquid surface

71. A Carnot engine takes 300 calories of heat from a source at 500 K and rejects 150 calories of heat to the sink. The temperature of the sink is

1) 125K 2) 250K 3) 750K 4) 1000K

72. Pressure of an ideal gas is increased by keeping temperature constant. The Kinetic energy of molecules

1) Decreases

2) Increases

3) Remains same

4) Increase or decreases depending on the nature of gas

73. A man weighing 60 kg is in a lift moving down with an acceleration of $1.8\,ms^{-2}$ The force exerted by the floor on him is

1) 588 N 2) 480 N 3) Zero 4) 696 N

74. Moment of inertia of a body about two perpendicular axes X and Y in the plane

of lamina are 20 kg m^2 and 25 kg m^2 respectively. Its moment of inertia about an axis perpendicular to the plane of the lamina and passing through the point of intersection of X and Y axes is

1) 5 kg m^2 2) 45 kg m^2 3) 12.5 kg m^2 4) 500 kg m^2

75. Two wires A and B are stretched by the same load. If the area of cross-section of wire 'A' is double that of 'B', then the stress on 'B' is

1) Equal to that on A   2) Twice that on A

3) Half that on A   4) Four times that on A

76. The magnitude of point charge due to which the electric field 30 cm away has The magnitude 2 NC^{-1} will be

1) $2 \times 10^{-11} C$ 2) $3 \times 10^{-11} C$ 3) $5 \times 10^{-11} C$ 4) $9 \times 10^{-11} C$

77. A mass of 1 kg carrying a charge of 2 C is accelerated through a potential of 1 V. The velocity acquired by it is

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

78. The force of repulsion between two identical positive charges when kept With a separation 'r' in air is 'F'. Half the gap between the two charges is Filled by a dielectric constant =4. Then the new force of repulsion between Those two charges becomes

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

79. For the arrangement of capacitors as shown in the circuit, the effective capacitance Between the points A and B is (capacitance of each capacitor is $4 \mu F$)
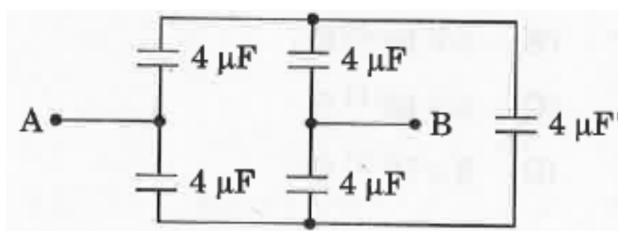
1) $4 \mu F$ 2) $2 \mu F$ 3) $1 \mu F$ 4) $8 \mu F$

80. The work done to move a charge on an equipotential surface is

1) Infinity   2) Less than 1   3) Greater than 1   4) Zero

81. Two capacitors of $3 \mu F$ and $6 \mu F$ are connected in series and a potential difference

Of 900 V is applied across the combination. They are then dissconnected and reconnected in parallel. The potential difference across the combination is

1) Zero   2) 100 V   3) 200 V   4) 400 V

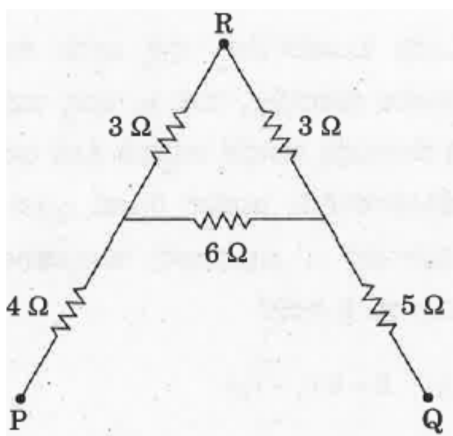82. Ohm's Law is applicable to

1) Diode   2) Transistor   3) Electrolyte   4) Conductor

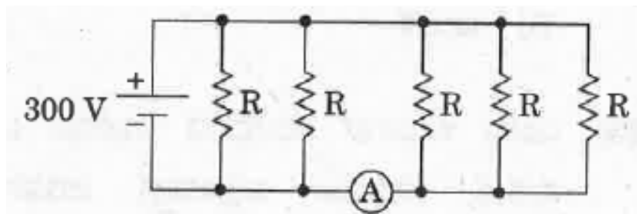83. If the last band on the carbon resistor is absent, then the tolerance is

1) 5%   2) 20%   3) 10%   4) 15%

84. The effective resistance between P and Q for the following network is

1) $\frac{1}{12}\Omega$ 2) 21Ω 3) 12Ω 4) $\frac{1}{21}\Omega$

85. Five identical resistors each of resistance $R= 1500\,\Omega$ are connected to a 300 V Battery as shown in the circuit. The reading of the ideal ammeter A is


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

86. Two cells of internal resistances r_1 and r_2 and of same emf are connected in series, across a resistor of resistance R. If the terminal potential difference across the cells of internal resistance r_1 is zero, then the value of R is

1) $R = 2(r_1 + r_2)$ 2) $R = r_2 - r_1$ 3) $R = r_1 - r_2$ 4) $R = 2(r_1 - r_2)$

87. The I – V graphs for two different electrical appliances P and Q are shown in the Diagram. If R_P and R_Q be the resistances of the devices, then
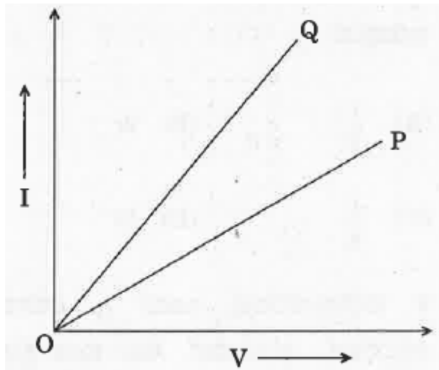
1) $R_P = R_Q$ 2) $R_P > R_Q$ 3) 3) $R_P < R_Q$ 4) 4) $R_P = \dfrac{R_Q}{2}$

88. The correct Biot- Savart law in vector form is

1) $d\vec{B} = \dfrac{\mu_0}{4\pi} \dfrac{I\left(d\vec{l} \times \vec{r}\right)}{r^2}$ 2) $d\vec{B} = \dfrac{\mu_0}{4\pi} \dfrac{I\left(d\vec{l} \times \vec{r}\right)}{r^3}$

3) $d\vec{B} = \dfrac{\mu_0}{4\pi} \dfrac{Id\vec{l}}{r^2}$ 4) $d\vec{B} = \dfrac{\mu_0}{4\pi} \cdot \dfrac{Id\vec{l}}{r^3}$

89. An electron is moving in a circle of radius r in a uniform magnetic field B. Suddenly the field is reduced to $\dfrac{B}{2}$ .The radius of the circular path now becomes

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

90. A charge q is accelerate through a potential difference V. It is then passed Normally through a uniform magnetic field, where it moves in a circle of radius r. The potential difference required to move it in a circle of radius 2r is

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

91. A cyclotron's oscillator frequency is 10 MHz and the operating magnetic field is 0.66 T. If the radius of its dees is 60 cm, then the kinetic energy of the proton beam produced by the accelerator is

1) 9 MeV   2) 10 MeV   3) 7 MeV   4) 11 MeV

92. Needles N_1, N_2 and N_3 are made of a ferromagnetic, a paramagnetic and a Diamagnetic substance respectively. A magnet when brought close to them Will

1) Attract all three of them

2) Attract N_1 strongly, N_2 weakly and repel N_3 weakly

3) Attract N_1 strongly but repel N_2 and N_3 weakly

4) Attract N_1 and N_2 strongly but repel N_3

93. The strength of the Earth's magnetic field is

    1) Constant everywhere

    2) Zero everywhere

    3) Having very high value

    4) Varying from place to place on the Earth's surface

94. A jet plane having a wing-spam of 25 m is travelling horizontally towards east with a speed of 3600 km/hour. If the Earth's magnetic field at the location is $4 \times 10^{-4} T$ and the angle of dip is $30°$, then, the potential difference between the ends of the wing is
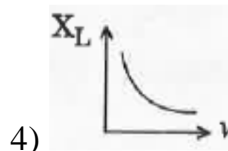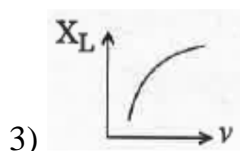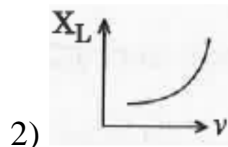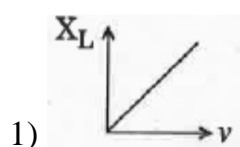
    1) 4 V   2) 5 V   3) 2 V   4) 2.5 V

95. Which of the following , represents the variation of inductive reactance (X_L) with the frequency of voltage source(v)?

    1)   2)

    3)   4)

96. The magnetic flux linked with a coil varies as $\phi = 3t^2 + 4t + 9$. The magnitude Of the emf induced at t=2 seconds is

    1) 8V   2) 16V   3) 32V   4) 64V

97. A 100 W bulb is connected to an AC source of 220 V, 50 Hz. Then the Current flowing through the bulb is

    1) $\frac{5}{11} A$ 2) $\frac{1}{2} A$ 3) 2A   4) $\frac{3}{4} A$

98. In the series LCR circuit, the power dissipation is through

    1) R   2) L   3) C   4) Both L and C

99. In Karnataka, the normal domestic power supply AC is 220 V, 50 Hz. Here 220 V and 50 Hz refer to

    1) Peak value of voltage and frequency

2) rms value of voltage and frequency

3) Mean value of voltage and frequency

4) Peak value of voltage and angular frequency

100. A set-up transformer operates on a 230 V line and a load current of 2A.

The ratio of primary and secondary windings is1:25. Then the current in the

Primary is

1) 25 A   2) 50 A   3) 15 A   4) 12.5 A

101. The number of photons falling per second on a completely darkened plate

To produce a force of 6.62×10^{-5} N is 'n' if the wavelength of the light falling

Is $5 \times 10^{-7} m$, then $n = \underline{\hspace{1cm}} \times 10^{22} . \left(h = 6.62 \times 10^{-34} J - s \right)$

1) 1   2) 5   3) 0.2   4) 3.3

102. An object is placed at the principle focus of a convex mirror. The image will

Be at

1) Centre of curvature   2) Principal focus

3) Infinity   4) No image will be formed

103. An object is placed at a distance of 20 cm from the pole of a concave mirror

Of focal length10 cm. The distance of the image formed is

1) +20 cm   2) +10 cm   3) – 20 cm   4) – 10 cm

104. A candle placed 25 cm from a lens forms an image on a screen placed 75cm

On the other side of the lens. The focal length and type of the lens should be

1) + 18.75cm and convex lens   2) – 15.75cm and concave lens

3) + 20. 25cm and convex lens   4) – 20 .25cm and concave lens

105. A plane wavefront of wavelength λ is incident on a single slit of width a.

The angular width of principal maximum is

1) $\dfrac{\lambda}{a}$ 2) $\dfrac{2\lambda}{a}$ 3) $\dfrac{a}{\lambda}$ 4) $\dfrac{a}{2\lambda}$

106. In a Fraunhofer diffraction at a single slit, if yellow light illuminating the slit

Is replaced by blue light, then diffraction bands

1) Remain unchanged   2) Become wider

3) Disappear   4) Become narrower

107. In young's double slit experiment, two wavelengths $\lambda_1 = 780 \; nm$ and

$\lambda_2 = 520 \, nm$ are used to obtain interference fringes. If the nth bright band due

To λ_1 coincides with $(n+1)^{th}$ bright band due to λ_2, then the value of an is

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

108. In Young's double slit experiment, slits are separated by 2mm and the screen

Is placed at a distance of 1.2 m from the slits. Light consisting of two

Wavelengths 6500 Å and 5200 Å are used to obtain interference fringes.

Then the separation between the fourth bright fringes of two different

Patterns produced by the two wavelengths is

1) 0.312 mm 2) 0.123 mm 3) 0.213 mm 4) 0.412 mm

109. The maximum kinetic energy of emitted photoelectrons depends on

1) Intensity of incident radiation

2) Frequency of incident radiation

3) Speed of incident radiation

4) Number of photons in the incident radiation

110. A proton and an α particle are accelerated through the same potential

difference V. The ratio of their de Broglie wavelengths

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

111. The total energy of an electron revolving in the second orbit hydrogen

Atom is

1) – 13 .6 eV 2) – 1.51 eV 3) – 3.4 eV 4)Zero

112. The period of revolution of an electron in the ground state of hydrogen atom

Is T. The period of revolution of the electron in the first excited state is

1) 2T 2) 4T 3) 6T 4) 8T

113. The energy equivalent to a substance of mass 1 g is

1) $18 \times 10^{13} J$ 2) $9 \times 10^{13} J$ 3) $18 \times 10^{6} J$ 4) $9 \times 10^{6} J$

114. The half-life of tritium is 12.5 years. What mass of tritium of initial mass

64 mg will remain undecayed after 50 years?

1) 32 mg 2) 8 mg 3) 16 mg 4) 4 mg

115. In a CE amplifier, the input ac signal to be amplified is applied across

1) Forward biased emitter-base junction

2) Reverse biased collector-base junction

Sri ChaitanyaEducational Institutions, India

3) Reverse biased emitter-base junction

4) Forward biased collector-base junction

116. If $A = 1$ and $B = 0$, then in terms of Boolean algebra, $A + \bar{B} =$

1) B   2) $\bar{B}$ 3) A   4) $\bar{A}$

117. The density of an electron-hole pair in a pure germanium is $3 \times 10^{16}\, m^{-3}$ at Room temperature. On doping with aluminium, the hole density increases to $4.5 \times 10^{22}\, m^{-3}$. Now the electron density(in m^{-3})in doped germanium will be

1) 1×10^{10} 2) 2×10^{10} 3) 0.5×10^{10} 4) 4×10^{10}

118. The dc common emitter current gain of a n-p-n transistor is 50. The Potential difference applied across the collector and emitter of a transistor Used in CE configuration is, $V_{CE} = 2V$. If the collector resistance, $R_C = 4K\Omega$, The base current (I_B) and the collector current (I_C) are

1) $I_B = 10\mu A,\ I_C = 0.5mA$ 2) $I_B = 0.5\mu A, I_C = 10mA$

3) $I_B = 5\mu A, I_C = 1mA$ 4) $I_B = 1\mu A, I_C = 0.5mA$

119. The radius of the earth is 6400km. If the height of an antenna is 500 m, then Its range is

1) 800 km   2) 100 km   3) 80 km   4) 10 km

120. A space station is at a height equal to the radius of the Earth. If 'v_E'is the Escape velocity on the surface of the Earth, the same on the space Station is _____ times v_E.

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

CHEMISTRY

121. 1.0 g of Mg is brunt with 0.28 g of O_2 in a closed vessel. Which reactant is left in excess and how much?

    1) Mg, 5.8 g   2) Mg, 0.58 g   3) O_2, 0.24 g   4) O_2, 2.4 g

122. The orbital nearest to the nucleus is

    1) 4f   2) 5d   3) 4s   4) 7p

123. Which of the following is the correct order of radius?

    1) $H^- > H > H^+$ 2) $Na^+ > F^- > O^{2-}$ 3) $F^- > O^{2-} > Na^+$ 4) $Al^{3+} > Mg^{2+} > N^{3-}$

124. The intramolecular hydrogen bond is present in

    1) Phenol   2) o-Nitrophenol

    3) p-Nitrophenol   4) p-Cresol

125. The state of hybrid orbitals of carbon in $CO_2, CH_4 CO_3^{2-}$ respectively is

    1) sp^3, sp^2 and sp 2) sp^3, sp and sp^2

    3) sp, sp^3 and sp^2 4) sp^2, sp^3 and sp

126. For an ideal gas, compressibility factor is

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

127. The relationship between K_p and K_c is $K_p = K_c (RT)^{\Delta n}$. What would be the value of Δn for the reaction $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$?

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

128. Acidity of BF_3 can be the explained on which of the following concepts?

    1) Arrhenius concept   2) Bronsted-Lowry concept

    3) Lewis concept   4) Bronsted-Lowry as well as Lewis concept

129. For the redox reaction x $MnO_4^- + yH_2C_2O_4 + zH^+ \rightarrow m Mn^{2+} + n CO_2 + p H_2O$, the values of *x, y, m* and *n* are

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

130. H_2O_2 is

    1) An oxidizing agent

    2) A reducing agent

    3) Both oxidizing and reducing agent

4) Neither oxidizing nor reducing agent

131. Dead burnt plaster is

1) $CaSO_4$
2) $CaSO_4 \cdot \dfrac{1}{2}H_2O$
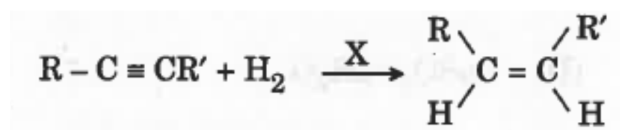3) $CaSO_4 \cdot H_2O$
4) $CaSO_4 \cdot 2H_2O$

132. Identify the following compound which exhibits geometrical isomerism

1) But-2-ene
2) But-1-ene
3) Butane
4) Isobutane

133. During the fusion of organic compound with sodium metal, nitrogen present in the organic compound is converted into

1) $NaNO_2$
2) $NaNH_2$
3) $NaCN$
4) $NaNC$

134. The reagent 'X' used for the following reaction is

$$R-C \equiv CR' + H_2 \xrightarrow{X} \underset{H}{\overset{R}{\diagdown}}C = C\underset{H}{\overset{R'}{\diagup}}$$

1) Ni
2) Pd/C
3) LiAl H_4
4) Na/Liquid NH_3

135. Which of the following ions will cause hardness in water?

1) Ca^{2+}
2) Na^+
3) Cl^-
4) K^+

136. Which of the following oxides shows electrical properties like metals?

1) SiO_2
2) MgO
3) $SO_2(s)$
4) CrO_2

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

1) 1.0 M NaOH
2) 1.0 M Na_2SO_4
3) 1.0 M NH_4NO_3
4) 1.0 M KNO_3

138. The charge required for the reduction of 1 Mole of MnO_4^- to MnO_2 is

1) 1 F
2) 3 F
3) 5 F
4) 7 F

139. For the reaction, $2SO_2 + O_2 \rightleftharpoons 2SO_3$, the rate of disappearance of O_2 is $2 \times 10^{-4} \, mol \, L^{-1}s^{-1}$ The rate of appearance of SO_3 is

1) $2 \times 10^{-4} \, mol \, L^{-1}s^{-1}$
2) $4 \times 10^{-4} \, mol \, L^{-1}s^{-1}$
3) $1 \times 10^{-1} \, mol \, L^{-1}s^{-1}$
4) $6 \times 10^{-4} \, mol \, L^{-1}s^{-1}$

140. Which of the following electrolytes will have maximum coagulating value for $AgI / Ag^+ sol$

1) Na_2S
2) Na_3PO_4
3) Na_2SO_4
4) $NaCl$

141. Electrolytic refining is used to purify which of the following metals?

    1) Cu and Zn   2) Ge and Si   3) Zr and Ti   4) Zn and Hg

142. Dry ice is

    1) Solid CO   2) Solid SO_2 3) Solid CO_2 4) Solid O_2

143. Which of the following is an amphoteric oxide?

    1) V_2O_5, Cr_2O_3 2) Mn_2O_7, Cr_2O_3 3) CrO, V_2O_5 4) V_2O_5, V_2O_4

144. The IUPAC name of $\left[Co(NH_3)_4 Cl(NO)_2\right]Cl$ is

    1) tetraamminechloridonitrito-N-cobalt(III) chloride

    2) tetraamminechloridonitrocobalt(II) Chloride

    3) tetraamminechloridonitrocobalt(I) chloride

    4) tetraamminechloridodinitrocobalt(III) chloride

145. Which of the following statements is true in case of alkyl halides?

    1) They are polar in nature

    2) They can form hydrogen bonds

    3) They are highly soluble in water

    4) They undergo addition reactions

146. Phenol can be distinguished from ethanol by the reagent

    1) Bromine water   2) Sodium metal

    3) Iron metal   4) Chlorine water

147. Which of the following compounds undergoes haloform reaction?

    1) CH_3COCH_3 2) $HCHO$ 3) CH_3CH_2Br 4) $CH_3 - O - CH_3$

148. Which of the following will be the most stable diazonium salt $\left(R N_2^+ X^-\right)$

    1) $CH_3 N_2^+ X^-$ 2) $C_6H_5 N_2^+ X^-$ 3) $CH_3CH_2 N_2^+ X^-$ 4) $C_6H_5CH_2 N_2^+ X^-$

149. Which of the following bases is not present in DNA?

    1) Adenine   2) Guanine   3) Cytosine   4) Uracil

150. Which one of the following is a polyamide polymer?

    1) Terylene   2) Nylon-6,6   3) Buna-S   4) Bakelite

151. In F.C.C. the unit cell is shared equally by how many unit cells

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

152. At a particular temperature, the ratio of molar conductance to specific conductance of 0.01 M NaCl solution is

1) $10^5 \, cm^3 mol^{-1}$ 2) $10^3 \, cm^3 mol^{-1}$ 3) $10 \, cm^3 mol^{-1}$ 4) $10^5 \, cm^2 mol^{-1}$

153. Isotanic solutions are solutions having the same

1) Surface tension 2) Vapour pressure

3) Osmotic pressure 4) Viscosity

154. The temperature coefficient of a reaction is 2.When the temperature is increased from $30°C$ to $90°C$, the rate of reaction is increased by

1) 150 times 2) 410 times 3) 72 times 4) 64 times

155. Gold sol is not a

1) Lyophobic sol 2) Negatively charged sol

3) Macromolecular sol 4) Multimolecular colloid

156. The common impurity present in bauxite is

1) CuO 2) ZnO 3) Fe_2O_3 4) Cr_2O_3

157. Very pure N_2 can be obtained by

1) Thermal decomposition of ammonium dichromate

2) Treating aqueous solution of NH_4Cl and $NaNO_3$

3) Liquifaction and fractional distillation of liquid air

4) Thermal decomposition of sodium azide

158. Which of the following oxidation states is common for all lanthanides?

1) $+2$ 2) $+3$ 3) $+4$ 4) $+5$

159. The electronic configuration of transition element "X" in its +3 oxidation state is $[Ar]3d^5$. What is its atomic number?

1) 25 2) 26 3) 27 4) 24

160. n-Propyl chloride reacts with sodium metal in dry ether to give

1) $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

2) $CH_3 - CH_2 - CH_3$

3) $CH_3 - CH_2 - CH_2 - CH_3$

4) $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

161. When the vapours of tertiary butyl alcohol are passed through heated copper at 573K, the product formed is

    1) But-2-ene

    2) 2-Butanone

    3) 2-Methyl propene

    4) Butanal

162. What is the increasing order of acidic strength among the following?

    i) CH_3COOH ii) C_6H_5COOH iii) $HCOOH$

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

163. Which of the following is more basic than aniline?

    1) Diphenylamine

    2) Triphenylamine

    3) p-nitroaniline

    4) Benzyalamine

164. The two forma of D-Glucopyranose are called

    1) Diastereomers

    2) Anomers

    3) Epimers

    4) Enantiomers

165. Among the following, the branched chain polymer is

    1) Polyvinyl chloride

    2) Bakelite

    3) Low density polythene

    4) High density polythene

166. Edge length of a cube is 300 pm. Its body diagonal would be

    1) 600 pm   2) 423 pm   3) 519.6 pm   4) 450.5 pm

167. Which of the following is not a conductor of electricity?

    1) Solid Nacl   2) Cu   3) fused Nacl   4) Brine solution

168. For a cell reaction involving two electron changes, $E^0_{cell} = 0.3V$ at $25° C$. The equilibrium constant of the reaction is

    1) 10^{-10} 2) 3×10^{-2} 3) 10   4) 10^{10}

169. The value of rate constant of a pseudo first order reaction

    1) Depends only on temperature

    2) Depends on the concentration of reactants present in small amounts

    3) Depends on the concentration of reactants present in excess

    4) Is independent of the concentration of reactants

170. $(CH_3)_3 SiCl$ is use during polymerization of organosilicons because

    1) The chain length of organosilicon polymers can be controlled by adding $(CH_3)_3 SiCl$

2) $(CH_3)_3 SiCl$ improves the quality and yield of the polymer

3) $(CH_3)_3 SiCl$ does not block the end terminal of silicon polymer

4) $(CH_3)_3 SiCl$ acts as a catalyst during polymerization

171. When PbO_2 reacts with concentrated HNO_3, the gas evolved is

    1) NO_2 2) O_2 3) N_2 4) N_2O

172. $KMnO_4$ acts as an oxidizing agent in alkaline medium. When alkaline $KMnO_4$ is treated with KI, iodide ion is oxidized to

    1) I_2 2) IO^- 3) IO_3^- 4) IO_4^-

173. $\left[Fe(NO_2)_3 Cl_3\right]$ and $\left[Fe(O-NO)_3 Cl_3\right]$ shows

    1) Linkage isomerism   2) Geometrical isomerism

    3) Optical isomerism   4) Hydrate isomerism

174. Tertiary alkyl halide is practically inert to substitution by SN^2 mechanism
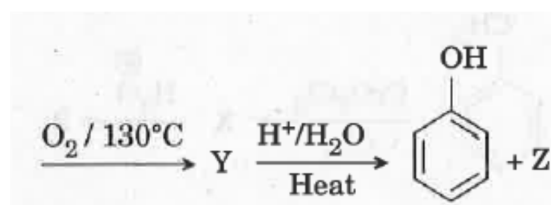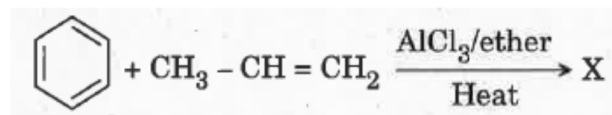
    1) Insolubility   2) Instability

    3) Inductive effect   4) Steric hindrance

175. The products X and Z in the following reaction sequence are
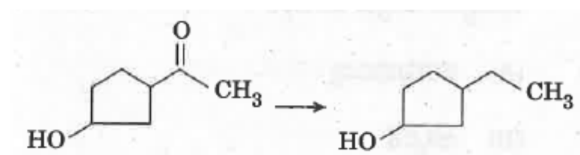

    1) Isopropylbenzene and acetone

    2) Cumene peroxide and acetone

    3) Isopropylbenzene and isopropyl alcohol

    4) Phenol and acetone

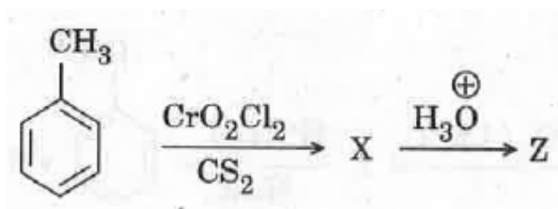176. The appropriate reagent for the following transformation is

    1) Zn /HCl 2) $H_2N - NH_2$, KOH/ethylene glycol

3) Ni/ H_2
4) $NaBH_4$

177. In the following reaction

The compound Z is

1) Benzoic acid
2) Benzaldehyde

3) Acetophenone
4) Benzene

178. The reaction of Benzenediazonium chloride with aniline yields yellow dye. The name of the yellow dye is

1) p-Hydroxyazobenzene
2) p-Aminoazobenzene

3) p-Nitroazobenzene
4) o-Nitroazobenzene

179. The glycosidic linkage involved in linking the glucose units in amylose part of starch is

1) $C_1 - C_4 \beta - linkage$
2) $C_1 - C_6 \alpha - linkage$

3) $C_1 - C_6 \beta - linkage$
4) $C_1 - C_4 \alpha - linkage$

180. Ziegler-Natta catalyst is used to prepare

1) Low-density polythene
2) Teflon

3) High density polythene
4) Nylon-6