![Delhi Government Practice Test](image)

**SINGLE CORRECT ANSWER TYPE**

This section contains 60 Single Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct.

<table>
<thead>
<tr>
<th>Question</th>
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<tr>
<td>1. The number of roots of the equation ( 2</td>
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<td>2. For a real number ( x ), ([x]) denotes the integral part of ( x ). The value of [\frac{1}{2} + \frac{1}{2 + \frac{1}{100}} + \frac{1}{2 + \frac{2}{100}} + \ldots + \frac{1}{2 + \frac{99}{100}}] is:&lt;br&gt;(A) 49&lt;br&gt;(B) 50&lt;br&gt;(C) 48&lt;br&gt;(D) 51&lt;br&gt;</td>
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<td>3. The minimum value of ( f(x) =</td>
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<td>4. The number of solutions of the equation ( 2^0 z \bar{z} = 0 ) is :&lt;br&gt;(A) 1&lt;br&gt;(B) 2&lt;br&gt;(C) 3&lt;br&gt;(D) 4&lt;br&gt;</td>
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<td>5. The value of ( 1 + \sum_{k=6}^{14} \left( \cos \left( \frac{(2k + 1)\pi}{15} \right) + i \sin \left( \frac{(2k + 1)\pi}{15} \right) \right) ) is :&lt;br&gt;(A) 0&lt;br&gt;(B) -1&lt;br&gt;(C) 1&lt;br&gt;(D) i&lt;br&gt;</td>
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<td>6. If ( z = \left( \frac{\sqrt{3}}{2} + \frac{i}{2} \right)^5 + \left( \frac{\sqrt{3}}{2} - \frac{i}{2} \right)^5 ), then:&lt;br&gt;(A) ( \text{Re} (z) = 0 )&lt;br&gt;(B) ( \text{Im} (z) = 0 )&lt;br&gt;(C) ( \text{Re} (z) &gt; 0, \text{Im} (z) &gt; 0 )&lt;br&gt;(D) ( \text{Re} (z) &gt; 0, \text{Im} (z) &lt; 0 )&lt;br&gt;</td>
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<td>7. If ( x^2 + x + 1 = 0 ), then the value of ( \left( x + \frac{1}{x} \right)^2 + \left( x^2 + \frac{1}{x^2} \right)^2 + \ldots + \left( x^{27} + \frac{1}{x^{27}} \right)^2 ) is :&lt;br&gt;(A) 27&lt;br&gt;(B) 72&lt;br&gt;(C) 45&lt;br&gt;(D) 54&lt;br&gt;</td>
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<td>8. The value of ( \sum_{n=1}^{13} \left( i^n + i^{n+1} \right) ), where ( i = \sqrt{-1} ) equals :&lt;br&gt;(A) ( i )&lt;br&gt;(B) ( i - 1 )&lt;br&gt;(C) ( -i )&lt;br&gt;(D) 0&lt;br&gt;</td>
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<td>9. The equation of the tangent to the parabola ( y^2 = 16x ) inclined at an angle of ( 60^\circ ) to x-axis, is :&lt;br&gt;(A) ( 3x - \sqrt{3}y + 4 = 0 )&lt;br&gt;(B) ( 3x + \sqrt{3}y + 4 = 0 )&lt;br&gt;(C) ( \sqrt{3}x - y + 4 = 0 )&lt;br&gt;(D) None of these&lt;br&gt;</td>
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10. The angle between the two tangents drawn from the point (1, 4) to the parabola $y^2 = 12x$ is:
   (A) $\tan^{-1}\left(\frac{1}{2}\right)$  (B) $\tan^{-1}\left(\frac{1}{3}\right)$  (C) $\tan^{-1}(2)$  (D) None of these

11. The locus of the mid points of the focal chords of the parabola $y^2 = 4ax$ is another parabola whose vertex is given by:
   (A) $(a, 0)$  (B) $(0, a)$  (C) $(-a, 0)$  (D) None of these

12. If tangents are drawn from any point on the line $x + 4a = 0$ to the parabola $y^2 = 4ax$, then their chord of contact subtends an angle $\theta$ at the vertex, where $\theta$ is equal to:
   (A) $\frac{\pi}{4}$  (B) $\frac{\pi}{3}$  (C) $\frac{\pi}{2}$  (D) None of these

13. The point $(2K, K)$ lies inside the region bounded by the parabola $x^2 = 4y$ and its latus rectum. Then,
   (A) $0 \leq a \leq 1$  (B) $0 < a < 1$  (C) $0 < a \leq 1$  (D) None of these

14. The locus of a point whose sum of the distances from the origin and the line $x + 4a = 0$ is 4 units, is:
   (A) $y^2 = -12(x-3)$  (B) $y^2 = 12(x-3)$  (C) $x^2 = 12(y-3)$  (D) $x^2 = -12(y-3)$

15. In the expansion of $\left(x^3 - \frac{1}{x^2}\right)^{15}$ the constant term is:
   (A) $15C_6$  (B) 0  (C) $-15C_6$  (D) 1

16. The term independent of $x$ in the expansion of $(1 - x)^2 \cdot \left(x + \frac{1}{x}\right)^{10}$ is:
   (A) $11C_5$  (B) $10C_5$  (C) $10C_4$  (D) None of these

17. If the $r$th term is the middle term in the expansion of $\left(x^2 - \frac{1}{2x}\right)^{20}$, then the $(r+3)$th term is:
   (A) $20C_{14} \cdot \frac{1}{2^{14}} \cdot x$  (B) $20C_{12} \cdot \frac{1}{2^{12}} \cdot x^2$  (C) $-\frac{1}{2^{13}} \cdot 20C_7 \cdot x$  (D) None of these

18. The sum of the coefficients in the polynomial expansion of $(1 + x - 3x^2)^{2163}$ is:
   (A) 1  (B) -1  (C) 0  (D) None of these

19. The sum $20C_0 + 20C_1 + 20C_2 + \ldots \ldots + 20C_{10}$ is equal to:
   (A) $2^{20} + \frac{20!}{(10!)^2}$  (B) $2^{19} + \frac{20!}{2 \cdot (10!)^2}$  (C) $2^{19} + 20C_{10}$  (D) None of these

20. If the sum of the roots of quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the square of their reciprocals then $\frac{b^2}{ac} + \frac{bc}{a^2}$ is equal to:
   (A) 2  (B) -2  (C) 1  (D) -1

21. If $\alpha \neq \beta$ and $\alpha^2 = 5\alpha - 3$, $\beta^2 = 5\beta - 3$, then the equation having $\alpha/\beta$ and $\beta/\alpha$ as its roots is:
   (A) $3x^2 + 19x + 3 = 0$  (B) $3x^2 - 19x + 3 = 0$  (C) $3x^2 - 19x - 3 = 0$  (D) $x^2 - 16x + 1 = 0$
22. If the roots of the equation \( ax^2 + bx + c = 0 \) are real and distinct, then:
   (A) both roots are greater than \( \frac{-b}{2a} \)
   (B) both roots are less than \( \frac{-b}{2a} \)
   (C) one of the roots exceeds \( \frac{-b}{2a} \)
   (D) None of these

23. The number of real roots of the equation: \((x - 1)^2 + (x - 2)^2 + (x - 3)^2 = 0\) is:
   (A) 1
   (B) 2
   (C) 3
   (D) None of these

24. If \( \frac{x^2 - bx}{ax - c} = \frac{\lambda - 1}{\lambda + 1} \) has roots equal in magnitude and opposite in sign then the value of \( \lambda \) is:
   (A) \( \frac{a - b}{a + b} \)
   (B) \( \frac{a + b}{a - b} \)
   (C) \( c \)
   (D) \( \frac{1}{c} \)

25. If \( \alpha, \beta \) are roots of \( x^2 + px - q = 0 \) and \( \gamma, \delta \) are roots of \( x^2 + px + r = 0 \), then the value of \( (\alpha - \gamma) (\alpha - \delta) \) is:
   (A) \( p + q \)
   (B) \( q - r \)
   (C) \( r - q \)
   (D) \( q + r \)

26. The ratio of the greatest value of \( 2 - \cos x + \sin^2 x \) to its least value is:
   (A) \( \frac{7}{4} \)
   (B) \( \frac{11}{4} \)
   (C) \( \frac{13}{4} \)
   (D) None of these

27. The value of \( \frac{2\pi}{7} + \frac{4\pi}{7} + \frac{6\pi}{7} \) is:
   (A) 1
   (B) \( \frac{-1}{2} \)
   (C) \( \frac{3\sqrt{3}}{4} \)
   (D) \( \frac{\sqrt{15}}{4} \)

28. The maximum value of \( 1 + \sin \left( \frac{\pi}{4} + \theta \right) + 2 \cos \left( \frac{\pi}{4} - \theta \right) \) for real values of \( \theta \) is:
   (A) 3
   (B) 5
   (C) 4
   (D) None of these

29. Let \( f(\theta) = \frac{\cot \theta}{1 + \cot \theta} \) and \( \alpha + \beta = \frac{5\pi}{4} \). Then the value of \( f(\alpha) \cdot f(\beta) \) is:
   (A) 2
   (B) \( \frac{-1}{2} \)
   (C) \( \frac{1}{2} \)
   (D) None of these

30. If \( \sin \theta + \csc \theta = 2 \) then the value of \( \sin^8 \theta + \csc^8 \theta \) is equal to:
   (A) 2
   (B) \( 2^8 \)
   (C) \( 2^4 \)
   (D) None of these

31. The nearest point on the line \( 3x - 4y = 25 \) from the origin is:
   (A) \((-4, 5)\)
   (B) \((3, -4)\)
   (C) \((3, 4)\)
   (D) \((3, 5)\)

32. The image of the point \((2, 4)\) in the line \(2x + 3y - 3 = 0\) is:
   (A) \((3, 5)\)
   (B) \((-2, -2)\)
   (C) \((0, 1)\)
   (D) \((-1, 3)\)

33. The point \(P(a, b)\) and \(Q(b, a)\) lie on the lines \(3x - 2y - 13 = 0\) and \(4x - y + 3 = 0\) respectively, then equation of line \(PQ\) is:
   (A) \(x - y = 5\)
   (B) \(x + y = 5\)
   (C) \(x - y = -5\)
   (D) \(x + y = -5\)
34. The vertices of a triangle are (1, 2), (2, 1) and \(\left(\frac{3}{2}, \frac{3 + \sqrt{3}}{2}\right)\). The distance between its orthocentre and circumcentre is:
(A) \(3 + \sqrt{3}\)  
(B) 2  
(C) \(\sqrt{2}\)  
(D) 0

35. For all values of \(a\) and \(b\) the the lines \((a + 2b)x + (a - b) y + (a + 5b) = 0\) pass through the point:
(A) (-1, 2)  
(B) (2, -1)  
(C) (-2, 1)  
(D) (1, -2)

36. It is given that \(\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \ldots \) to \(\infty\) is equal to \(\frac{n^4}{90}\). Then \(\frac{1}{4^4} + \frac{1}{5^4} + \ldots \) to \(\infty\) is equal to:
(A) \(\frac{\pi^4}{96}\)  
(B) \(\frac{\pi^4}{45}\)  
(C) \(\frac{89\pi^4}{90}\)  
(D) None of these

37. If \(a, a_1, a_2, a_3, \ldots, a_{2n}, b\) are in AP and \(a, g_1, g_2, g_3, \ldots, g_{2n}, b\) are in GP and \(h\) is the HM of \(a\) and \(b\), then \(\frac{a_1 + a_{2n}}{8g_1g_{2n}} + \frac{a_2 + a_{2n-1}}{8g_2g_{2n-1}} + \ldots + \frac{a_n + a_{n+1}}{8g_ng_{n+1}}\) equals:
(A) \(\frac{2n}{h}\)  
(B) \(2nh\)  
(C) \(nh\)  
(D) \(\frac{n}{h}\)

38. If the equation of a circle is \(ax^2 + (2a - 3)y^2 - 4x - 1 = 0\), then its centre is:
(A) (2, 0)  
(B) (2/3, 0)  
(C) (-2/3, 0)  
(D) None of these

39. Equation of the circle with centre on the X-axis and passing through the origin and (2, 3) is:
(A) \(x^2 + y^2 + 13y = 0\)  
(B) \(2x^2 + 2y^2 - 13x = 0\)  
(C) \(x^2 + y^2 + 13x + 3 = 0\)  
(D) \(6x^2 + 6y^2 - 13x = 0\)

40. The equation of the diameter of the circle \(3(x^2 + y^2) - 2x + 6y - 9 = 0\) which is perpendicular to the line \(2x + 3y = 12\) is:
(A) \(3x - 2y = 3\)  
(B) \(3x - 2y + 1 = 0\)  
(C) \(3x - 2y = 9\)  
(D) None of these

41. Area of the circle in which a chord of length \(\sqrt{2}\) makes an angle \(\pi/2\) at the circle is:
(A) \(\frac{\pi}{2}\)  
(B) \(\frac{\pi}{3}\)  
(C) \(\pi\)  
(D) \(\frac{\pi}{4}\)

42. The two circles \(x^2 + y^2 = ax\) and \(x^2 + y^2 = c^2\) (with \(c > 0\)) touch each other if:
(A) \(c = a\)  
(B) \(2a = |c|\)  
(C) \(2c = a\)  
(D) None of these

43. Consider the circles \(x^2 + y^2 = 1\) and \(x^2 + y^2 - 2x - 3 = 0\). Then equation of a common tangent to the two circles is:
(A) \(4x - 3y - 5 = 0\)  
(B) \(x + 1 = 0\)  
(C) \(3x + 4y - 5 = 0\)  
(D) \(y - 1 = 0\)

44. If the sum of an infinite \(GP\) is 20 and sum of their square is 100, then common ratio will be:
(A) \(\frac{1}{2}\)  
(B) \(\frac{1}{4}\)  
(C) \(\frac{3}{5}\)  
(D) 1

45. If 100 times the 100\(^{th}\) term of an \(AP\) with non-zero common difference equals the 50 times its 50\(^{th}\) term, then the 150\(^{th}\) term of this \(AP\) is:
(A) 150  
(B) Zero  
(C) -150  
(D) 150 times its 50\(^{th}\) term
46. The sum of first 20 terms of the sequence 0.7, 0.77, 0.777, ….. is :
   (A) \(\frac{7}{81}(179+10^{-20})\)  (B) \(\frac{7}{9}(99+10^{-20})\)  (C) \(\frac{7}{18}(179-10^{-20})\)  (D) \(\frac{7}{9}(99-10^{-20})\)

47. The number of ways in which 6 men and 5 women can dine at a round table, if no two women are to sit together, is given by :
   (A) \(6! \times 5!\)  (B) \(30\)  (C) \(5! \times 4!\)  (D) \(7! \times 5!\)

48. How many different words can be formed by jumbling the letters in the word MISSISSIPPI in which no two S are adjacent ?
   (A) \(6 \cdot 7C_4 \cdot 7C_4\)  (B) \(6 \cdot 7C_4 \cdot 7C_4\)  (C) \(6 \cdot 8 \cdot 7C_4\)  (D) \(7 \cdot 6C_4 \cdot 8C_4\)

49. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is :
   (A) \(630\)  (B) \(879\)  (C) \(880\)  (D) \(629\)

50. If \(\omega \neq 1\) is a cube root of unity, and \((1+\omega)^7 = A + B\omega\), then \((A, B)\) equals :
   (A) \((1, 1)\)  (B) \((1, 0)\)  (C) \((-1, 1)\)  (D) \((0, 1)\)

51. If \(z\) is a complex number of unit modulus and argument \(\theta\), then \(\arg\left(\frac{1+z}{1+z}\right)\) equals :
   (A) \(\theta\)  (B) \(\pi - \theta\)  (C) \(-\theta\)  (D) \(\frac{\pi}{2} - \theta\)

52. Consider
   Statement-1 : \((p \land q) \land (\lnot p \land q)\) is a fallacy.
   Statement-2 : \((p \land q) \iff (\lnot q \land \lnot p)\) is a tautology.
   (A) Statement-1 is true, Statement-2 is false
   (B) Statement-1 is false, Statement-2 is true
   (C) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
   (D) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1

53. If the mean division about the median for the numbers \(a, 2a, \ldots, 50a\) is 50, then \(|a|\) equals :
   (A) \(3\)  (B) \(4\)  (C) \(5\)  (D) \(2\)

54. All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which of the following statistical measures will not change even after the grace marks were given ?
   (A) Mode  (B) Variance  (C) Mean  (D) Median

55. The expression \(\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}\) can be written as :
   (A) \(\tan A + \cot A\)  (B) \(\sec A + \cos ecA\)
   (C) \(\sin A + \cos A + 1\)  (D) \(\sec A \cdot \cos ec A + 1\)

56. A tower stands at the centre of a circular park. \(A\) and \(B\) are two points on the boundary of the park such that \(AB(=a)\) subtends an angle of \(60^\circ\) at the foot of the tower and the angle of elevation of the top of the tower from \(A\) or \(B\) is \(30^\circ\). The height of the tower is :
   (A) \(\frac{2a}{\sqrt{3}}\)  (B) \(2a\sqrt{3}\)  (C) \(\frac{a}{\sqrt{3}}\)  (D) \(\sqrt{3}\)
57. The line $L$ given by $\frac{x}{5} + \frac{y}{b} = 1$ passes through the point $(13, 32)$. The line $K$ is parallel to $L$ and has the equation $\frac{x}{c} + \frac{y}{3} = 1$. Then the distance between $L$ and $K$ is:

(A) $\sqrt{17}$  
(B) $\frac{17}{\sqrt{15}}$  
(C) $\frac{23}{\sqrt{17}}$  
(D) $\frac{23}{\sqrt{15}}$

58. If the line $2x + y = k$ passes through the point which divides the line segment joining the points $(1, 1)$ and $(2, 4)$ in the ratio $3 : 2$, then $k$ equal:

(A) 6  
(B) $\frac{11}{5}$  
(C) $\frac{29}{5}$  
(D) 5

59. A focus of an ellipse is at the origin. The directrix is the line $x = 4$ and eccentricity is $\frac{1}{2}$, then the length of the semi major axis is:

(A) $\frac{8}{3}$  
(B) $\frac{2}{3}$  
(C) $\frac{4}{3}$  
(D) $\frac{5}{3}$

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

(A) $x^2 + y^2 - 6y - 5 = 0$  
(B) $x^2 + y^2 - 6y + 5 = 0$  
(C) $x^2 + y^2 - 6y - 7 = 0$  
(D) $x^2 + y^2 - 6y + 7 = 0$
### ANSWERS to Delhi Government Practice Test/Mathematics

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PART - II

SINGLE CORRECT ANSWER TYPE

This section contains 100 Single Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct.

1. If \( x = 2\sqrt{2} + \sqrt{7} \), then the value of \( x^2 + \frac{1}{x^2} \) is:
   (A) 1  (B) 16  (C) 30  (D) 32

2. The expression \( (x + y)^3 - (x-y)^3 - 6y\left(x^2 - y^2\right) \) is simplified to:
   (A) \( 8x^3 \)  (B) \( 8y^3 \)  (C) \( y^3 \)  (D) None of these

3. The quadrilateral formed by joining the mid-points of the consecutive side of a rhombus is a:
   (A) rectangle  (B) square  (C) parallelogram  (D) None of these

4. \( (x^n + a^n) \) is divisible by \((x + a)\) when \( n \) is:
   (A) rational  (B) odd  (C) irrational  (D) even

5. The volume of a pyramid whose base is an equilateral triangle is 12 m\(^3\). If the height of the pyramid is 3\( \sqrt{3} \) metres, then area of the base is:
   (A) 2  (B) 3  (C) 4\( \sqrt{3} \)  (D) 6

6. If \( c, d \) are the zeroes of \( (x-a)(x-b) - k \) then quadratic expression whose zeroes are \( a, b \) is:
   (A) \( x^2 - (c + d)x + k + cd \)  (B) \( x^2 - (c - d)x + k + cd \)
   (C) \( x^2 - (c - d)x - k + cd \)  (D) None of these

7. Which of the following is a pure surd?
   (A) \( 4\sqrt{3} \)  (B) \( 3\sqrt{5} \)  (C) \( \sqrt{12} \)  (D) \( \frac{3}{4}\sqrt{8} \)

8. \( \sqrt{a} > \sqrt{b} > \sqrt{c} > \sqrt{d} \) where \( d, c, b, a \) are consecutive natural numbers. Then which of the following is true?
   (A) \( \sqrt{a} - \sqrt{b} > \sqrt{c} - \sqrt{d} \)  (B) \( \sqrt{c} - \sqrt{a} > \sqrt{b} - \sqrt{d} \)
   (C) \( \sqrt{a} - \sqrt{c} > \sqrt{b} - \sqrt{d} \)  (D) None of these

9. A fraction \( \frac{a}{b} \) can be expressed as a terminating decimal, if \( b \) has no prime factors other than
   (A) 2, 3  (B) 3, 5  (C) 2, 5  (D) 2, 3, 5

10. The slope of a vertical line is:
    (A) 0  (B) 1  (C) -1  (D) undefined
11. The points \((4, -5), (1, 1), (-2, 7)\) are:
(A) collinear  (B) non-collinear
(C) vertices of a triangle  (D) None of these

12. \(D, E, F\) are the mid-points of the sides \(BC, CA\) and \(AB\) respectively of a \(ABC\). The ratio of the area of triangles \(DEF\) and \(ABC\) is:
(A) 1 : 2  (B) 1 : 4  (C) 2 : 3  (D) 4 : 5

13. The angle made by side \(AB\) of a cyclic quadrilateral at the centre, if it is given that \(\angle DBC = 60^\circ\) and opposite sides \(AB\) and \(DC\) are of equal length is:
(A) 150°  (B) 90°  (C) 120°  (D) 60°

14. If \(x = -2\) and \(y = 3\) is the solution of the equation \(3x - 5y = k\), then the value of \('k'\) is:
(A) -21  (B) -9  (C) -18  (D) 19

15. Which of the following straight lines lie in only two quadrants?
(A) \(3x + 4y = 5\)  (B) \(\sqrt{3}y + \frac{1}{7}x = 0\)  (C) \(x + y = 8\)  (D) \(x - y = 8\)

16. If the degrees of polynomials \(f(x), g(x)\) and \(h(x)\) be 2, 3 and 4 respectively, then the highest power of \(x\) in \(\frac{[f(x)]^3 [g(x)]^4}{[h(x)]^4}\) is:
(A) 2  (B) 3  (C) 4  (D) None of these

17. If \(A\) be the greatest number that will divide 3467, 6931 and 8663, leaving the same remainder in each case. The sum of digits in \(A\) is:
(A) 11  (B) 12  (C) 13  (D) 14

18. If \(x = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}\) and \(y = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}\), then the value of \(x^2 + xy + y^2\) is:
(A) 5  (B) 99  (C) 101  (D) 98

19. The medians \(BE\) and \(CF\) of a triangle \(ABC\) intersect at \(G\). Then the area of \(\triangle GBC\) is equal to the:
(A) Area of quadrilateral \(AFGE\)  (B) \(\frac{1}{2}\) Area of quadrilateral \(AFGE\)
(C) < Area of quadrilateral \(AFGE\)  (D) None of these

20. If \((x - 1)\) is a factor of polynomial of degree \(n\) then:
(A) Sum of coefficients of even terms is equal to the coefficients of odd terms.
(B) Sum of coefficients is zero  (C) Both  (D) All of the above

21. The greater among \(\sqrt{17} - \sqrt{12}\) and \(\sqrt{11} - \sqrt{6}\) is:
(A) \(\sqrt{17} - \sqrt{12}\)  (B) \(\sqrt{11} - \sqrt{6}\)  (C) both are equal  (D) can’t say

22. A horizontal line has a slope of:
(A) 0  (B) 1  (C) -1  (D) undefined

23. Points in which abscissa and ordinate have different signs will lie in
(A) I and III quadrants  (B) III and IV quadrants
(C) II and III quadrants  (D) II and IV quadrants
24. The triangle whose vertices are (0, 0), (2.7, 0) and (0, 4.9) is:
   (A) equilateral triangle  (B) right angled triangle
   (C) isosceles triangle   (D) obtuse angled triangle

25. An equation of the form \(ax + by + c = 0\), where \(a, b\) are non-zero numbers, represents is:
   (A) a straight line  (B) a circle
   (C) a triangle       (D) a quadrilateral

26. Area of the square formed by lines \(x = 2, y = -3, x = -3\) and \(y = 2\) is:
   (A) 1  (B) 9  (C) 4  (D) 25

27. If \(a_1x + b_1y + c_1 = 0\) and \(a_2x + b_2y + c_2 = 0\) be two linear equations in two variables \(x\) and \(y\), then the condition for two lines to be parallel is:
   (A) \(\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}\)  (B) \(\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}\)
   (C) \(\frac{a_1}{a_2} = \frac{c_1}{c_2}\)  (D) \(\frac{b_1}{b_2} = \frac{c_1}{c_2}\)

28. A cat takes 5 leaps for every 4 leaps of a dog, but 3 leaps of the dog are equal to 4 leaps of the cat. The ratio of the speed of the cat to that of the dog is:
   (A) 13 : 14  (B) 15 : 11  (C) 17 : 15  (D) 15 : 16

29. A number when divided successively by 4 and 5 leaves remainders 1 and 4 respectively. When it successively divided by 5 and 4, then the respective remainders can be:
   (A) 1, 2  (B) 2, 3  (C) 3, 2  (D) 4, 1

30. A scored 30% marks and failed by 15 marks. B scored 40% marks and obtained 35 marks more than those required to pass. The pass percentage is:
   (A) 33%  (B) 34%  (C) 40%  (D) 48%

31. If \(2b = a + c\) and \(z^2 = xy\), then the value of \(x^{a-b} \cdot y^{b-c} \cdot z^{c-a}\) is:
   (A) 0  (B) 1  (C) 2  (D) Depends on \(x, y, z, a, b, c\)

32. A pump can be used either to fill or to empty a tank. The capacity of the tank is 3600 m\(^3\). The emptying capacity of the pump is 10 m\(^3\)/min higher than its filling capacity. If the pump needs 12 more minutes to fill the tank than to empty it, then the emptying capacity of the pump (in m\(^3\)/min) is:
   (A) 45  (B) 50  (C) 60  (D) 90

33. If one zeroes of \(p(x) = 4x^2 + 2x - 1\) be \(\alpha\), then the other zeroes of \(p(x)\) is:
   (A) \(4\alpha^3 + 3\alpha\)  (B) \(4\alpha^3 - 3\alpha\)
   (C) \(3\alpha^3 + 4\alpha\)  (D) \(3\alpha^3 - 4\alpha\)

34. If \(x^4 + \frac{1}{x^4} = 194\), then \(x^3 + \frac{1}{x^3}\) equals to:
   (A) 52  (B) 54  (C) 76  (D) 64

35. If the cubic polynomial \(x^3 - 6x^2 + 12x + c\) has equal zeroes then the value of \(c\) is:
   (A) 8  (B) -4  (C) -8  (D) 4

36. The number of positive integral ordered pair of \(a\) and \(b\) for which graph of a linear equation \(\frac{x}{a} + \frac{y}{b} = 1\) passes through point \((4, 3)\) is:
   (A) 4  (B) 5  (C) 6  (D) 8
37. The equation of the line parallel to $y$-axis is:
(A) $y = -2$  
(B) $y = 0$  
(C) $y = 5$  
(D) $x = -4$

38. Area of the triangle formed by straight line \( \frac{x}{\tan \theta} + \frac{y}{\cot \theta} = 2 \) with $X$ and $Y$-axis is:
(A) $\frac{1}{2}$  
(B) $1$  
(C) $2$  
(D) $4$

39. The sum of the zeroes of the polynomial $x^3 - 3x^2 - 4x + 12$ is:
(A) 1  
(B) 2  
(C) 3  
(D) 0

40. If $a \cos \theta + b \sin \theta = p$ and $b \cos \theta - a \sin \theta = q$, then the value of $p^2 - a^2$ is:
(A) $b^2 + q^2$  
(B) $b^2 - q^2$  
(C) $2b^2 + 3q^2$  
(D) None of these

41. If $M93048458N$ is divisible by 8 and 11; where $M$ and $N$ are single digit integers, then the values of $M$ and $N$ are:
(A) 7, 8  
(B) 8, 6  
(C) 7, 4  
(D) 5, 4

42. The electricity bill of a certain establishment is partly fixed and partly varies as the number of units of electricity consumed. When in a certain month 540 units are consumed, the bill is ₹1800. In another month 620 units are consumed and the bill is ₹2040. If in yet another month 500 units are consumed, then the bill for that month would be (in ₹):
(A) 1605  
(B) 1680  
(C) 1840  
(D) 2050

43. If $(x + \alpha)$ is a common factor of $a_1x^2 + b_1x + c_1$ and $a_2x^2 + b_2x + c_1$, $(a_1 \neq a_2)$ then the value of $\alpha$ is:
(A) $\frac{a_1 - a_2}{b_1 - b_2}$  
(B) $\frac{c_1}{a_1 - a_2}$  
(C) $b_1 - b_2$  
(D) $\frac{c_1}{b_1 - b_2}$

44. If 5 spiders can catch five flies in five minutes. How many flies can hundred spiders catch in 100 minutes?
(A) 100  
(B) 1000  
(C) 500  
(D) 2000

45. When 75% of a no. is added to 75, the result is the same number. The number is:
(A) 150  
(B) 300  
(C) 100  
(D) 450

46. Ramu had some currency notes of denominations Rs. 50, Rs. 20 and Rs. 10, such that at least two notes of each denominations were present with him. He had to pay a bill of Rs. 200 in a shop and when he counted all the money he had, he realized that he was short of Rs. 30. How many notes of Rs.20 and total number of notes did Ramu have ?
(A) 7  
(B) 6  
(C) 2  
(D) 3

47. Chakradhar and Dhruva have two spools of 'manja' (specially prepared thread) to fly their kites. Each of the manjas has tiny knots at regular intervals, which helps in keeping track of the length of the manja that is used. Each of the persons has the same length of manja. While Chakradhar's manja has knots at intervals of 10 feet, Dhruva's has knots at intervals of 12 feet and it has 10 knots less than that of Chakradhar. Each of the manjas has knots at only one of the extreme ends. Then the length of the manja with either of them (in feet) is:
(A) 610  
(B) 590  
(C) 600  
(D) 190

48. Ram owns a garden. In the garden, the number of mango trees is equal to number of mangoes per tree and the cost price per mango is the same as the number of mango trees in the garden. The maintenance cost is Rs. 935 per tree. If Ram sells one mango at Rs. 61, the overall loss in the business is Rs. 875. The number of mangoes were there in the garden, if no mangoes were wasted and the number of trees was more than 30 were:
(A) 625  
(B) 1225  
(C) 900  
(D) None of these

49. A 10% sugar solution implies 10 gm sugar is dissolved in 100 gm water. Water evaporates on heating the solution. On heating, 1 kg of the 10% solution is reduced to 0.5 kg. The concentration now is:
(A) 20%  
(B) 18.2%  
(C) 22.2%  
(D) 21.18%
50. When \( x^5 - 5x^4 + 9x^3 - 6x^2 - 16x + 13 \) is divided by \( x^2 - 3x + a \), then quotient and the remainder are \( x^3 - 2x^2 + x + 1 \) and \( -15x + 11 \), respectively, the value of \( a \) is:
- (A) 2
- (B) 5
- (C) 7
- (D) 9

51. The sum of the ages of Mummy, Papa, Sonu, Sona and Sonia now is 96 years. Sonu is the youngest in the family. The year Sonu was born, the sum of the ages of all the members of the family was just 66 years. If Papa's age now is 6 times that of Sonu's present age then Papa's age 10 years hence will be:
- (A) 30 years
- (B) 36 years
- (C) 40 years
- (D) 46 years

52. Let ABCD be a rectangle, such that AB = 2BC. An equilateral triangle ABE is drawn as shown in the figure with M as the midpoint of BE. The value of \( \angle CMB \) is:
- (A) 105°
- (B) 60°
- (C) 75°
- (D) 90°

53. The above price, then the loss is 4%. If the ratio of lower quality and the higher quality beans in the mixture is 5 : 2, then the percentage profit when the lower quality beans are sold at the same price is:
- (A) \( \frac{29}{5} \)%
- (B) \( \frac{33}{3} \)%
- (C) 30%
- (D) None of these

54. The sum of a number and its reciprocal is 8/15 less than three times the sum of one third the original, and its reciprocal. The original number is:
- (A) 11
- (B) 25
- (C) 35
- (D) None of these

55. Raman has a square cardboard of area 4 sq. ft, from which he clips away a smaller square of area 1 sq. ft, from one of the corners. Now, if he wants to cut up the remaining piece of cardboard into exactly four identical smaller pieces, the perimeter of each smaller piece is:
- (A) 4 ft
- (B) 3.75 ft
- (C) 3.5 ft
- (D) 3.25 ft

56. I rode one-third of a journey at 10 km an hour, one-third more at 9, and the rest at 8 km an hour; if I had ridden half the journey at 10, and the other half at 8 km per hour, I should have been half a minute longer on the way. I ride for \( x \) distance. Then \( x \) is:
- (A) 12
- (B) 14
- (C) 16
- (D) 18

57. A fraction in reduced form is such that when it is squared and then its numerator is reduced by \( \frac{33}{3} \)% and the denominator is reduced to 20%, its result is twice the original fraction. Then the sum of the numerator and the denominator is:
- (A) 6
- (B) 3
- (C) 5
- (D) 8

58. A bought 4 bottles of milk and \( B \) bought one bottle of coke, coke per bottle costing twice that of the milk. \( C \) bought nothing but paid Rs.50 for his share of the drink which they mixed together and shared equally. If \( C \)'s Rs.50 covered his share, then the cost of the coke is:
- (A) 50
- (B) 75
- (C) 30
- (D) 46

59. Aman buys some pens at the rate of Rs 10 for 3 and twice these pens at the rate of Rs 13 for 4. He sells all of them at Rs 59 a dozen. He makes a profit (in %) of:
- (A) 16.67
- (B) 50
- (C) 33.33
- (D) 59

60. If \( m \) men can do a job in \( d \) days, then \( m + r \) men can do the job in:
- (A) \( d + r \) days
- (B) \( d - r \) days
- (C) \( \frac{md}{m + r} \) days
- (D) \( \frac{d}{m + r} \) days
61. John ordered 4 pairs of black socks and some additional pairs of blue socks. The price of the black socks per pair was twice that of the blue. When the order was filled, it was found that the number of pairs of the two colors had been interchanged. This increased the bill by 50%. The ratio of the number of pairs of black socks to the number of pairs of blue socks in the original order was:

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

62. A rectangle inscribed in a triangle such that its base coincides with the base \( b \) of the triangle (obviously, the length of the rectangle is less than \( b \)). If the altitude of the triangle is \( h \), and the altitude \( x \) of the rectangle is half the base of the rectangle, then:

(A) \( x = \frac{1}{2} h \)  (B) \( x = \frac{bh}{h+b} \)  (C) \( x = \frac{bh}{2h+b} \)  (D) \( x = \frac{1}{2} b \)

63. From a group of boys and girls, 15 girls leave. There are then left two boys for each girl. After this 45 boys leave. There are then 5 girls for each boy. The number of girls in the beginning was:

(A) 40  (B) 43  (C) 29  (D) 50

64. A can do a piece of work in 9 days. \( B \) is 50% more efficient than \( A \). The number of days it takes \( B \) to do the same piece of work is:

(A) 13 \( \frac{1}{2} \)  (B) 4 \( \frac{1}{2} \)  (C) 6  (D) 3

65. Two little bands of monkey were at play. One eighth of them squared were jabbering wildly in the thickest when twelve shouted loudly with glee. How many monkeys were there?

(A) 16  (B) 32  (C) 64  (D) 24

66. If \( \frac{100\sqrt{25}}{25 + X} = 50 \), then the value of \( X \) is:

(A) 25  (B) \( \frac{1}{\sqrt{25}} \)  (C) \( \sqrt{25} \)  (D) \( \frac{1}{25} \)

67. \( A \) supplies 20 men who work for 8 hrs a day working for 6 days. \( B \) supplies 15 men working at 9 hrs a day for 7 days and \( C \) supplies 10 men working at 6 hrs a day for 8 days to do a certain job. If Rs. 636 is paid for all labor, then the share of \( C \) is:

(A) Rs. 130  (B) Rs. 125  (C) Rs. 128  (D) Rs. 135

68. If the sum of the diagonals of a rhombus is 10 cm and its perimeter is \( 4\sqrt{13} \) cm, then the lengths of its diagonals are:

(A) 5, 5  (B) 6, 4  (C) 7, 3  (D) 8, 2

69. Two pipes \( P \) and \( Q \) can fill a tank in 3 hrs and 4 hrs respectively. If both pipes are opened together, then after time \( t \), \( P \) should be closed so that the tank is full in 2 hrs from the start, where \( t \) will be:

(A) 1 hr to 10 min  (B) 1 hr 15 min  (C) 1 hr 20 min  (D) 1 hr 30 min

70. In triangle \( PQR \), \( PQ = 12 \), \( QR = 16 \) and \( PR = 20 \). \( QS \) is an altitude to \( PR \). Find \( PS \):

(A) 9.6  (B) 7.2  (C) 6.4  (D) 5.2

71. Anwar bought two radios at the same price. He sold one at 20% profit and the other at 10% loss. Find his overall profit percentage.

(A) 0 %  (B) 5 %  (C) 10 %  (D) 15 %

72. The surface area of a sphere and a cube are equal. Then the volumes are in ratio:

(A) \( 6 : \sqrt{\pi} \)  (B) \( \sqrt{6} : \sqrt{\pi} \)  (C) \( 6 : \pi \)  (D) \( \sqrt{6} : \pi \)

73. The area of an equilateral triangle of side 6 cm is:

(A) 18 sq. cm  (B) 36 sq. cm  (C) 9\( \sqrt{3} \) sq. cm  (D) 18\( \sqrt{3} \) sq. cm
74. The value of \( \frac{a}{(a-b)(a-c)} + \frac{b}{(b-c)(b-a)} + \frac{c}{(c-a)(c-b)} \) is:
   (A) 0  (B) 2  (C) 1  (D) -1

75. In the adjacent figure, O is the centre of the circle. Find the length of the minor arc AB if \( OA = 7 \text{ cm} \). \( \text{Consider } \pi = \frac{22}{7} \)
   (A) 11 cm  (B) 12 cm  (C) 13 cm  (D) 14 cm

76. The value of \( 30^3 + 20^3 - 50^3 \) is:
   (A) 80000  (B) 90000  (C) -90000  (D) -80000

77. If \( m = \frac{4}{3} \) and \( r = \frac{9}{14} \), the value of \( \frac{3mr - nt}{4nt - 7mr} \) is:
   (A) -5 \( \frac{1}{2} \)  (B) -11 \( \frac{1}{14} \)  (C) -1 \( \frac{1}{4} \)  (D) 11 \( \frac{1}{14} \)

78. The area of parallelogram \( ABCD \), whose height on side \( AB \) is 9 cm, is 108 sq. cm. Find length of side \( AB \).
   (A) 11 cm  (B) 12 cm  (C) 13 cm  (D) 14 cm

79. A boy is running at a speed of \( p \text{ km/h} \) to cover a distance of 1 km. But due to slippery ground, his speed is reduced by \( q \text{ km/h} \). If he takes \( r \) hours to cover the distance, then:
   (A) \( \frac{1}{r} = \frac{pq}{p+q} \)  (B) \( \frac{1}{r} = p + q \)  (C) \( r = p - q \)  (D) \( \frac{1}{r} = p - q \)

80. If \( x^3 - 6x^2 + ax + b \) is exactly divisible by \( x^2 - 3x + 2 \), then:
   (A) \( a + b > 0, \ ab > 0 \)  (B) \( a + b > 0, \ ab < 0 \)  (C) \( a + b < 0, \ ab > 0 \)  (D) \( a + b < 0, \ ab < 0 \)

81. The square root of \( \left(x^2 + 2x - 1\right) + \frac{1}{x^2 + 2x + 1} \) is:
   (A) \( \frac{x^2 - 2x}{x+1} \)  (B) \( \frac{x^2 + 2x}{x+1} \)  (C) \( \frac{x^2 + 2x}{x-1} \)  (D) None of these

82. If a man cycles at 10 km/hr, then he arrives at a certain place at 1 P.M. If he cycles at 15 km/hr, he will arrive at the same place at 11 A.M. At what speed must he cycle to get there at noon?
   (A) 11.6 km/hr  (B) 12 km/hr  (C) 12.5 km/hr  (D) 13 km/hr

83. A flat piece of cardboard is placed on a mirror as shown below:

   What is the area of the figure formed by combining the above triangle and its image?
   (A) \( 3\left(2 + \sqrt{10}\right) \) sq. units  (B) \( 6\left(2 + \sqrt{10}\right) \) sq. units
   (C) \( 4\left(2 + \sqrt{10}\right) \) sq. units  (D) None of these
84. Refer to the code below and answer the question that follow :

\[ a \cup b = ab \quad a \cap b = \frac{a}{b} \quad \text{and} \quad a - b = a + b \quad a \Delta b = a^b \]

What is the value of \( \left(6 \Delta 3\right) - \left\{(20 \cup 5) \cap (80 \cap 16)\right\} \)?

(A) \( \frac{196}{82} \)  \quad (B) \( \frac{236}{82} \)  \quad (C) 2  \quad (D) 3

85. A cone is made by melting a cylinder keeping the radius same. Find the percentage increase in height.

(A) 75%  \quad (B) 100%  \quad (C) 150%  \quad (D) 200%

86. In the adjacent figure, O is the centre and \( CD = DE = 4 \), \( OA = 7 \). Find OE.

(A) 10  \quad (B) 6  \quad (C) 9  \quad (D) 7

87. \( ABCD \) is a square, \( EFGH \) is another square. \( AE = FB = GC = HD = a \) and \( CF = DG = AH = BE = b \), then the ratio of the perimeters of \( ABCD \) to \( EFGH \) is :

(A) \( a : b \)  \quad (B) \( (a + b):(a - b) \)  \quad (C) \( (a + b) \sqrt{a^2 + b^2} \)  \quad (D) None of these

88. Let a polynomial \( P(k) = a_0 k^4 + a_1 k^3 + (a_2 + a_3) k^2 + a_4 k + a_5 \) satisfy \( P(0) = P(1) = P(2) = P(-1) = 0 \) and \( P(-2) = 12 \). Then \( P(3) \) equals :

(A) \( \frac{1}{3} \)  \quad (B) \( \frac{-1}{2} \)  \quad (C) 12  \quad (D) 2

89. A person spends 1/3 of the money with him on clothes, 1/5 of the remaining on food and 1/4 of the remaining on travel. Now, he is left with Rs.100. How much did he have with him in the beginning ?

(A) Rs.200  \quad (B) Rs.250  \quad (C) Rs.300  \quad (D) Rs.450

90. In a pair of fractions, fraction \( A \) is twice the fraction \( B \) and the product of two fractions is 2/25. What is the value of fraction \( A \) ?

(A) \( 1/5 \)  \quad (B) \( 1/25 \)  \quad (C) \( 2/5 \)  \quad (D) Data insufficient

91. A monkey climbing up a greased pole ascends 10 \textit{metres} and slips down 2 \textit{metres} in alternate \textit{minutes}. If the pole is 64 \textit{metres} high, how long will it take him to reach the top ?

(A) 16 min  \quad (B) 14 min and 48 sec  \quad (C) 12 min  \quad (D) 15 min
92. Which of the following is(are) true?

I. If \( PQ = a, PR = b, QS = c \) and \( SR = d \), then \((a - b)(a + b) = (c + d)(c - d)\)

II. If \( PQ = m^2 - n^2, PR = 2mn \) and \( QR = m^2 + n^2 \), then \( \angle QPR = 90^\circ \)

(A) Only I (B) Only II (C) Both I and II (D) Either I or II

93. A container is in the shape of a sphere of radius 7 cm. Find the cost of painting it at Rs.2 per square centimeter and filling it with a liquid costing Rs.9 per cubic cm.

(A) Rs.1232, Rs.12936 (B) Rs.1232, Rs.4956
(C) Rs.3214, Rs.11240 (D) Rs.3408, Rs.14780

94. Volumes in the proportion 3 : 4 : 7 of three different substances are mixed together. The densities of the substances are in the ratio 5 : 2 : 6 respectively. Find the weight of the third substance contained in 130 kg of the mixture: (Use: Mass = volume \times density)

(A) 30 kg (B) 16 kg (C) 84 kg (D) 70 kg

95. Find the unit’s digit of \( \gamma^{1999 \times 3^{2003}} \)

(A) 1 (B) 3 (C) 7 (D) 9

96. If \( x, y \neq 0 \) and \((x - \frac{1}{x})(y - \frac{1}{y}) = 25\), then the value of \((xy + \frac{1}{xy}) - \left(\frac{x}{y} + \frac{y}{x}\right)\) is:

(A) 0 (B) 25 (C) 22 (D) 30

97. \( X \) and \( Y \) are two cylinders of the same height. The base of \( X \) has diameter that is half the diameter of the base of \( Y \). If the height of \( X \) is doubled, then the ratio of volume of \( X \) to that of \( Y \) is:

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

98. The area of the shaded portion is:

(A) \(-\pi\) (B) \(6\pi\) (C) \(5\pi\) (D) \(\pi\)

99. A dog is passed by a train in 8 seconds. The length of the train if its speed is 36 km/hr is:

(A) 70 m (B) 80 m (C) 85 m (D) 90 m

100. In the given figure, if \( ED \parallel AB \) and \( EF \parallel BC \), then \( \angle ABC + \angle DEF \) is:

(A) 120\(^\circ\) (B) 60\(^\circ\) (C) 160\(^\circ\) (D) 180\(^\circ\)
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PART - I

SINGLE CORRECT ANSWER TYPE

This section contains 50 Single Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct.

1. A block connected by a massless spring with a fixed wedge as shown in the figure is released with the spring in its natural length. Friction is absent, maximum elongation in the spring will be: (Assume length of inclined plane is large)
   \[ \frac{3 Mg}{5k} \]  \[ \frac{6 Mg}{5k} \]  \[ \frac{4 Mg}{5k} \]  \[ \frac{8 Mg}{5k} \]

2. Two ends of a conducting rod of varying cross-section are maintained at 200°C and 0°C respectively. In steady state:
   (A) Temperature difference across AB and CD are equal
   (B) Temperature difference across AB is greater than that of across CD
   (C) Temperature difference across AB is less than that of across CD
   (D) Temperature difference may be equal or different depending on the thermal conductivity of the rod

3. The plots of intensity versus wavelength for three black bodies at temperatures  \( T_1 \),  \( T_2 \) and  \( T_3 \) respectively are as shown, Their temperature are such that:
   (A)  \( T_1 > T_2 > T_3 \)  \[ \frac{T_1}{T_2} \]  \[ \frac{T_1}{T_3} \]  \[ \frac{T_1}{T_1} \]
   (B)  \( T_1 > T_3 > T_2 \)
   (C)  \( T_2 > T_3 > T_1 \)
   (D)  \( T_3 > T_2 > T_1 \)

4. Young’s modulus of brass and steel are 10\( \times 10^{10} \frac{N}{m} \) and 2\( \times 10^{11} \frac{N}{m} \), respectively. A brass wire and a steel wire of the same length are extended by 1 mm under the same force. The radii of the brass and steel wires are \( R_B \) and \( R_S \), respectively. Then :
   (A)  \( R_S = \sqrt{2} R_B \)
   (B)  \( R_S = \frac{R_B}{\sqrt{2}} \)
   (C)  \( R_S = 4R_B \)
   (D)  \( R_S = \frac{R_B}{4} \)

5. A diatomic gas is compressed adiabatically to \( \frac{1}{32} \) of its initial volume. If initial temperature is  \( T K \) and final temperature is \( aT K \) then the value of \( a \) is :
   (A)  2
   (B)  3
   (C)  4
   (D) None of these
6. Starting with the same initial conditions, an ideal gas expands from volume $V_1$ to $V_2$ in three different ways, the work done by the gas is $W_1$ if the process is purely isothermal, $W_2$ if purely isobaric and $W_3$ if purely adiabatic, then:
(A) $W_2 > W_1 > W_3$  (B) $W_2 > W_3 > W_1$  (C) $W_1 > W_2 > W_3$  (D) $W_1 > W_3 > W_2$

7. An ideal fluid at the pipe as shown in the figure. The pressure in the fluid at the bottom $P_2$ is the same as it is at the top $P_1$. I the velocity of the top $v_1 = 2 \text{ m/s}$ Then the ratio of areas $A_1/A_2$ is:
(A) 2 : 1  (B) 4 : 1  (C) 8 : 1  (D) 4 : 3

8. A piece of material weighing 50.0 g is coated with 6.3 g of wax of specific gravity 0.9. If the coated piece weighs 16.3 g in water, then the density of the material is:
(A) 1.5  (B) 2.1  (C) 2.35  (D) 4.6

9. If work done in process $AB$ is $W$, work done in process $ABCA$ is:
($\ln 2 = 0.7$)
(A) $0.3W$  (B) $0.7W$  (C) $-0.3W$  (D) $-0.7W$

10. A heated body emits radiation which has maximum radiation near a wavelength $\lambda_m$. The emissivity of the material is 0.75. The absolute temperature of the body is doubled:
I. The maximum intensity of radiation will be near wavelength $2\lambda_m$
II. The maximum intensity of radiation will be near wavelength $\lambda_m / 2$
III. The total energy emitted will increase 16 times
IV. The total energy emitted will increase 12 times
Which of the above statements is(are) true:
(A) I and III  (B) II and III  (C) II and IV  (D) I and IV

11. A sonometer wire of length $l$ vibrates in fundamental mode when excited by a tuning fork of frequency 416 Hz. If the length is doubled keeping other things same, the string will.
(A) vibrate with a frequency of 416 Hz  (B) vibrate with frequency of 208 Hz
(C) vibrate with a frequency of 832 Hz  (D) stop vibrating

12. An open and a closed pipe have same length. The ratio of frequencies of their $n$th overtone is:
(A) $\frac{n+1}{2n+1}$  (B) $\frac{2(n+1)}{2n+1}$  (C) $\frac{n}{2n+1}$  (D) $\frac{n+1}{2n}$

13. Identical wires $A$ and $B$ of different materials are hung from the ceiling of a room. The density of material wire $A$ is greater than the density of material of wire $B$. Identical wave pulses are produced at the bottom of respective wires. The time taken by the pulse to reach the top is:
(A) greater of wire $A$  (B) greater for wire $B$
(C) same for both the wires  (D) cannot be determined
14. The time taken by particle performing SHM on a straight line to pass from point A to B where its velocities are same is 2 seconds. After another 2 seconds it returns to B. The time period of oscillation is (in seconds):
(A) 2  (B) 4  (C) 6  (D) 8

15. A uniform rod of length \( \ell \) is suspended from a point P and is made to undergo small oscillations. Time period of oscillation is (O is centre of mass):
(A) \( 2\pi \sqrt{\frac{M}{g}} \)  (B) \( 2\pi \sqrt{\frac{\ell}{g}} \)  (C) \( 2\pi \sqrt{\frac{7\ell}{12g}} \)  (D) \( 2\pi \sqrt{\frac{\ell}{12g}} \)

16. Two solids A and B float in a liquid. It is observed that A floats with half its volume immersed and B floats with (2/3) of its volume immersed. Compare the densities of A and B:
(A) 4 : 3  (B) 2 : 3  (C) 3 : 4  (D) 1 : 3

17. During the first 18 minute of a 60 minute trip a car has an average velocity of 11 m/s. What should be the average speed for remaining 42 minutes so that car is having an average speed of 21 m/s for the entire trip?
(A) 25.3 m/s  (B) 29.2 m/s  (C) 31 m/s  (D) 35.6 m/s

18. Two forces of equal magnitude act at a point. Square of their resultant is 3 times of product of their magnitude. The angle between the force is:
(A) 30°  (B) 60°  (C) 90°  (D) 0°

19. The maximum & minimum magnitude of the resultant of 2 vectors are 2 and 8. Then magnitude of resultant of the vectors when they act at an angle of 60° is:
(A) 5  (B) 6  (C) 7  (D) 8

20. Unit vector parallel to the resultant of vector \( \overrightarrow{A} = 4\hat{i} - 3\hat{j} \) and \( \overrightarrow{B} = 8\hat{i} + 8\hat{j} \).
(A) \( \frac{24\hat{i} + 5\hat{j}}{13} \)  (B) \( \frac{6\hat{i} + 5\hat{j}}{13} \)  (C) \( \frac{12\hat{i} + 5\hat{j}}{23} \)  (D) \( \frac{12\hat{i} + 5\hat{j}}{13} \)

21. \( B_1, B_2 \) and \( B_3 \) are three balloons ascending with velocities \( v \), 2\( v \) and 3\( v \), respectively. If a bomb is dropped from each when they are at the same height, then:
(A) Bomb from \( B_1 \) reaches ground first  (B) Bomb from \( B_2 \) reaches ground first  (C) Bomb from \( B_3 \) reaches ground first  (D) They reach the ground simultaneously

22. A ball is thrown upwards from the ground with an initial speed of \( u \). The ball is at a height of 80 m at two times. The time interval being 6s between these two points. Find \( 'u' \). Take \( g = 10 \text{ m/s}^2 \).
(A) 40 m/s  (B) 55 m/s  (C) 50 m/s  (D) 45 m/s

23. The time of flight and range of the projectile along the inclined plane as shown in figure is: [\( g = 10 \text{ m/s}^2 \) and \( \sin 76^\circ = 0.966 \)]
(A) 8.3 sec and 166 m  (B) 6.3 sec and 146 m  (C) 7.3 sec and 156 m  (D) 5.3 sec and 136 m
24. If \( \vec{a} \) and \( \vec{b} \) are 2 vectors, then the value of \((\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})\) is:
   (A) \(2(\vec{b} \times \vec{a})\)   (B) \(-2(\vec{b} \times \vec{a})\)   (C) \(\vec{b} \times \vec{a}\)   (D) \(\vec{a} \times \vec{b}\)

25. Three vectors which are coplanar with respect to a certain rectangular co-ordinate system are given by
   \(\vec{a} = 4\hat{i} - \hat{j}\), \(\vec{b} = -3\hat{i} + 2\hat{j}\), \(\vec{c} = -3\hat{j}\)

   Find the angle between \(\vec{a} + \vec{b} + \vec{c}\) and \(\vec{a} + \vec{b} - \vec{c}\).
   (A) \(\cos^{-1}\left(-\frac{5}{\sqrt{85}}\right)\)   (B) \(\cos^{-1}\left(-\frac{7}{\sqrt{85}}\right)\)   (C) \(\cos^{-1}\left(\frac{5}{\sqrt{85}}\right)\)   (D) \(\cos^{-1}\left(\frac{7}{\sqrt{85}}\right)\)

26. Which of the following graphs are NOT possible?
   (A) (i), (ii) and (iv)   (B) (i), (ii), (iii) and (iv)   (C) (i), (ii) and (iii)   (D) (ii) and (iii)

27. A particle is projected vertically upwards with velocity 40 m/s. The displacement and distance traveled by the particle in 6 sec is:
   (A) 50 m, 100 m   (B) 50 m, 110 m   (C) 60 m, 110 m   (D) 60 m, 100 m

28. The angle of projection of a projectile for which the horizontal range and maximum height are equal is:
   (A) \(\tan^{-1}(4)\)   (B) \(\tan^{-1}(3)\)   (C) \(\tan^{-1}\frac{2}{3}\)   (D) \(\tan^{-1}\frac{\sqrt{3}}{3}\)

29. A particle is fired horizontal from an inclined plane of inclination 30° with horizontal with speed 50 ms\(^{-1}\).
   The Range along the incline is: \([g = 10 \text{ m/s}^2]\)
   (A) 500 m   (B) 100\(\sqrt{3}\) m   (C) 200\(\sqrt{2}\) m   (D) \(\frac{1000}{3}\) m

30. A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity \(\omega_0\). If the length of the string and angular velocity are double, the tension in the string which was initially \(T_0\) is now:
   (A) \(T_0\)   (B) \(\frac{T_0}{2}\)   (C) 4\(T_0\)   (D) 8\(T_0\)

31. A cyclist riding the bicycle at a speed of 14\(\sqrt{3}\) ms\(^{-1}\) takes a turn around a circle road of radius 20\(\sqrt{3}\) m without skidding. Given \(g = 9.8 \text{ ms}^{-2}\), what is his inclination to the vertical?
   (A) 30°   (B) 90°   (C) 45°   (D) 60°

32. A man across a 320 m wide river perpendicular to the current in 4 minute. If in still water he can swim a speed \(\frac{5}{3}\) times that of the speed of current, then the speed of the current, in m/min is:
   (A) 30   (B) 40   (C) 50   (D) 60
33. A spherical metal ball A of mass 0.5 kg moving with a speed of 0.5 m/s on a smooth linear horizontal track collides head on with another identical ball B at rest. Assuming the collision to be perfectly elastic, speeds of A and B after the collision respectively will be:

(A) 0.5 m/s, 0.5 m/s  
(B) 0, 1 m/s  
(C) 0, 0.5 m/s  
(D) 0.5 m/s, 0

34. Two particles of masses M and 4M are moving with equal kinetic energy. The ratio of their linear moments is:

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

35. Consider the following statement. When jumping from a height, you should bend your knees as you come to rest on ground, instead of keeping your legs stiff. Which of the following relations can be best used in explaining this statement?

(A) \( \Delta p_1 = -\Delta p_2 \)  
(B) \( \Delta E = -\Delta (PE + KE) = 0 \)  
(C) \( F \Delta t = m \Delta v \)  
(D) \( \Delta x \propto \Delta F \)

36. A shell initially at rest explodes into two pieces of equal mass. No external force acts on the shell. The two pieces will:

(A) Move with different speeds in different directions  
(B) Move with the same speed in opposite directions  
(C) Move with the same speed in the same direction  
(D) Be at rest

37. Block A of mass 2 kg is placed over block B of mass 8 kg. The combination is placed over a rough horizontal surface. Coefficient of friction between B and the floor is 0.5. Coefficient of friction between A and B is 0.4. A horizontal force of 10 N is applied on block B. The force of friction between A and B is:

(A) Zero  
(B) 50 N  
(C) 40 N  
(D) 100 N

38. Two masses 8 kg and 12 kg are connected at the two ends of a string that goes over a frictionless pulley (Atwood’s machine). Acceleration of the masses and the tension in the string respectively will be:

(Take \( g = 10 \text{ m/s}^2 \))

(A) \( 8 \text{ m/s}^2, 144 \text{ N} \)  
(B) \( 4 \text{ m/s}^2, 112 \text{ N} \)  
(C) \( 6 \text{ m/s}^2, 128 \text{ N} \)  
(D) \( 2 \text{ m/s}^2, 96 \text{ N} \)

39. Starting from rest, the time taken by a body in sliding down a rough inclined plane, inclined at 45° with the horizontal, is twice the time taken to slide down a smooth plane of same inclination and same length. Then the coefficient of kinetic friction between body and incline is:

(A) 0.25  
(B) 0.33  
(C) 0.50  
(D) 0.75

40. Two masses A and B of 15 kg and 10 kg are connected with a string passing over a frictionless pulley fixed at the corner of a table (as shown in figure). The coefficient of friction between the table and block is 0.4. The minimum mass of C, that may be placed on A to prevent it from moving is:

(A) 10 kg  
(B) 5 kg  
(C) Zero  
(D) 15 kg
41. The figure shows a circular path of a moving particle. At some instant of time, the velocity of the particle is \( v = -3\hat{i} - 4\hat{j} \). Through which quadrant is the particle moving at this instant, considering clockwise and anticlockwise motion respectively?
   (A) 1st and 4th  (B) 4th and 2nd  (C) 2nd and 3rd  (D) 3rd and 4th

![Diagram of a circular path](image)

42. A body dropped from a height ‘H’ reaches the ground with a speed of \( 1.2\sqrt{gH} \). Calculate the work done by air friction.
   (A) Zero  (B) 0.28 mgH  (C) 0.72 mgH  (D) −0.28 mgH

43. A wire of length \( l \) and mass \( m \) is first bent in a circle, then in a square and then in an equilateral triangle. The moment of inertia about an axis perpendicular to their planes and passing through their centers of mass are \( I_1 \), \( I_2 \) and \( I_3 \) respectively. Then maximum of them is:
   (A) \( I_1 \)  (B) \( I_2 \)  (C) \( I_3 \)  (D) Data insufficient

44. A uniform circular disc of radius \( r \) placed on a rough horizontal plane has initial velocity \( v_0 \) and an angular velocity \( \omega_0 \) as shown. The disc comes to rest after moving some distance in the direction of motion. Then initially:
   (A) The friction force acts in the forward direction
   (B) The point of contact of disc with ground has zero velocity
   (C) \( v_0 \) must be equal to \( r\omega_0/2 \) in magnitude
   (D) \( v_0 \) must be equal to \( 2r\omega_0 \) in magnitude

45. A disc of radius \( r \) rolls without slipping on a rough horizontal floor. If velocity of its centre of mass is \( v_0 \), then velocity of point \( P \), as shown in the figure (\( OP = r/2 \) and \( \angle QOP = 60^\circ \)), is:
   (A) \( v_0 \)  (B) \( \frac{v_0}{2} \)
   (C) \( \frac{v_0}{2\sqrt{3}} \)  (D) \( \frac{v_0}{2\sqrt{2}} \)

46. A block weighing 10 N travels down a smooth curved track AB joined to a rough horizontal surface (figure). The rough surface has a friction coefficient of 0.20 with the block. If the block is released from rest on the track from a point 1.0 m above the horizontal surface, the distance it will move on the rough surface is:
   (A) 5.0 m  (B) 10.0 m  (C) 15.0 m  (D) 20.0 m
47. A body of mass \( m \) dropped from a certain height strikes a light vertical fixed spring of stiffness \( k \). The height of its fall before touching the spring if the maximum compression of the spring is equal to \( \frac{3mg}{k} \) is:

(A) \( \frac{3mg}{2k} \)  
(B) \( \frac{2mg}{k} \)  
(C) \( \frac{3mg}{4k} \)  
(D) \( \frac{mg}{4k} \)

48. A particle is moved from \((0, 0)\) to \((a, a)\) under a force \( \vec{F} = (3\hat{i} + 4\hat{j}) \) from two paths. Path 1 is \( OP \) and path 2 is \( OQP \). Let \( W_1 \) and \( W_2 \) be the work done by this force in these two paths. Then,

(A) \( W_1 = W_2 \)  
(B) \( W_1 = 2W_2 \)  
(C) \( W_2 = 2W_1 \)  
(D) \( W_2 = 4W_1 \)

49. Four particles of masses \( m_1 = 2m \), \( m_2 = 4m \), \( m_3 = m \) and \( m_4 \) are placed at four corners of a square. What should be the value of \( m_4 \), so that the centre of mass of all the four particles are exactly at the centre of the square?

(A) \( 2m \)  
(B) \( 8m \)  
(C) \( 6m \)  
(D) None of these

50. A solid sphere is rotating in free space. If the radius of sphere is increased keeping mass same which one of the following will not be affected?

(A) Angular velocity  
(B) Angular momentum  
(C) Moment of inertia  
(D) Rotational kinetic energy
### ANSWERS to Delhi Government Practice Test/Physics

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1. The smallest matter particle that can take part in chemical reaction is:
   (A) Atom  (B) Molecule  (C) Both (A) and (B)  (D) None of these

2. The mass of 112 cm$^3$ of CH$_4$ gas at STP is:
   (A) 0.16 g  (B) 0.8 g  (C) 0.08 g  (D) 1.6 g

3. How many atoms are present in a mole of H$_2$SO$_4$?
   (A) $7 \times 6.02 \times 10^{23}$  (B) $1.5 \times 6.02 \times 10^{23}$  (C) $6.02 \times 10^{23}$  (D) $2 \times 6.02 \times 10^{23}$

4. The percentage of an element M is 53 in its oxide of molecular formula M$_2$O$_3$. The atomic mass of M is:
   (A) 45  (B) 9  (C) 18  (D) 27

5. The mass of 1 mole of electrons is:
   (A) $9.1 \times 10^{-28}$ g  (B) 1.008 mg  (C) 0.55 mg  (D) $9.1 \times 10^{-27}$ g

6. By heating 10 g CaCO$_3$, 5.6 g CaO is formed. What is the weight of CO$_2$ obtained in this reaction?
   (A) 3.16 g  (B) 2.16 g  (C) 4.4 g  (D) 4.16 g

7. Which represents the largest pressure?
   (A) One atmosphere  (B) Five pounds per square inch  (C) One mm of Hg  (D) One hundred Pascal

8. For an ideal gas which of the following graphs will not be straight line when all the other variables are held constant?
   (A) $P$ vs $T$  (B) $V$ vs $T$  (C) $P$ vs $\frac{1}{V}$  (D) $n$ vs $T$

9. The van der Waals equation is true for:
   (A) Ideal gas  (B) Real gas  (C) Gaseous substance  (D) None of these

10. The compressibility factor of an ideal gas is:
    (A) 0  (B) 1  (C) 2  (D) 4

11. The Boltzmann constant ($k_B$) is:
    (A) $\frac{R N_A}{N_A}$  (B) $\frac{N_A}{R}$  (C) $\frac{R}{N_A}$  (D) $\frac{R}{N_A} \times T$

12. Which one of the following is not a state function?
    (A) Enthalpy  (B) Entropy  (C) Work  (D) Free energy

13. Which of the following is a path function?
    (A) Internal energy  (B) Enthalpy  (C) Work  (D) Entropy
14. The relation between $\Delta H$ and $\Delta U$ is:
   (A) $\Delta H = \Delta U + RT$  (B) $\Delta H = \Delta U - \Delta nRT$
   (C) $\Delta H = \Delta U + \Delta nRT$  (D) $\Delta U = \Delta H + \Delta nRT$

15. For the gaseous reaction involving the complete combustion of iso-butane:
   (A) $\Delta H = \Delta E$  (B) $\Delta H > \Delta E$
   (C) $\Delta H < \Delta E$  (D) None of these

16. The bond energy of O–H bond is 109 kcal/mol. When a mole of water is formed, then:
   (A) 109 kcal is released  (B) 218 kcal is absorbed
   (C) 109 kcal is absorbed  (D) 218 kcal is released

17. The work done during the expansion of a gas from a volume of 4 dm$^3$ to 6 dm$^3$ against a constant external pressure of 3 atm is:
   (A) $-6 \ J$  (B) $-608 \ J$
   (C) $+304 \ J$  (D) $-304 \ J$

18. A process is taking place at constant temperature and pressure. Then:
   (A) $\Delta H = \Delta E$  (B) $\Delta H = T \Delta S$
   (C) $\Delta H = 0$  (D) $\Delta S = 0$

19. In an isothermal process:
   (A) $q = 0$ and $\Delta E = 0$  (B) $q \neq 0$ and $\Delta E = 0$
   (C) $q = 0$ and $\Delta E \neq 0$  (D) $q \neq 0$ and $\Delta E \neq 0$

20. What is $\Delta E$ for system that does 500 cal of work on surrounding and 300 cal of heat is absorbed by the system?
   (A) $-200 \ cal$  (B) $-300 \ cal$
   (C) $+200 \ cal$  (D) $+300 \ cal$

21. The correct relationship between free energy change in a reaction and the corresponding equilibrium constant $K_c$ is:
   (A) $\Delta G = RT \ln K_c$  (B) $-\Delta G = RT \ln K_c$
   (C) $\Delta G^\circ = RT \ln K_c$  (D) $-\Delta G^\circ = RT \ln K_c$

22. For the reaction at 298 K:
   $$A(g) + B(g) \rightleftharpoons C(g) + D(g)$$
   $\Delta H^\circ = -29.8 \ kcal$, $\Delta S^\circ = -0.100 \ kcal \ K^{-1}$
   What is the value of $\Delta G^\circ$?
   (A) 1  (B) 0  (C) 2  (D) 4

23. Unit of entropy is:
   (A) $JK^{-1} \ mol^{-1}$  (B) $J \ mol^{-1}$
   (C) $J^{-1} K^{-1} \ mol^{-1}$  (D) $JK \ mol^{-1}$

24. Which one is true from the following for isobaric process?
   (A) $\Delta P = 0$  (B) $\Delta q = 0$
   (C) $\Delta H = 0$  (D) $\Delta U = 0$

25. For a cyclic process, the condition is:
   (A) $\Delta U = 0$  (B) $\Delta H = 0$
   (C) $\Delta U > 0$ and $\Delta H > 0$  (D) Both $\Delta U = 0$ and $\Delta H = 0$

26. In the system $AB(s) \rightleftharpoons A(g) + B(g)$ doubling the equilibrium concentration of A will cause the equilibrium concentration of B to:
   (A) Change to two times its original value  (B) Change to one-half its original value
   (C) Remain constant  (D) Change to a new value which cannot be predicted
27. Which of the following is a wrong statement about equilibrium state?
(A) Rate of forward reaction = Rate of backward reaction
(B) Equilibrium is dynamic
(C) Catalysts increase value of equilibrium constant
(D) Free energy change is zero

28. For a reaction and equilibrium which of the following is correct?
(A) Concentration of reactant = concentration of product
(B) Concentration of reactant is always greater than product
(C) Rate forward reaction = rate of backward reaction
(D) Qc = k

29. In chemical equilibrium, the value of $\Delta n$ (number of molecules), is negative, then the relationship between $K_p$ and $K_c$ will be:
(A) $K_p - K_c = 0$
(B) $K_p = K_c \times (RT)^{+\Delta n}$
(C) $K_p = K_c \times (RT)^{-\Delta n}$
(D) $K_p = \frac{1}{K_c}$

30. Which of the following is correct for the reaction?
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(A) $K_p = K_c$
(B) $K_p < K_c$
(C) $K_p > K_c$
(D) Pressure is required to predict the correlation

31. The equilibrium constant of a reaction is 300. If the volume of reaction flask is tripled, the equilibrium constant is:
(A) 300 (B) 600 (C) 900 (D) 100

32. The reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3 + \text{heat}$. The equilibrium reaction proceeds in forward direction by
(A) Addition of O$_2$
(B) Removal of O$_2$
(C) Additional of inert gas
(D) Cannot proceed

33. According to Le-Chatelier’s principle, the addition of temperature to the following reaction
$CO_2(g) + 2H_2O(g) \rightarrow CH_4(g) + 2O_2(g)$
Will cause it to the right. This reaction is, therefore:
(A) Exothermic
(B) Unimolecular
(C) Endothermic
(D) Spontaneous

34. A reversible reaction is one which:
(A) Proceeds in both directions
(B) Proceeds in one direction
(C) Proceeds spontaneously
(D) All the above statements are wrong

35. For the system; $3A + 2B \rightleftharpoons C$, the expression for equilibrium constant is:
(A) $\frac{[A]^3[B]^2}{[C]}$
(B) $\frac{[C]}{[A]^3[B]^2}$
(C) $\frac{[3A][2B]}{[C]}$
(D) $\frac{[C]}{[3A][2B]}$

36. CH$_3$COOH is weaker acid than H$_2$SO$_4$. It is due to:
(A) More ionisation
(B) Less ionisation
(C) Covalent bond
(D) Electrovalent bond

37. Which of the following base is weakest?
(A) NH$_4$OH; $K_b = 1.6 \times 10^{-5}$
(B) C$_6$H$_5$NH$_2$; $K_b = 3.8 \times 10^{-10}$
(C) C$_2$H$_5$NH$_2$; $K_b = 5.6 \times 10^{-4}$
(D) C$_9$H$_7$N; $K_b = 6.3 \times 10^{-10}$
38. \[ \text{pK}_a \text{ or a weak acid is defined as:} \]

\[
\begin{align*}
\text{A) } & \log K_a & \text{B) } & \frac{1}{\log K_a} & \text{C) } & \log \frac{1}{K_a} & \text{D) } & -\log \frac{1}{K_a}
\end{align*}
\]

39. The solubility of a sparingly soluble salt \( \text{AB}_2 \) in water is \( 1.0 \times 10^{-5} \text{ M} \). Its solubility product will be:

\[
\begin{align*}
\text{A) } & 1.0 \times 10^{-10} \text{ M}^3 & \text{B) } & 4 \times 10^{-15} \text{ M}^3 & \text{C) } & 4 \times 10^{-10} \text{ M}^3 & \text{D) } & 1 \times 10^{-15} \text{ M}^3
\end{align*}
\]

40. The pH of \( 10^{-8} \text{ M} \) HCl solution is:

\[
\begin{align*}
\text{A) } & 8 & \text{B) } & \text{more than 8} & \text{C) } & \text{between 6 and 7} & \text{D) } & \text{slightly more than 7}
\end{align*}
\]

41. The conjugate acid of \( \text{NH}_3 \) is:

\[
\begin{align*}
\text{A) } & \text{NH}_3 & \text{B) } & \text{NH}_4^+ & \text{C) } & \text{N}_2\text{H}_4 & \text{D) } & \text{NH}_2\text{OH}
\end{align*}
\]

42. The solubility of a sparingly soluble salt \( \text{AB}_2 \) in water is \( 1.0 \times 10^{-5} \text{ M} \). Its solubility product will be:

\[
\begin{align*}
\text{A) } & 1.0 \times 10^{-10} \text{ M}^3 & \text{B) } & 4 \times 10^{-15} \text{ M}^3 & \text{C) } & 4 \times 10^{-10} \text{ M}^3 & \text{D) } & 1 \times 10^{-15} \text{ M}^3
\end{align*}
\]

43. The pH value of 0.001 M aqueous solution of NaCl is:

\[
\begin{align*}
\text{A) } & 7 & \text{B) } & \text{4} & \text{C) } & \text{11} & \text{D) } & \text{unpredictable}
\end{align*}
\]

44. The IUPAC name of \[
\begin{align*}
\text{Cl} & \text{Br} & \text{I}
\end{align*}
\]
is:

\[
\begin{align*}
\text{A) } & \text{2-methyl-3-bromohexanal} & \text{B) } & \text{3-bromo-2-methylbutanal} & \text{C) } & \text{2-bromo-3-bromobutanal} & \text{D) } & \text{3-bromo-2-methylpentanal}
\end{align*}
\]

45. \( \text{CH}_3\text{CH}_2\text{O} = \text{CH}_2\text{CH}_3 \) and \( \text{CH}_2 = \text{O} = \text{C}_2\text{H}_2 \) are the example of:

\[
\begin{align*}
\text{A) } & \text{chain isomerism} & \text{B) } & \text{functional isomerism} & \text{C) } & \text{position isomerism} & \text{D) } & \text{metamerism}
\end{align*}
\]

46. Methoxy methane and ethanol are:

\[
\begin{align*}
\text{A) } & \text{position isomers} & \text{B) } & \text{chain isomers} & \text{C) } & \text{functional isomers} & \text{D) } & \text{optical isomers}
\end{align*}
\]

47. Inductive effect involves:

\[
\begin{align*}
\text{A) } & \text{delocalization of } \sigma \text{–electrons} & \text{B) } & \text{displacement of } \sigma \text{–electrons} & \text{C) } & \text{delocalization of } \pi \text{–electrons} & \text{D) } & \text{displacement of } \pi \text{–electrons}
\end{align*}
\]

48. Electromeric effect is:

\[
\begin{align*}
\text{A) } & \text{permanent effect} & \text{B) } & \text{temporary effect} & \text{C) } & \text{resonance effect} & \text{D) } & \text{inductive effect}
\end{align*}
\]

49. The treatment of \( \text{CH}_3\text{Mg X} \) with \( \text{CH}_3\text{C} = \text{CHMe} \) produces:

\[
\begin{align*}
\text{A) } & \text{CH}_3\text{CH} = \text{CH}_2 & \text{B) } & \text{CH}_3\text{C} = \text{C} = \text{CH}_3 & \text{C) } & \text{H} \quad \text{H} & \text{D) } & \text{CH}_4
\end{align*}
\]

50. Which one of the following gives, on ozonolysis, both aldehydes and ketones?

\[
\begin{align*}
\text{A) } & \text{Me}_2\text{C} = \text{CHMe} & \text{B) } & \text{Me}_2\text{C} = \text{CMe}_2 \\
\text{C) } & \text{MeCH}_2\text{C} = \text{C} = \text{CMe}_2 & \text{D) } & \text{MeCH} (\text{Me}) = \text{C} = \text{CHMe}
\end{align*}
\]

51. An alkene on vigorous oxidation with \( \text{KMnO}_4 \) gives only propionic acid. The alkene is:

\[
\begin{align*}
\text{A) } & \text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2 & \text{B) } & \text{CH}_3\text{CH} = \text{CHCH}_3 \\
\text{C) } & (\text{CH}_3)_2\text{C} = \text{CH}_2 & \text{D) } & \text{CH}_3\text{CH} = \text{CH}_2
\end{align*}
\]

52. The hydrocarbon which can react with \( \text{NaNH}_2 \):

\[
\begin{align*}
\text{A) } & \text{CH}_3\text{CH} = \text{CH}_2 & \text{B) } & \text{CH}_3\text{CH}_2\text{C} = \text{CH} & \text{C) } & \text{Ph} = \text{C} = \text{CH} & \text{D) } & \text{(B) and (C)}
\end{align*}
\]
53. Friedel-Crafts acylation can be given by

\[
\begin{align*}
\text{C} & \text{H} \\
\text{O} & \text{O} \\
\text{O} & \text{O} \\
\text{O} & \text{O} \\
\text{O} & \text{O} \\
\end{align*}
\]

\[
\begin{align*}
\text{X} : & \text{Cl} \\
\text{R} & \text{C} \\
\end{align*}
\]

(A) \[ \text{R} - \text{C} - \text{Cl} \] \hspace{1cm} (B) \[ \text{R} - \text{C} - \text{H} \] \hspace{1cm} (C) \[ \text{R} - \text{C} - \text{H} \] \hspace{1cm} (D) \[ \text{R} - \text{O} - \text{R} \]

54. Inorganic benzene is:

(A) \[ \text{B}_2\text{H}_3\text{N}_3 \] \hspace{1cm} (B) \[ \text{BH}_3\text{NH}_3 \] \hspace{1cm} (C) \[ \text{B}_2\text{H}_6\text{N}_3 \] \hspace{1cm} (D) \[ \text{H}_3\text{B}_3\text{N}_6 \]

55. Boron halides behave as Lewis acids because of their _______ nature.

(A) proton donor \hspace{1cm} (B) covalent \hspace{1cm} (C) electron deficient \hspace{1cm} (D) ionising

56. Aluminium is obtained by:

(A) Reducing \( \text{Al}_2\text{O}_3 \) with coke \hspace{1cm} (B) Electrolysis of \( \text{Al}_2\text{O}_3 \) dissolved in \( \text{Na}_3\text{AlF}_6 \)

(C) Reducing \( \text{Al}_2\text{O}_3 \) with chromium \hspace{1cm} (D) Heating alumina with cryolite

57. The order of acidic strength of boron trihalides:

(A) \[ \text{BF}_3 < \text{BCl}_3 < \text{BBr}_3 < \text{BI}_3 \] \hspace{1cm} (B) \[ \text{BI}_3 < \text{BBr}_3 < \text{BCl}_3 < \text{BF}_3 \]

(C) \[ \text{BBr}_3 < \text{BCl}_3 < \text{BF}_3 < \text{BI}_3 \] \hspace{1cm} (D) \[ \text{BF}_3 < \text{BCl}_3 < \text{BF}_3 < \text{BI}_3 \]

58. Which type of silicate is shown in the given figure?

(A) Orthosilicate \hspace{1cm} (B) Pyrosilicate \hspace{1cm} (C) Meta silicate \hspace{1cm} (D) None of these

59. Graphite is a soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that, graphite:

(A) Is a non-crystalline substance \hspace{1cm} (B) Is an allotropy of diamond

(C) Has molecules of variable molecular masses like polymers \hspace{1cm} (D) Has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds

60. Buckminster fullerene is:

(A) Pure graphite \hspace{1cm} (B) C-60 \hspace{1cm} (C) Diamond \hspace{1cm} (D) C-90

61. Which of the following equations depict the oxidizing nature of \( \text{H}_2\text{O}_2 \)?

(A) \[ 2\text{MnO}_4^- + 6\text{H}^+ + 5\text{H}_2\text{O}_2 \rightarrow 2\text{Mn}^{2+} + 8\text{H}_2\text{O} + 5\text{O}_2 \]

(B) \[ 2\text{Fe}^{3+} + 2\text{H}^+ + \text{H}_2\text{O}_2 \rightarrow 2\text{Fe}^{2+} + 2\text{H}_2\text{O} + \text{O}_2 \]

(C) \[ 2\text{I}^- + 2\text{H}^+ + \text{H}_2\text{O}_2 \rightarrow \text{I}_2 + 2\text{H}_2\text{O} \]

(D) \[ \text{KIO}_4 + \text{H}_2\text{O}_2 \rightarrow \text{KIO}_3 + \text{H}_2\text{O} + \text{O}_2 \]

62. Which of the following equation depicts reducing nature of \( \text{H}_2\text{O}_2 \)?

(A) \[ 2[\text{Fe(CN)}_6]^{3+} + 2\text{H}^+ + \text{H}_2\text{O}_2 \rightarrow 2[\text{Fe(CN)}_6]^{3-} + 2\text{H}_2\text{O} \]

(B) \[ \text{I}_2 + \text{H}_2\text{O}_2 + 2\text{OH}^- \rightarrow 2\text{I}^- + 2\text{H}_2\text{O} + \text{O}_2 \]
(C) \[ \text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{Mn}^{4+} + 2\text{OH}^- \]

(D) \[ \text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O} \]

63. Elements of which of the following group(s) of periodic table do \textbf{not} form hydrides.

(A) Groups 7, 8, 9\hspace{1cm} (B) Group 13\hspace{1cm} (C) Groups 15, 16, 17\hspace{1cm} (D) Group 14

64. 

Statement : I Permanent hardness of water is removed by treatment with washing soda.

Statement : II Washing soda reacts with soluble magnesium and calcium sulphate to form insoluble carbonates.

(A) Statement-I is True, Statement-II is True and Statement-II is a correct explanation for Statement-I.

(B) Statement-I is True, Statement-II is True and Statement-II is NOT a correct explanation for Statement-I.

(C) Statement-I is True, Statement-II is False.

(D) Statement-I is False, Statement-II is True.

65. Washing soda is:

(A) \( \text{Na}_2\text{CO}_3 \)\hspace{1cm} (B) \( \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} \)\hspace{1cm} (C) \( \text{KHCO}_3 \)\hspace{1cm} (D) \( \text{NaHCHO}_3 \)

66. On heating sodium carbonate …… is evolved.

(A) \( \text{CO}_2 \)\hspace{1cm} (B) \( \text{CO} \)\hspace{1cm} (C) \( \text{H}_2\text{O} \)\hspace{1cm} (D) No gas

67. Sodium metal can be stored under.

(A) pyrole\hspace{1cm} (B) kerosene\hspace{1cm} (C) alcohol\hspace{1cm} (D) water

68. Alkali metals are powerful reducing agents because:

(A) these are metals\hspace{1cm} (B) there are monovalent

(C) their ionic radii are large\hspace{1cm} (D) their ionization potentials are low

69. \( \text{LiAlH}_4 \) is used as:

(A) an oxidizing agent\hspace{1cm} (B) a reducing agent

(C) a mordant\hspace{1cm} (D) a water softener

70. Conjugate base of \( \text{HSO}_4^- \) is:

(A) \( \text{SO}_4^{2-} \)\hspace{1cm} (B) \( \text{H}_2\text{SO}_4 \)\hspace{1cm} (C) \( \text{H}_2\text{SO}_4^+ \)\hspace{1cm} (D) None of these
## Answers to Delhi Govt. Practice Test

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