

AP EAPCET 2026 May 14 Shift 1

Question Paper

Conducted by National Testing Agency (NTA)



General Instructions

- (i) The test is of 3 hours duration.
- (ii) This test paper consists of 160 questions. The maximum marks are 160.
- (iii) Physics and Chemistry contains 40 questions each and Mathematics contains 80 questions.
- (iv) Each question carries +1 marks for correct answer and there is no negative marking for wrong answer.

1. If a real valued function $f : A \rightarrow B$ defined by $f(x) = |x| - [x]$ is a bijection, then A and B are respectively:

- (A) $(-\infty, 0]$ and $[0, \infty)$
- (B) $[-3, -2]$ and $(5, 6]$
- (C) $[1, 2)$ and $[3, 4]$
- (D) $[0, \infty)$ and $[0, 1)$

2. If $f : (-\infty, 0) \rightarrow \mathbb{R}$ is defined by

$$f(x) = \frac{[x]}{|x|}$$

then $f(x) : x \in (-\infty, 0)$ is:

- (A) $(-\infty, 0)$
- (B) $[-1, 0)$
- (C) $(-2, -1]$
- (D) $(-\infty, -1]$

3. For $n \in \mathbb{N}$,

$$1^2 + 2^2 + 3^2 + \dots + n^2 >$$

- (A) n^3
 (B) $\frac{n^3}{2}$
 (C) $\frac{n^3}{3}$
 (D) $3n^3$
-

4. Let S be a symmetric matrix obtained from

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & -2 & 1 \\ 3 & 1 & -1 \end{bmatrix}$$

and T be a skew-symmetric matrix obtained from

$$B = \begin{bmatrix} 4 & 2 & 0 \\ 1 & -1 & 3 \\ 0 & 2 & -3 \end{bmatrix}$$

If trace of $S = -4$ and the non-zero elements of T are $-1, 1$, then $S + T =$

(A)

$$\begin{bmatrix} 2 & 5 & 0 \\ 3 & -4 & 3 \\ 0 & 1 & -2 \end{bmatrix}$$

(B)

$$\begin{bmatrix} 2 & 5 & 0 \\ 3 & 3 & 3 \\ 0 & 1 & 2 \end{bmatrix}$$

(C)

$$\begin{bmatrix} 2 & 5 & 0 \\ 3 & -3 & 3 \\ 0 & 1 & -2 \end{bmatrix}$$

(D)

$$\begin{bmatrix} 2 & -5 & 0 \\ 3 & -3 & 3 \\ 0 & 1 & -2 \end{bmatrix}$$

5. If

$$A = \begin{bmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{bmatrix}$$

is a matrix such that trace of $A = 18$ and

$$\det(A) = 96,$$

if $a, b, c \in \mathbb{N}$ and $ab = 6$, then $ab + bc + ca =$

- (A) 36
 - (B) 26
 - (C) 48
 - (D) 24
-

6. If $x = \alpha, y = \beta, z = \gamma$ satisfy the equations

$$3x + y + 2z + 2 = 0,$$

$$2x - 3y + z - 7 = 0,$$

$$x - 4y + 3z - 1 = 0,$$

then

$$\alpha^3 - \beta^3 =$$

- (A) 19
 - (B) -35
 - (C) 0
 - (D) 16
-

7. Among the roots of

$$3\sqrt{3}z^3 - i = 0,$$

the sum of the squares of the two roots having non-zero real part is

- (A) ω^2

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

8. If

$$\int \frac{dx}{x^4 + 1} = \frac{1}{4\sqrt{2}} \log \left(\frac{x^2 + \sqrt{2}x + 1}{x^2 - \sqrt{2}x + 1} \right) + \frac{1}{2\sqrt{2}} \tan^{-1} \left(\frac{\sqrt{2}x}{1 - x^2} \right) + c,$$

then

$$\int_0^1 \frac{x^2 + 1}{x^4 + 1} dx =$$

- (A) $\frac{\pi}{4\sqrt{2}}$
 (B) $\frac{\pi}{2\sqrt{2}}$
 (C) $\frac{\pi}{8\sqrt{2}}$
 (D) $\frac{\pi}{16\sqrt{2}}$
-

9. Given that

$$\sum_{k=1}^n k(k-1) = \frac{n(n-1)(n+1)}{3}$$

and ω and ω^2 are complex cube roots of unity. If

$$\sum_{k=1}^{2026} \left(k + \frac{1}{\omega} \right) \left(k + \frac{1}{\omega^2} \right) = \frac{2026}{3}(N + 3),$$

then $N =$

- (A) 2025×2026
 (B) 2025×2024
 (C) 2027×2025
 (D) 2026×2027
-

10. For the real values of x , the set of values of k for which the function

$$f(x) = \frac{x^2 + x + 1}{x^2 + kx + 1}$$

takes all real values is

- (A) $(-2, 2)$
 - (B) $\{-1\}$
 - (C) $(-\infty, \infty)$
 - (D) ϕ (Null set)
-

11. If α, β ($\alpha < \beta$) are the roots of

$$2x^2 - x - 6 = 0$$

and

$$\alpha x^2 + kx - \beta \leq 0 \quad \forall x \in \mathbb{R},$$

then the number of integral values k takes is

- (A) 24
 - (B) 15
 - (C) 6
 - (D) 7
-

12. If the equation

$$x^4 - 10x^3 + 37x^2 - 60x + 36 = 0$$

has two distinct real roots, where each one of them is a repeated root, then the sum of squares of all the roots of the given equation is

- (A) 74
 - (B) 26
 - (C) 52
 - (D) 68
-

13. If all the roots of the equation

$$x^5 - 3x^4 - 5x^3 + 27x^2 - 32x + 12 = 0$$

are diminished by h to get a transformed equation in which the constant term is missing, then the sum of the squares of all possible values of h is

- (A) 19
- (B) 25

(C) 72

(D) 45

14. Let P and Q are two sets such that

$$n(P) = 27, \quad n(Q) = 17, \quad n(P \cap Q) = 5.$$

If x is the number of ways of selecting 7 elements from P such that all the elements of $P \cap Q$ are in each selection and y is the number of ways of selecting 10 elements from Q such that no element of $P \cap Q$ is present in any selection, then $x + y + 1 =$

(A) 231

(B) 248

(C) 297

(D) 298

15. In each of its move, a pawn in a chess board can move one step either horizontally or vertically to its adjacent cell from its current position. If a pawn is initially located at the South-West corner cell of the chess board, then the number of ways it can reach the North-East corner cell with minimum number of moves, is

(A) ${}^{64}C_2$

(B) $2 \times {}^8C_2$

(C) ${}^{14}C_7$

(D) ${}^{16}C_8$

16. All the letters of the word REMAIN are permuted in all possible ways and the words (with or without meaning) thus formed are arranged in the dictionary order. The rank of the word REMAIN, when counted from the rank of the word MARINE beginning with 1 itself, is

(A) 266

(B) 256

(C) 272

(D) 245

17. The coefficient of x^{12} in the expansion of

$$(3 + 2x)^{-5}$$

is

(A) ${}^{17}C_5 \frac{3^{12}}{2^5}$

(B) ${}^{16}C_{12} \frac{2^{12}}{3^{17}}$

(C) ${}^{16}C_{12} \frac{2^{17}}{3^{12}}$

(D) ${}^{17}C_5 \frac{3^{12}}{2^{17}}$

18. If x is so small that the values of x^n , $n \geq 2$ are negligible, then the approximate value of

$$\frac{\sqrt{2-3x}}{(3+2x)}(x+1)$$

is

(A) $\frac{\sqrt{2}}{3} \left(1 - \frac{5x}{12}\right)$

(B) $\frac{\sqrt{2}}{3}(1+5x)$

(C) $\frac{\sqrt{2}}{3}(1-7x)$

(D) $\frac{\sqrt{2}}{3}(1+6x)$

19. If

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

and

$$f(x) + \frac{xf(x)}{(x-1)(x-2)} = g(x) + \frac{A}{x-2} + \frac{B}{x-1},$$

then $g(A+B) =$

(A) 6

(B) 5

(C) 4

(D) 8

20. The quadratic equation whose roots are

$$\cos 72^\circ \quad \text{and} \quad \sin 54^\circ$$

is

(A) $4x^2 + \sqrt{5}x - 1 = 0$

(B) $4x^2 + 2\sqrt{5}x + 1 = 0$

(C) $4x^2 - 2\sqrt{5}x + 1 = 0$

(D) $x^2 - 2\sqrt{5}x + 4 = 0$

21. If $f(x) = \frac{x}{1-3x^2} + \frac{x}{8}$, then $f(\tan 15^\circ) + f(\tan 20^\circ) =$

(A) $\frac{1+\sqrt{3}}{8}$ (B) $\frac{3}{8}(3+\sqrt{3})$ (C) $\frac{2+\sqrt{3}}{8}$

(D) $\frac{3}{8}(1+\sqrt{3})$

22. If $A + B + C = \pi$, then

$$3 - 2 \left(\cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2} + \cos \frac{A}{2} \sin \frac{B}{2} \cos \frac{C}{2} + \sin \frac{A}{2} \cos \frac{B}{2} \cos \frac{C}{2} \right) =$$

(A) $\sin^2 A + \sin^2 B + \sin^2 C$ (B) $\cos^2 A + \cos^2 B + \cos^2 C$ (C) $\sin^2 \frac{A}{2} + \sin^2 \frac{B}{2} + \sin^2 \frac{C}{2}$ (D) $\cos^2 \frac{A}{2} + \cos^2 \frac{B}{2} + \cos^2 \frac{C}{2}$

23. If $6 \sin^2 x = 3 \cos^4 x - \sin^2 x \cos^2 x$, then $x =$

(A) $2n\pi \pm \frac{\pi}{3}, \forall n \in \mathbb{Z}$ (B) $n\pi \pm \frac{\pi}{3}, \forall n \in \mathbb{Z}$ (C) $n\pi \pm \frac{\pi}{6}, \forall n \in \mathbb{Z}$ (D) $2n\pi \pm \frac{\pi}{4}, \forall n \in \mathbb{Z}$

24. If $x = \frac{n}{n^2 + 1}, n \in \mathbb{N}$, then $2 \cos^{-1} x + \cos^{-1}(2x^2 - 1) =$

(A) $4 \cos^{-1} x$ (B) 2π (C) π (D) $\cos^{-1}(-x)$

25. $\operatorname{Cosech}^{-1}2 + \operatorname{Cosech}^{-1}\left(-\frac{1}{2}\right) =$

- (A) $\log\left(\frac{3-\sqrt{5}}{2}\right)$ (B) $\log(3-\sqrt{5})$ (C) $\log\left(\frac{7+3\sqrt{5}}{2}\right)$ (D) $\log\left(\frac{4\sqrt{5}+5}{2}\right)$
-

26. In a triangle ABC , if $a = 6$, $b = 5$, $c = 9$, then the sum of the squares of the reciprocals of the altitudes of the triangle is

- (A) $\frac{71}{400}$ (B) $\frac{142}{300}$ (C) $\frac{80}{421}$ (D) $\frac{15}{157}$
-

27. In a triangle ABC , $\frac{r_3 + r_2}{r_2 + r_1} =$

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

28. In a triangle ABC , if $r_1 = \frac{5}{\sqrt{2}}$, $r_2 = 2\sqrt{2}$, $r = r\sqrt{2}$, then $\frac{a+c}{b} =$

- (A) 15 (B) 12 (C) 3 (D) 5
-

29. If $\hat{i} + 2\hat{j} + \hat{k}$, $a\hat{i} + 3\hat{j} + 2\hat{k}$, $-\hat{i} + 4\hat{j} + \beta\hat{k}$ are the position vectors of three points A, B, C , then the position vector of a point which divides BC in the ratio $a + 1 : \beta$ is

- (A) $\left(-\frac{1}{4}, \frac{13}{4}, \frac{9}{4}\right)$ (B) $\left(-\frac{1}{3}, \frac{13}{3}, \frac{9}{3}\right)$ (C) $\left(\frac{5}{2}, \frac{7}{2}, \frac{6}{2}\right)$ (D) $\left(\frac{7}{3}, \frac{2}{3}, \frac{1}{3}\right)$
-

30. If a vector $3\hat{i} - 6\hat{j} + 2\hat{k}$ makes angles α, β, γ with the positive x, y, z -axes respectively, then $\cos \alpha + \cos^2 \beta + 7 \cos^3 \gamma =$

- (A) 1 (B) $\frac{65}{49}$ (C) 2 (D) $-\frac{7}{49}$
-

31. If $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} - 5\hat{j} + 6\hat{k}$, then the magnitude of the projection of $2\vec{a} - \vec{b}$ on $\vec{a} + \vec{b}$ is:

- (A) $\frac{11\sqrt{2}}{\sqrt{10}}$ (B) $\frac{22}{\sqrt{10}}$ (C) $\frac{22}{\sqrt{133}}$ (D) $\frac{22}{\sqrt{5}}$

32. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} + \hat{j} - \hat{k}$, then match the following:

List-I		List-II
A	$[\vec{a} \vec{b} \vec{c}]$	I : 4
B	$ \vec{a} + \vec{b} + \vec{c} ^2$	II : 11
C	Volume of tetrahedron	III : $\frac{2}{3}$
D	$ (\vec{a} \times \vec{b}) \times (\vec{a} \times \vec{c}) $	IV : $4\sqrt{3}$
		V : 12

- (A) A-I, B-II, C-III, D-V (B) A-I, B-III, C-II, D-V (C) A-I, B-II, C-V, D-IV (D) A-I, B-II, C-III, D-IV

33. Let $\vec{a} = 3\hat{i} - \hat{j} - \hat{k}$, $\vec{b} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{c} = 2\hat{i} + 2\hat{j} + \hat{k}$. Let \vec{d} be a vector such that $|\vec{d}| = \sqrt{2}$ units. If the vector \vec{d} is coplanar with \vec{a} , \vec{b} and perpendicular to \vec{c} , then $\vec{d} =$

- (A) $\pm \frac{1}{5}(3\hat{i} - 5\hat{j} + 4\hat{k})$
 (B) $\pm \frac{1}{5}(-4\hat{i} + 5\hat{j} - 3\hat{k})$
 (C) $\pm \frac{1}{5}(3\hat{i} + 5\hat{j} - 4\hat{k})$
 (D) $\pm \frac{1}{5}(-3\hat{i} + 5\hat{j} + 4\hat{k})$

34. If the mean of the set of values $(3, 6, 9, 10, n)$ is 9, then the variance of the given set of values is:

- (A) 19 (B) 22 (C) 24 (D) 15

35. If E_1 and E_2 are two events of a sample space such that $P(E_1) = 0.8$, $P(E_2) = 0.7$ and $P(E_1 \cap E_2) \geq c$, then $c =$

- (A) 0.5 (B) 0.6 (C) 0.7 (D) 0.65

36. In a bolt factory, machines A , B , and C manufacture 25%, 35%, and 40% of the total output respectively. There is a chance of having 5%, 4%, and 2% defective bolts manufactured by A , B , and C respectively. If a bolt is drawn at random from the output, then the probability that it is defective is:

- (A) $\frac{69}{2000}$ (B) $\frac{59}{2000}$ (C) $\frac{79}{2000}$ (D) $\frac{89}{2000}$
-

37. If b and c are numbers chosen at random from the set $\{1, 2, 3, \dots, 10\}$ with replacement, then the probability that the quadratic equation

$$x^2 + bx + c = 0$$

has real roots is:

- (A) 0.52
(B) 0.54
(C) 0.58
(D) 0.62
-

38. Let E_1, E_2 and E_3 be mutually independent events.

Statement I: E_1 and $E_2 \cup E_3$ are independent.

Statement II: E_1 and $E_2 \cap E_3$ are independent.

Which one of the following options is correct?

- (A) Both I and II are true
(B) Only I is true
(C) Only II is true
(D) Both I and II are false
-

39. A pair of dice is thrown independently 3 times. The probability of getting a total score of at least 9 twice, is:

- (A) $\frac{925}{5832}$
(B) $\frac{975}{5832}$
-

- (C) $\frac{1025}{5832}$
 (D) $\frac{1075}{5832}$

40. The following table gives the probability distribution of a random variable X :

x_i	0	1	2	3
$P(X = x_i)$	0.1	0.3	0.5	0.1

The standard deviation of X is:

- (A) 0.4
 (B) 0.42
 (C) 0.8
 (D) 0.64

41. If O is the origin and P is a point moving on the straight line $lx + my + n = 0$ ($n \neq 0$). If Q is a point on the segment OP such that $OP \cdot OQ = k^2$, where $k \neq 0$, then the locus of Q is

- (A) $n(x^2 + y^2) = k^2(lx + my)$
 (B) $k^2(x^2 + y^2) = n(lx + my)$
 (C) $n(x^2 - y^2) = k^2(lx - my)$
 (D) $n(x^2 + y^2) = k^2(lx - my)$

42. If the axes are rotated about the origin in positive direction through an angle of 30° , then the transformed equation of

$$x^2 + 2\sqrt{3}xy - y^2 = 2a^2$$

is

- (A) $x'^2 + y'^2 = a^2$
 (B) $x'^2 + y'^2 = 2a^2$
 (C) $x'^2 - y'^2 = a^2$
 (D) $x'^2 - y'^2 = 2a^2$

43. If a non-horizontal line L passes through the point $(4, -2)$ and the distance of L from the origin is 2 units, then the equation of the line L is

- (A) $4x + 3y - 10 = 0$
 - (B) $x + y - 2\sqrt{2} = 0$
 - (C) $3x + 4y - 4 = 0$
 - (D) $2x + 3y - 2 = 0$
-

44. If the equation of the line passing through the orthocentre and circumcentre of triangle ABC , whose vertices are $A(3, 1)$, $B(3, 3)$, $C(6, 1)$, is $2x + by + c = 0$, then $b + c =$

- (A) -6
 - (B) 6
 - (C) 0
 - (D) 2
-

45. The equations of the pairs of opposite sides of a parallelogram are

$$x^2 - 5x + 6 = 0$$

and

$$y^2 - 6y + 5 = 0.$$

Then the equations of its diagonals are

- (A) $4x - y - 7 = 0$, $4x + y = 13$
 - (B) $4x + y - 7 = 0$, $4x - y = 13$
 - (C) $4x - y - 7 = 0$, $x + 4y = 13$
 - (D) $4x + y + 7 = 0$, $x - 4y = 13$
-

46. The circumcenter of a triangle lies at the origin and its centroid is the midpoint of the line segment joining the points $(a^2 + 1, a^2 + 1)$ and $(2a, -2a)$, where $a \neq 0$. Then the equation of the parabola passing through the orthocentre is

- (A) $y - 2ax = 0$
- (B) $y - (a^2 + 1)x = 0$

- (C) $x + y = 0$
(D) $(a - 1)^2x - (a + 1)^2y = 0$
-

47. If the chord $y = mx + 1$ of the circle $x^2 + y^2 = 1$ subtends an angle 45° at the major segment of the circle, then the value of m is:

- (A) $2 + \sqrt{2}$
(B) $-2 + \sqrt{2}$
(C) $-1 \pm \sqrt{2}$
(D) ± 1
-

48. Equation of the circle with origin as centre and passing through the vertices of an equilateral triangle whose median is of length 3 is:

- (A) $x^2 + y^2 = 4a^2$
(B) $x^2 + y^2 = 2a^2$
(C) $x^2 + y^2 = 9a^2$
(D) $x^2 + y^2 = 16a^2$
-

49. The tangent to the circle $C_1 : x^2 + y^2 - 2x - 1 = 0$ at the point $(2, 1)$ cuts off a chord of length 4 units from a circle C_2 whose centre is $(3, -2)$. The radius of circle C_2 is:

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

50. If the radical axis of the circles $x^2 + y^2 + 2gx + 2fy + c = 0$ and $2x^2 + 2y^2 + 3x + 8y + 2c = 0$ touches the circle $x^2 + y^2 + 2x + 2y + 1 = 0$, then:

- (A) $g = \frac{3}{2}$ or $f = 2$
(B) $g = \frac{3}{2}$ or $f = \frac{1}{2}$

- (C) $g = \frac{1}{2}$ or $f = \frac{3}{4}$
(D) $g = \frac{3}{2}$ or $f = \frac{3}{4}$
-

51. The radical axis of two orthogonal circles is $x + 1 = 0$. If one of those circles is $x^2 + y^2 = 4$, then the equation of the other circle is:

- (A) $x^2 + y^2 + 8x + 4 = 0$
(B) $x^2 + y^2 - 4x + 4 = 0$
(C) $x^2 + y^2 - 8x + 2y + 8 = 0$
(D) $x^2 + y^2 - 16 = 0$
-

52. A chord is drawn through the focus of the parabola $y^2 = 6x$ such that its perpendicular distance from the vertex is $\frac{\sqrt{5}}{2}$. Then its slope can be:

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

53. A perpendicular is drawn through the vertex O of the parabola $y^2 = 8x$ to any non-vertical tangent meeting the parabola at P . Then $OP \cdot OQ =$

- (A) 16
(B) 12
(C) 6
(D) 24
-

54. The tangents drawn at the points P_1 and P_2 lying on the ellipse $\frac{x^2}{4} + y^2 = 1$ are parallel to the chord joining the points $(0, 1)$ and $(2, 0)$, then the distance between P_1 and P_2 is:

- (A) $2\sqrt{2}$
(B) $\sqrt{5}$
-

(C) $2\sqrt{3}$

(D) $\sqrt{10}$

55. An ellipse intersects the hyperbola $2x^2 - 2y^2 = 1$ orthogonally. The eccentricity of the ellipse is reciprocal to that of the hyperbola. If the axes of the ellipse are along the coordinate axes, then the equation of the ellipse is:

(A) $x^2 + 2y^2 = 4$

(B) $2x^2 + y^2 = 4$

(C) $2x^2 + y^2 = 2$

(D) $x^2 + 2y^2 = 2$

56. If $A(1, 1, 1)$, $B(2, 3, 4)$ and $C(2, 5, 7)$ are the vertices of $\triangle ABC$, then the length of the altitude drawn through the vertex A is:

(A) 2

(B) 1

(C) $\sqrt{2}$

(D) $\sqrt{3}$

57. If $(K, 3, 5)$, $(2, -1, 2)$ are direction ratios of two lines and the angle between them is 45° , then a value of K is:

(A) 2

(B) 4

(C) 6

(D) 8

58. If the angle θ between the line

$$\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$$

and the plane

$$2x - y + \sqrt{\lambda}z + 4 = 0$$

is such that $\sin \theta = \frac{1}{3}$, then the value of λ is:

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

59. Evaluate:

$$\lim_{x \rightarrow e} \frac{\log x - 1}{x - e}$$

- (A) 1
 - (B) $\frac{1}{2}$
 - (C) $\frac{1}{e}$
 - (D) Does not exist
-

60. Evaluate:

$$\lim_{x \rightarrow \frac{\pi}{3}} \frac{\tan^3 x - 3 \tan x}{\cos\left(x + \frac{\pi}{6}\right)}$$

- (A) 12
 - (B) 24
 - (C) -24
 - (D) -12
-

61. If

$$f(x) = \begin{cases} \frac{\sqrt{2 + \cos x} - 1}{(\pi - x)^2}, & x \neq \pi \\ k, & x = \pi \end{cases}$$

is continuous at $x = \pi$, then $k =$

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

62. The set of all the points at which

$$f(x) = |2 - |x||$$

is continuous but not differentiable is:

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

63. If

$$f(x) = \sqrt{2^{2x} \log(3x - 2)}$$

then $f'(2) =$

- (A) $\frac{4 \log 2 \log 4 + 3}{\sqrt{\log 4}}$
 - (B) $\frac{8(\log 2)^2 + 3}{2\sqrt{\log 4}}$
 - (C) $\frac{8(\log 4)^2 + 3}{2\sqrt{\log 4}}$
 - (D) $\frac{8 \log 2 \log 4 + 3}{2\sqrt{\log 4}}$
-

64. If

$$y = \sec^{-1} \left(\frac{1 + x^2}{2x} \right) \quad \text{and} \quad x > 1,$$

then

$$\frac{dy}{dx} =$$

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

65. The cubic equation

$$2x^3 - 3x^2 + 6x + 2 = 0$$

- (A) has 3 distinct real roots
 - (B) has only one real root in the interval $(-1, 0)$
 - (C) has two distinct real roots
 - (D) has only one real root in the interval $(0, 1)$
-

66. If the vertical angle of a cone is 60° and the rate of change of its total surface area is $2\sqrt{3} \text{ cm}^2/\text{sec}$, then the rate of change of its volume (in cm^3/sec) when its radius is 5 cm is:

- (A) 15
 - (B) 10
 - (C) 5
 - (D) 9
-

67. The surface area of a sphere is $49\pi \text{ sq.cm}$. If it is increased by 0.016 sq.cm. , then the approximate increase in its volume (in c.c.) is:

- (A) 0.07
 - (B) 0.04
 - (C) 0.032
 - (D) 0.028
-

68. If the normal drawn to the curve $y^4 = 16x^3$ at the point of intersection of this curve and the line $y = 2$ meets the X- and Y-axes at A and B respectively, then $OA + 3OB =$

- (A) 6
 - (B) 8
 - (C) 16
 - (D) 12
-

69. Evaluate:

$$\int \frac{dx}{(x^5 + 1)^{6/5}}$$

- (A) $\frac{1}{\sqrt[5]{x^5 + 1}} + c$

- (B) $\frac{\sqrt[5]{x^5 + 1}}{x} + c$
 (C) $\frac{x}{\sqrt[5]{x^5 + 1}} + c$
 (D) $\sqrt[5]{x^5 + 1} + c$
-

70. Evaluate:

$$\int \frac{\sin^2 x \cos^2 x}{\cos^6 x + \sin^6 x} dx$$

- (A) $\frac{1}{2} \tan^{-1}(\tan^2 x) + c$
 (B) $\frac{1}{2} \tan^{-1}(\tan^2 x) + c$
 (C) $\frac{1}{3} \tan^{-1}(\tan^3 x) + c$
 (D) $\tan^{-1}(\tan^3 x) + c$
-

71. If

$$\int (x + 5)\sqrt{x - 5} dx = \frac{2(x - 5)^{5/2}}{15} f(x) + c,$$

then $f(6) =$

- (A) 5
 (B) 20
 (C) 100
 (D) 53
-

72. Evaluate the integral:

$$\int \frac{x}{x^2 - 5x + 4} dx$$

- (A) $\frac{1}{3} \log \left| \frac{(x - 4)^4}{x - 1} \right| + c$
 (B) $\frac{4}{3} \log \left| \frac{x - 4}{(x - 1)^4} \right| + c$
 (C) $\frac{1}{3} \log \left| \frac{(x - 4)^2}{x - 1} \right| + c$
 (D) $\frac{4}{3} \log \left| \frac{x - 4}{(x - 1)^4} \right| + c$
-

73. Evaluate:

$$\int \frac{e^{2x} - 1}{e^{2x} + e^x + 1} dx$$

- (A) $\log(e^{2x} + e^x + 1) + x + c$
(B) $\log(e^{2x} + e^x + 1) - x + c$
(C) $\log\left(\frac{e^{2x} + e^x + 1}{e^{2x}}\right) + c$
(D) $\log\left|\frac{e^{2x} + e^x + 1}{e^{2x} - 1}\right| + c$
-

74. Evaluate:

$$\lim_{n \rightarrow \infty} \sum_{r=n}^{2n} \left(\frac{n^3 + r^3}{n^4} \right)$$

- (A) $\frac{19}{4}$
(B) $\frac{21}{4}$
(C) $\frac{23}{4}$
(D) $\frac{27}{4}$
-

75. Evaluate:

$$\int_{\pi/2}^{4051\pi/2} \frac{\cos^2 2x}{1 + \sin 2x} dx$$

- (A) 2026π
(B) 2047π
(C) 2027π
(D) 2025π
-

76. Evaluate:

$$\int_{-2\pi}^{2\pi} (1 + \cos x)^3 (1 - \cos x)^4 dx$$

- (A) 0
(B) 5π
(C) $\frac{5\pi}{2}$
(D) $\frac{5\pi}{4}$
-

77. Find the area of the region bounded by the curve

$$y = x^2 - 4,$$

the x -axis and the lines $x = -2$ and $x = 3$.

- (A) 13
 - (B) $\frac{46}{3}$
 - (C) $\frac{32}{3}$
 - (D) 11
-

78. If a and b are arbitrary constants, then the differential equation corresponding to the family of curves

$$ax^2 + 2hxy = 1$$

is

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

79. The general solution of the differential equation

$$\frac{dy}{dx} = \frac{2xy - 3y^2}{2x^2 + 3xy}$$

is

- (A) $3 \log \left| \frac{y}{x} \right| = -\frac{x}{y} + c$
 - (B) $\log |xy| = 2xy + c$
 - (C) $3 \log |xy| = \frac{2x}{y} + c$
 - (D) $\log \left| \frac{y}{x} \right| = xy + c$
-

80. The general solution of the differential equation

$$(x + y - 1)dy = (x - y + 1)dx$$

is

- (A) $x^2 - 2xy - y^2 + 2x + 2y + c = 0$
 - (B) $x^2 + 2xy - y^2 + 2x + 2y + c = 0$
 - (C) $x^2 + 2xy + y^2 + 2x + 2y + c = 0$
 - (D) $x^2 - 2xy - y^2 + 2x - 2y + c = 0$
-

81. If Q , L and T represent the electric charge, inductance and time respectively, then the physical quantity having the dimensions of $\frac{QL}{T^2}$ is:

- (A) Magnetic energy
 - (B) Impedance
 - (C) Electric potential
 - (D) Electric field
-

82. A body is falling freely under gravity from a height of 200 m. The total displacement of the body during the second half-second, fourth half-second and sixth half-second of its motion is (Acceleration due to gravity = 10 m s^{-2}):

- (A) 26.25 m
 - (B) 32.50 m
 - (C) 37.25 m
 - (D) 42.25 m
-

83. If the minimum velocity of a projectile during its motion is 40 m s^{-1} and the ratio of its vertical and horizontal displacements at a time of 2 s is 1 : 2, then the angle of projection of the projectile is:

- (A) $\sin^{-1}(0.6)$
 - (B) $\cos^{-1}(0.6)$
 - (C) $\tan^{-1}(0.6)$
 - (D) $\sec^{-1}(0.6)$
-

84. A body is projected with a velocity of $15\sqrt{3} \text{ m s}^{-1}$ at an angle of 60° with the horizontal and another body is projected simultaneously from the same point in the same vertical plane with a velocity of 40 m s^{-1} at an angle of 30° with the horizontal. The time at which the velocity vectors of the two bodies will be in the same direction is:

- (A) 3.2 s
 - (B) 2.4 s
 - (C) 1.2 s
 - (D) 3.6 s
-

85. A small bead is placed on a thin circular loop of radius 25 cm which is rotating about its vertical diameter with a constant velocity of 10 rad s^{-1} . The angle made by the radius vector joining the center of the loop to the bead with the vertically downward direction is (Neglect friction and take $g = 10 \text{ m s}^{-2}$):

- (A) $\cos^{-1}(0.4)$
 - (B) $\cos^{-1}(0.6)$
 - (C) $\sin^{-1}(0.4)$
 - (D) $\sin^{-1}(0.6)$
-

86. A body is placed at the top of an inclined plane of angle of inclination $\tan^{-1}\left(\frac{9}{16}\right)$. If the plane is smooth, the body reaches the bottom in time T and if the plane is rough, it takes time $3T$ to reach the bottom of the plane, then the coefficient of kinetic friction between the body and the rough inclined plane is:

- (A) 0.2
 - (B) 0.3
 - (C) 0.4
 - (D) 0.5
-

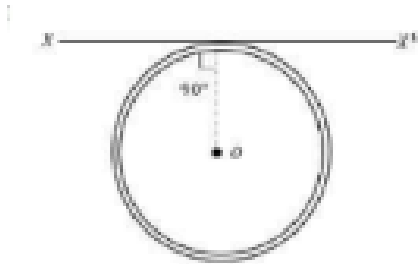
87. A 5 kg block pushed by 100 N over 10 m on a plane. If the coefficient of friction between the block and plane is 0.2, then the final kinetic energy of the block is _____ ($g = 10 \text{ m s}^{-2}$):

- (A) 1000 J
 - (B) 900 J
 - (C) 800 J
 - (D) 700 J
-

88. A force $F = 4x$ is applied to move an object from $x = 0$ to $x = 2\text{ m}$, then the work done is:

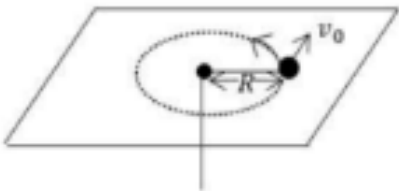
- (A) $8J$
 - (B) $16J$
 - (C) $4J$
 - (D) $32J$
-

89. A thin wire of length L and uniform linear mass density ρ is bent into a circular loop with centre at O as shown. The moment of inertia of the loop about the axis XX' is:



- (A) $\frac{\rho L^3}{8\pi^2}$
 - (B) $\frac{\rho L^3}{16\pi^2}$
 - (C) $\frac{5\rho L^3}{16\pi^2}$
 - (D) $\frac{3\rho L^3}{8\pi^2}$
-

90. On imparting an initial velocity v_0 , a ball begins to move in horizontal circle of radius R on horizontal plane. If the coefficient of friction between the ball and plane is μ , then the time required by ball to come to rest is:



- (A) $\frac{v_0^2}{\mu g}$
 - (B) $\frac{\mu g}{v_0}$
 - (C) $\frac{v_0 \mu}{g}$
 - (D) $\frac{g}{v_0 \mu}$
-

91. A particle is executing simple harmonic motion with time period T and amplitude A . The distance travelled by the particle in $\frac{T}{12}$ time starting from rest is:

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

92. Two blocks each of mass m are connected to a spring of spring constant K . If both are given velocity V in opposite directions as shown in the figure, then the maximum elongation of the spring is

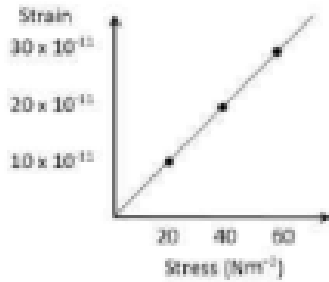


- (A) $\sqrt{\frac{mV^2}{K}}$
 (B) $\sqrt{\frac{2mV^2}{K}}$
 (C) $\sqrt{\frac{mV^2}{2K}}$
 (D) $\sqrt{\frac{mV^2}{4K}}$

93. Work required to shift an artificial satellite from an orbit of radius r to an orbit of radius $2r$ is

- (A) $\frac{GMm}{2r}$
 (B) $\frac{GMm}{4r}$
 (C) $\frac{GMm}{8r}$
 (D) Zero

94. The elastic behavior of a material for linear stress to linear strain is given in the figure. The energy density for a linear strain of 4×10^{-4} is



- (A) 20000 J m^{-3}
 (B) 16000 J m^{-3}
 (C) 12000 J m^{-3}
 (D) 8000 J m^{-3}

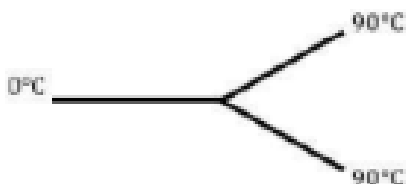
95. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is

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

96. Heat energy released by water of mass 3 kg when it is cooled by 20°C is (specific heat capacity of water $4200 \text{ J kg}^{-1} \text{K}^{-1}$)

- (A) 252000 J
 (B) 420000 J
 (C) 52000 J
 (D) 25200 J

97. Three rods made of the same material and having the same cross-section have been joined as shown in figure. Each rod is of same length. The left and right ends are kept at 0°C and 90°C respectively. The temperature of the junction will be



- (A) 45°C
 - (B) 60°C
 - (C) 30°C
 - (D) 20°C
-

98. Two gases A and B are initially at same pressure, volume and temperature. If A is compressed isothermally and B adiabatically to half of the initial volume, then the final pressure of A

- (A) greater than the final pressure of B
 - (B) equal to the final pressure of B
 - (C) less than the final pressure of B
 - (D) twice the final pressure of B
-

99. Assertion (A): When 1 g of ice melts at constant temperature at a pressure of 1 atm, the increase in internal energy is greater than 80 cal.

Reason (R): During melting of ice, work is done on the ice.

- (A) Both A and R are true. R is the correct explanation of A
 - (B) Both A and R are true, but R is not the correct explanation of A
 - (C) A is true, R is false
 - (D) A is false, R is true
-

100. The temperature at which the rms speed of hydrogen molecules is equal to that of oxygen molecules at 47°C is

- (A) 20 K
 - (B) 80 K
 - (C) 73 K
 - (D) 3 K
-

101. A person at rest hears an electric siren which is stationary. Now the person accelerates at 2 m s^{-2} along a straight line path. The distance travelled by him when he hears the frequency of the siren as 94% of its original value is (speed of sound = 330 m s^{-1}):

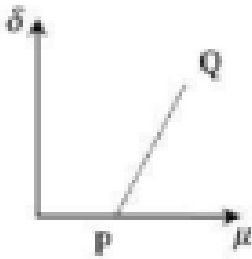
- (A) 49 m
-

- (B) 98 m
 - (C) 147 m
 - (D) 196 m
-

102. An object is placed at a distance of 15 cm from a convex lens of focal length 10 cm. On the other side of the lens, at its focus, a convex mirror is placed such that final image formed coincides with the object. The focal length of convex mirror is:

- (A) 20 cm
 - (B) 10 cm
 - (C) 15 cm
 - (D) 30 cm
-

103. For a prism of angle 5° , the angle of minimum deviation (δ) varies with refractive index (μ) as shown in the graph. The slope of the graph is:



- (A) 5°
 - (B) 5 rad
 - (C) 0.5°
 - (D) 0.5 rad
-

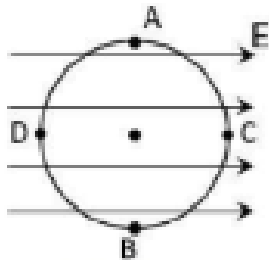
104. In Young's double slit experiment, the ratio of intensities of maxima and minima is 25 : 9. The ratio of intensities of two slits is:

- (A) 18 : 3
 - (B) 4 : 1
 - (C) 8 : 1
 - (D) 16 : 1
-

105. Two electric charges $+3.2 \times 10^{-19} \text{ C}$ and $-3.2 \times 10^{-19} \text{ C}$ are placed 2.4 \AA apart to form an electric dipole. It is placed in a uniform electric field of intensity $4 \times 10^5 \text{ V m}^{-1}$. The work done to rotate the electric dipole from equilibrium position by 180° is:

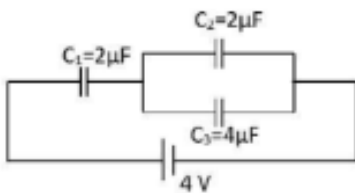
- (A) $3 \times 10^{-25} \text{ J}$
- (B) $6 \times 10^{-23} \text{ J}$
- (C) $12 \times 10^{-23} \text{ J}$
- (D) Zero

106. A circle of radius r is drawn in a uniform electric field E as shown in figure. If V_A, V_B, V_C and V_D are the potentials at A, B, C and D respectively, then:



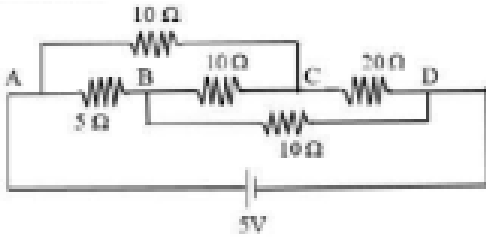
- (A) $V_A = V_B, V_C = V_D$
- (B) $V_A > V_B, V_C = V_D$
- (C) $V_A = V_B, V_C < V_D$
- (D) $V_A > V_B, V_C < V_D$

107. In the arrangement shown, the charge on capacitor C_1 is:



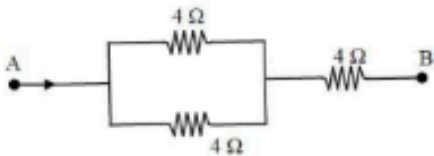
- (A) $6 \mu\text{C}$
- (B) $4 \mu\text{C}$
- (C) $8 \mu\text{C}$
- (D) $2 \mu\text{C}$

108. The current I drawn from the 5 V source will be:



- (A) 0.67 A
 (B) 2 A
 (C) 0.33 A
 (D) 0.5 A

109. In the circuit given below, each of three resistors of 4Ω can have a maximum power of 20 W otherwise, it will melt. The maximum power which the whole circuit can take is:



- (A) 30 W
 (B) 40 W
 (C) 20 W
 (D) 10 W

110. If a current is passing in a spring, it

- (A) gets compressed
 (B) gets expanded
 (C) oscillates
 (D) remains unchanged

111. Magnetic moment of an electron moving in a circular orbit of radius r with a speed v is

- (A) $\frac{ev^2}{r}$
 (B) evr
 (C) $\frac{ev^2}{2r}$
 (D) $\frac{evr}{2}$

112. A material satisfies the relation $\mu_0(H + M) = 0$, where H and M are magnetic intensity and magnetization respectively; then the material is

- (A) Nonmagnetic
 - (B) Paramagnetic
 - (C) Ferromagnetic
 - (D) Diamagnetic
-

113. In a coil the current varies from $-3A$ to $+3A$ in $4s$, and induces an emf of $0.2V$. The self inductance of the coil is

- (A) $0.133H$
 - (B) $0.266H$
 - (C) $0.65H$
 - (D) $0.532H$
-

114. To have dissipative power in an LCR series circuit to be half

- (A) current amplitude = $2 \times$ maximum current amplitude
 - (B) current amplitude = $\frac{\text{Maximum current amplitude}}{2}$
 - (C) current amplitude = $(\text{Maximum current amplitude})^{1/2}$
 - (D) current amplitude = $\frac{\text{Maximum current amplitude}}{\sqrt{2}}$
-

115. Which of the following statements are correct about electromagnetic waves?

1. Electromagnetic waves are produced by accelerating charges
2. Electromagnetic waves do not transport charge
3. Energy of electromagnetic waves is shared equally between electric and magnetic fields
4. Electromagnetic waves travel with same speed in all media

- (A) (i) and (iv) only
- (B) (ii) and (iii) only
- (C) (i), (ii) and (iv) only
- (D) (i), (ii) and (iii) only

116. Light of wavelength 1000 incidents on a metal surface of work function 6 eV . The maximum kinetic energy of photoelectrons is

- (A) 12.4 eV
 - (B) 6.4 eV
 - (C) 19.2 eV
 - (D) 0 eV
-

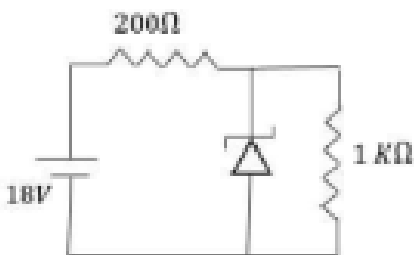
117. The energy of an electron in Bohr's hydrogen atom is -3.4 eV . The angular momentum of the electron is

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

118. The half-life of a certain radio isotope is 4 minutes. The number of radioactive nuclei at a given instant is 10^6 . Then the number of radioactive nuclei left 2 minutes later would be

- (A) $\frac{10^6}{2}$
 - (B) 10^3
 - (C) $\frac{10^6}{\sqrt{2}}$
 - (D) $\sqrt{2} \times 10^6$
-

119. The breakdown voltage of a zener diode is 10 V . It is used in a voltage regulator circuit shown in figure. Current through zener diode is



- (A) 20 mA

- (B) 30 mA
 - (C) 32 mA
 - (D) 12 mA
-

120. A carrier wave of frequency 2 MHz and peak voltage 15 V is used to modulate a message signal of frequency 20 kHz and peak voltage 8 V. The frequencies of side bands produced are

- (A) 2000 kHz, 20 kHz
 - (B) 2020 kHz, 1980 kHz
 - (C) 2040 kHz, 1960 kHz
 - (D) 2020 kHz, 2000 kHz
-

121. A ball has a mass of 50 g and a speed of 50 m s⁻¹. If the speed is measured within an accuracy of 2%, then the uncertainty in its position (in m) is

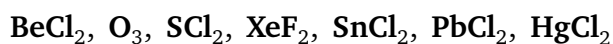
$$(h = 6.626 \times 10^{-34} \text{ J s}, \pi = 3.14)$$

- (A) 2.12×10^{-34}
 - (B) 1.06×10^{-33}
 - (C) 2.12×10^{-33}
 - (D) 1.06×10^{-34}
-

122. The work function of Mg, Cu, Ag, Li are 3.7, 4.8, 4.3, 2.5 eV respectively. A wavelength of 300 nm light is shined on them. The metals which undergo photoelectric effect are

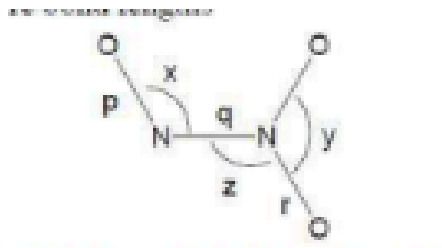
- (A) Mg, Cu
 - (B) Cu, Ag
 - (C) Ag, Li
 - (D) Mg, Li
-

123. How many of the following molecules are linear with no lone pairs of electrons on the central atom?



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

124. Following is the structural representation of N_2O_3 molecule in which x, y, z are bond angles and p, q, r are bond lengths. The correct orders of bond angles and bond lengths respectively are



- (A) $x < z < y$ and $p < q < r$
 - (B) $x < y < z$ and $p < r < q$
 - (C) $y < z < x$ and $p < r < q$
 - (D) $x < y < z$ and $p < q < r$
-

125. At $T(K)$, the rms velocity of an ideal gas is $x \text{ m s}^{-1}$. At what temperature (in K), the rms velocity becomes $3x \text{ m s}^{-1}$?

- (A) $3T$
 - (B) $4T$
 - (C) $9T$
 - (D) $18T$
-

126. 5.4 g of a metal (M) reacts with chlorine to form 26.7 g of metal chloride. What is the weight (in g) of M that reacts with 48 g of oxygen?

- (A) 67.5
 - (B) 40.5
 - (C) 54
 - (D) 27
-

127. Combustion of methane gives $CO_2(g)$ and $H_2O(l)$. What is enthalpy of combustion ($\Delta_c H^\circ$ in kJ mol^{-1}) of $CH_4(g)$ at 298 K?

$$(\Delta_f H^\circ(CH_4(g)) = -x \text{ kJ mol}^{-1}, \Delta_f H^\circ(CO_2(g)) = -y \text{ kJ mol}^{-1}, \Delta_f H^\circ(H_2O(l)) = -z \text{ kJ mol}^{-1})$$

- (A) $-(y + 2z - x)$
(B) $(2z - y + x)$
(C) $(2z + x - y)$
(D) $-(2y + z + x)$
-

128. Identify the correct statements from the following:

1. Bomb calorimeter is used to determine the heat absorbed by water in a chemical reaction at constant volume
2. Heat capacity is an extensive property
3. The units of entropy are $J K^{-1}$

The correct answer is

- (A) I, II, III
(B) I, II only
(C) I, III only
(D) II, III only
-

129. Match the following

List-I	List-II
A. Co, Ni	I. Electronegativity
B. K, Ba	II. Electron gain enthalpy
C. N, Cl	III. Metallic radius
D. Ar, Kr	IV. Standard reduction potential (-ve)

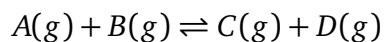
The correct answer is

- (A) A-III, B-I, C-IV, D-II
(B) A-IV, B-III, C-II, D-I
-

(C) A-IV, B-III, C-I, D-II

(D) A-III, B-IV, C-I, D-II

130. Observe the following reaction



In a 1 L closed flask, 2 moles of $A(g)$ and 1 mole of $B(g)$ were taken and heated to temperature $T(K)$. At equilibrium, the concentration of $C(g)$ is thrice the concentration of $B(g)$. What is the value of K_c ?

(A) 7.2

(B) 3.6

(C) 0.9

(D) 1.8

131. The dissociation constants of H_2A are

$$K_{a1} = 6 \times 10^{-2} \quad \text{and} \quad K_{a2} = 6 \times 10^{-5}$$

respectively. At equilibrium,

$$[A^{2-}] = [H_2A]$$

What is the approximate concentration of H^+ at equilibrium?

(A) 1.9×10^{-3}

(B) 2×10^{-4}

(C) 1.9×10^{-5}

(D) 1.9×10^{-2}

132. The interstitial hydrides of which set of metals have same lattice as that of the parent metals?

(A) Yb, Ti

(B) V, Zr

(C) Ni, Pd

(D) Cs, Cr

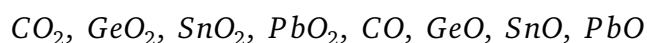
133. When lithium nitrate and calcium nitrate are heated in separate test tubes, which of the following observations would be identical for both?

- (A) Evolution of colorless, non-flammable gas
 - (B) Evolution of brown fumes and gas that supports combustion
 - (C) The formation of a metal that reacts vigorously with water
 - (D) Gases are not liberated
-

134. In which of the following boron and boron related substances are not correctly matched with the application shown against it?

- (A) Boron fibres – manufacture of glass wool
 - (B) Metal borides – protective shields in nuclear industry
 - (C) Borax – flux for soldering metals
 - (D) Boric acid – mild antiseptic
-

135. The number of amphoteric oxides in the following is



- (A) 5
 - (B) 3
 - (C) 2
 - (D) 4
-

136. Which of the following radical initiates the chain reaction responsible for depletion of ozone layer?

- (A) CF_2Cl^\bullet
 - (B) Cl^\bullet
 - (C) ClO^\bullet
 - (D) OH^\bullet
-

137. A mixture (X) contains two liquids with large difference in their boiling points. Another

mixture (Y) contains two liquids with not much difference in their boiling points. Mixtures X and Y can be separated respectively by the methods

- (A) Simple distillation, Steam distillation
 - (B) Simple distillation, Fractional distillation
 - (C) Fractional distillation, Simple distillation
 - (D) Steam distillation, Fractional distillation
-

138. What are X and Y in the following set of reactions respectively?



- (A) 2-Methylpropan-1-ol ; 2-Methylpropanoic acid
 - (B) 2-Methylpropan-1-ol ; 2-Methylpropan-2-ol
 - (C) 2-Methylpropan-2-ol ; 2-Methylpropan-2-ol
 - (D) 2-Methylpropan-2-ol ; 2-Methylpropanoic acid
-

139. The correct IUPAC names of the compounds X and Y given below are respectively

- (A) 3-Methyl-4-ethylheptane ; 1-Phenylbutan-2-ol
 - (B) 4-Ethyl-3-Methylheptane ; 1-Phenylbutan-2-ol
 - (C) 3-(sec-butyl)-hexane ; 2-Hydroxy-1-phenylbutane
 - (D) 3-Methyl-4-Ethylheptane ; 2-Hydroxybutylbenzene
-

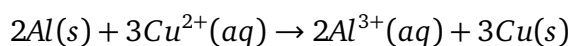
140. Atoms of element B form hcp lattice and atoms of element A occupy $\frac{2}{3}$ of tetrahedral voids. The formula of the compound formed by the elements A and B is

- (A) A_3B_4
 - (B) A_4B_3
 - (C) AB_4
 - (D) A_4B
-

141. 1.0 g of a non-electrolytic and non-volatile solute (X) was dissolved in 20.4 g of water. At 760 mm Hg the freezing point of solution was found to be -1.05°C . The molar mass (in g mol^{-1}) of the solute is ($K_f(\text{H}_2\text{O}) = 1.86 \text{ K kg mol}^{-1}$)

- (A) 96.8
 - (B) 43.4
 - (C) 86.8
 - (D) 48.4
-

142. ΔG° (in kJ mol^{-1}) for the cell reaction given below is



Given: $E_{\text{Al}^{3+}/\text{Al}}^{\circ} = -1.66\text{V}$, $E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = +0.34\text{V}$, $F = 96500 \text{ C mol}^{-1}$

- (A) -1158
 - (B) -579
 - (C) -386
 - (D) -772
-

143. Molten Al_2O_3 was electrolyzed between carbon electrodes. The mass (in g) of aluminium produced at cathode when 965 amperes current is passed through it for 1000 seconds is ($F = 96500 \text{ C mol}^{-1}$)

- (A) 30
 - (B) 90
 - (C) 60
 - (D) 45
-

144. At 300°C , decomposition of azomethane follows first order kinetics. Rate constant for this reaction at this temperature is $2.5 \times 10^{-4} \text{ s}^{-1}$. If the activation energy of the reaction is 42 kcal mol^{-1} , what is the temperature (in K) at which the half-life of the reaction is 138.6 seconds?

$$(R = 2 \text{ cal K}^{-1} \text{ mol}^{-1}, \log 20 = 1.30)$$

- (A) 725
 - (B) 425
 - (C) 525
 - (D) 625
-

145. Identify the correct pair of ions which are most effective towards the coagulation of sols $Fe_2O_3 \cdot xH_2O$ and CdS respectively.

- (A) PO_4^{3-} , Al^{3+}
 - (B) Al^{3+} , PO_4^{3-}
 - (C) $[Fe(CN)_6]^{4-}$, Al^{3+}
 - (D) Al^{3+} , $[Fe(CN)_6]^{4-}$
-

146. Which of the following statements are correct about chemisorption?

1. It is highly specific in nature.
2. It is reversible in nature.
3. It depends on nature of gas.
4. It is unilayer adsorption.

The correct answer is:

- (A) I & II only
 - (B) I & IV only
 - (C) I, II & IV only
 - (D) I, III & IV only
-

147. Which method of purification is used for refining titanium?

- (A) Zone refining
 - (B) Van Arkel method
 - (C) Mond process
 - (D) Liquation
-

148. Which of the following oxoacid is formed when phosphoric acid is made to react with PCl_5 ?

- (A) $H_4P_2O_6$
 - (B) $H_4P_2O_7$
 - (C) $H_4P_2O_5$
 - (D) H_3PO_3
-

149. Which of the following statement is not correct about the structures of ozone and sulphur dioxide?

- (A) Both have angular shape
 - (B) Both have resonance structures
 - (C) Both have same hybridization
 - (D) Both have same bond angles
-

150. The spin only magnetic moment of the element having highest third ionization enthalpy among Ti, V, Cr, Mn and Fe in its +3 state is (BM):

- (A) 3.87
 - (B) 4.90
 - (C) 5.92
 - (D) 2.84
-

151. Identify the correct set containing only ambidentate ligands.

- (A) NO_2^- , CN^- , SCN^-
 - (B) NH_3 , CN^- , $C_2O_4^{2-}$
 - (C) SO_4^{2-} , SCN^- , CO
 - (D) $C_2O_4^{2-}$, $(CH_3)_3P$, CO
-

152. Which one of the polymers does not contain $-COO-$ linkage in its structure?

- (A) Bakelite
- (B) Glyptal

- (C) PHBV
(D) Dacron

153. Match List-I with List-II and identify the correct combination.

List - I జాబితా - I Name of amino acid ఎమినో ఆమ్లం పేరు		List - II జాబితా - II R part of $\begin{array}{c} \text{H}_2\text{N}-\text{C}(\text{H})-\text{COOH} \\ \\ \text{R} \end{array}$	
A	Alanine ఎలనైన్	I	$-\text{CH}_2 - \text{CH}(\text{CH}_3)_2$
B	Leucine ల్యూసిన్	II	$-\text{CH}_2 - \text{OH}$
C	Serine సెరిన్	III	$-\text{CH}_3$
D	Cysteine సిస్టైన్	IV	$-\text{CH}_2\text{SH}$

- (A) A - I, B - II, C - III, D - IV
(B) A - III, B - I, C - II, D - IV
(C) A - II, B - III, C - IV, D - I
(D) A - IV, B - II, C - I, D - III

154. Two statements are given below:

Statement I: Aspirin inhibits the synthesis of chemicals which stimulate inflammation.

Statement II: The enzyme that degrades noradrenaline is inhibited by iproniazid.

The correct answer is:

- (A) Both statements I and II are correct
(B) Both statements I and II are not correct
(C) Statement I is correct but Statement II is not correct
(D) Statement I is not correct but Statement II is correct

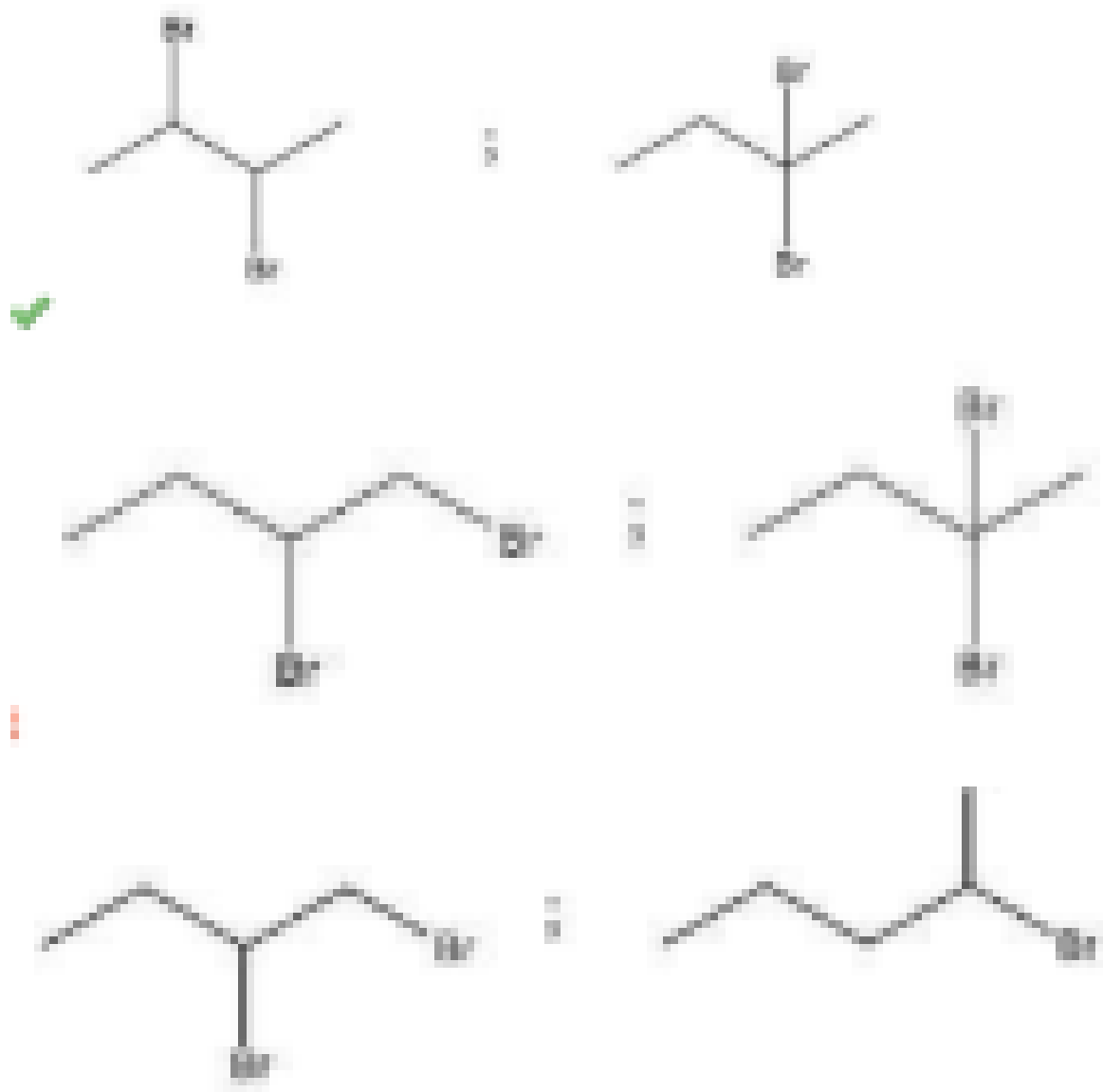
155. An organic compound C_4H_9Br (A) on reaction with Na/dry ether gave B. Photochemical chlorination of B gave two monochlorides. Correct statement regarding A is:

- (A) It is a chiral molecule
(B) It undergoes nucleophilic substitution by S_N1 mechanism

(C) Reaction of it with $NaOC_2H_5$ gave predominantly substitution product

(D) It can be obtained by the addition of HBr to but-2-ene

156. An isomer of C_4H_8 (A) exhibits cis-trans isomerism. Reaction of A with Br_2/CCl_4 gave B. Another organic compound C_4H_6 (C) forms sodium derivative with $NaNH_2$. Reaction of C with HBr gave D. What are B and D respectively?



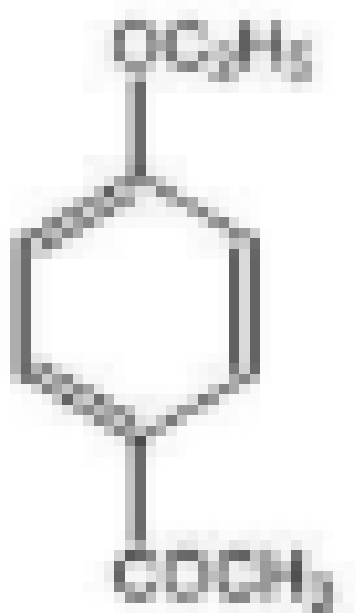
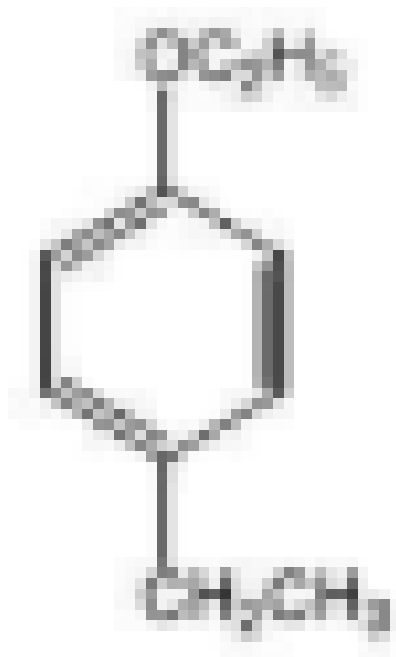


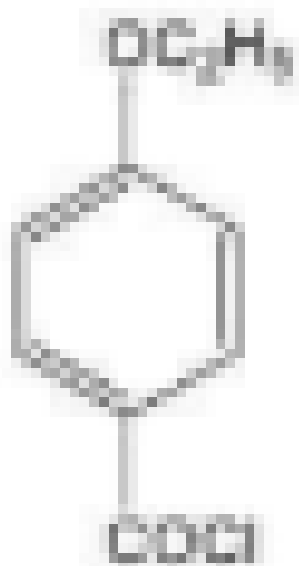
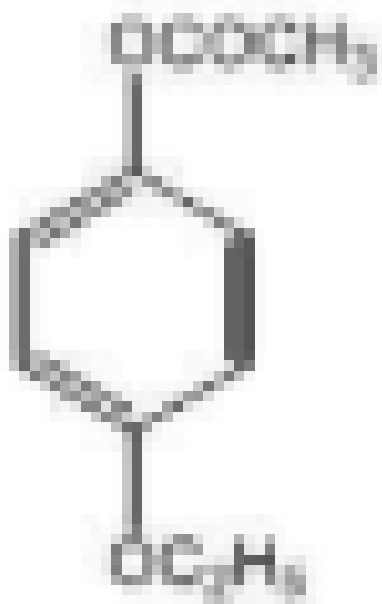
Options :

- (A) Fig. A
- (B) Fig. B
- (C) Fig. C
- (D) Fig. D

157. Identify the major product 'Z' in the given sequence of reactions.







Options :

- (A) Fig. A
- (B) Fig. B
- (C) Fig. C
- (D) Fig. D

158. The ratio between the number of σ -electrons and number of π -electrons in the final

product Z is:

- (A) 15 : 4
 - (B) 13 : 5
 - (C) 12 : 5
 - (D) 11 : 4
-

159. Identify C in the given reaction sequence.

- (A) HCOOC_2H_5
 - (B) $\text{C}_6\text{H}_5\text{CO}_2\text{CH}_3$
 - (C) $\text{C}_6\text{H}_5\text{CO}_2\text{CH}_2\text{C}_6\text{H}_5$
 - (D) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
-

160. Choose the correct statement(s) with regard to N-ethyl benzene sulphonamide.

1. It is soluble in alkali.
2. It is formed by reaction between 1° amine and Hinsberg reagent.
3. It is formed by reaction between 2° amine and Hinsberg reagent.

Options :

- (A) I only
 - (B) I & II only
 - (C) II & III only
 - (D) III only
-