TS EAMCET 2025 Engineering May 3 Shift 1 Question Paper

Time Allowed :3 Hours	Maximum Marks :160	Total Questions :160

General Instructions

1. The **TS EAMCET 2025 Engineering** examination is conducted in **Computer-Based Test (CBT)** mode.
2. The duration of the test is **3 hours**.
3. The question paper consists of **160 multiple-choice questions (MCQs)** divided into three sections:
   - **Mathematics – 80 Questions**
   - **Physics – 40 Questions**
   - **Chemistry – 40 Questions**
4. Each question carries **1 mark**. There is **no negative marking**.
5. The medium of the question paper is **English** and **Telugu/Urdu (as opted by the candidate)**.
6. Candidates must report at the test center **at least 90 minutes before** the commencement of the examination.
7. Candidates must carry:
   - **TS EAMCET 2025 Hall Ticket**
   - **Filled-in Online Application Form (printout)**
   - **Valid Photo ID Proof** (Aadhaar, Passport, PAN, Driving Licence, etc.)
8. Rough work must be done only on the provided rough sheets. Additional sheets will not be provided.
9. Use of **calculators, mobile phones, smart watches, or any electronic devices** is strictly prohibited.
10. Follow the invigilator's instructions carefully. Any malpractice will result in **disqualification**.

Mathematics

1. If $D \subseteq R$ and $f : D \to R$ defined by $f(x) = \frac{x^2+x+a}{x^2-x+a}$ is a surjection, then 'a' lies in the interval

(A) R

(B) $(0, \infty)$

(C) $(-\infty, 0)$
(D) $(0, 1)$

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2. If the domain of the real valued function $f(x) = \frac{1}{\sqrt{\log_{\frac{1}{3}}\left(\frac{x-1}{2-x}\right)}}$ is (a, b), then $2b =$

(A) $a - 1$
(B) a
(C) $a + 1$
(D) $a + 2$

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3. If $\frac{1}{2.7} + \frac{1}{7.12} + \frac{1}{12.17} + \frac{1}{17.22} + \ldots$ to 10 terms $= k$, then $k =$

(A) $\frac{2}{51}$
(B) $\frac{5}{51}$
(C) $\frac{5}{52}$
(D) $\frac{1}{26}$

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4. If the system of simultaneous linear equations $x + \lambda y - 2z = 1$, $x - y + \lambda z = 2$ and $x - 2y + 3z = 3$ is inconsistent for $\lambda = \lambda_1$ and λ_2, then $\lambda_1 + \lambda_2 =$

(A) 5
(B) $\sqrt{5}$
(C) 1
(D) -1

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5. The system of linear equations $(\sin\theta)x + y - 2z = 0$, $2x - y + (\cos\theta)z = 0$ and $-3x + (\sec\theta)y + 3z = 0$, where $\theta \neq (2n+1)\frac{\pi}{2}$, has non-trivial solution for

(A) $\theta = n\pi + \frac{\pi}{4}, n \in Z$
(B) $\theta = n\pi + (-1)^n\frac{\pi}{4}, n \in Z$
(C) $\theta = n\pi + (-1)^n\frac{\pi}{2}, n \in Z$
(D) $\theta = 2n\pi \pm \frac{\pi}{4}, n \in Z$

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6. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then Adj(Adj(Adj A)) =

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

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7. The sum of all the roots of the equation $\begin{vmatrix} x & -3 & 2 \\ -1 & -2 & (x-1) \\ 1 & (x-2) & 3 \end{vmatrix} = 0$ **is**

(A) 13
(B) 3
(C) 2
(D) 7

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8. One of the values of $\sqrt{24-70i} + \sqrt{-24+70i}$ **is**

(A) $2 + 12i$
(B) $12 - 2i$
(C) $-12 + 2i$
(D) $-12 - 2i$

---

9. The set of all values of θ **such that** $\frac{1-i\cos\theta}{1+2i\sin\theta}$ **is purely imaginary is**

(A) $\left\{n\pi + (-1)^n \frac{\pi}{4}, n \in Z\right\}$
(B) $\left\{n\pi + (-1)^n \frac{\pi}{4}, n \in Z\right\}$ (Note: The visual options are similar, but the key points to the solution for $\sin\theta$)
(C) $\left\{n\pi + (-1)^n \frac{\pi}{2}, n \in Z\right\}$
(D) $\left\{2n\pi \pm \frac{\pi}{4}, n \in Z\right\}$

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10. If $\cos\alpha + \cos\beta + \cos\gamma = 0 = \sin\alpha + \sin\beta + \sin\gamma$**, then** $\sin 2\alpha + \sin 2\beta + \sin 2\gamma =$

(A) $\cos(\alpha+\beta) + \cos(\beta+\gamma) + \cos(\gamma+\alpha)$
(B) $\cos^2\alpha + \cos^2\beta + \cos^2\gamma$
(C) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$
(D) $\cos(2\alpha-\beta-\gamma) + \cos(2\beta-\gamma-\alpha) + \cos(2\gamma-\alpha-\beta)$

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11. If α **is a root of the equation** $x^2 - x + 1 = 0$ **then**
$\left(\alpha + \frac{1}{\alpha}\right)^3 + \left(\alpha^2 + \frac{1}{\alpha^2}\right)^3 + \left(\alpha^3 + \frac{1}{\alpha^3}\right)^3 + \ldots$ **to 12 terms =**

(A) -32
(B) 32
(C) 0
(D) 16

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12. If the equations $x^2 + px + 2 = 0$ **and** $x^2 + x + 2p = 0$ **have a common root, then the sum of the roots of the equation** $x^2 + 2px + 8 = 0$ **is**

(A) -3
(B) 3
(C) 6

(D) -6

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13. If both roots of the equation $x^2 - 5ax + 6a = 0$ exceed 1, then the range of 'a' is
(A) $[-1, 0) \cup \left[\frac{24}{25}, \infty\right)$
(B) $\left[\frac{24}{25}, \infty\right)$
(C) $[-1, 0)$
(D) R

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14. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 - 4x^3 + 3x^2 + 2x - 2 = 0$ such that α and β are integers and γ, δ are irrational numbers, then $\alpha + 2\beta + \gamma^2 + \delta^2 =$
(A) 5
(B) 7
(C) 11
(D) 13

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15. The equation having the multiple root of the equation $x^4 + 4x^3 - 16x - 16 = 0$ as its root is
(A) $x^2 + 2x - 3 = 0$
(B) $x^2 - 3x + 2 = 0$
(C) $x^2 + x - 2 = 0$
(D) $x^2 - 4x + 3 = 0$

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16. There are 15 stations on a train route and the train has to be stopped at exactly 5 stations among these 15 stations. If it stops at at least two consecutive stations, then the number of ways in which the train can be stopped is
(A) ${}^{11}C_5$
(B) ${}^{15}C_5$
(C) ${}^{15}C_5 - {}^{11}C_5$
(D) ${}^{15}C_{10} - {}^{9}C_5$

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17. Number of all possible ways of distributing eight identical apples among three persons is
(A) 45
(B) 42
(C) 39
(D) 36

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18. Number of all possible words (with or without meaning) that can be formed using all the letters of the word CABINET in which neither the word CAB nor the word NET appear is
(A) 5040
(B) 4806
(C) 4800
(D) 5034

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19. Numerically greatest term in the expansion of $(2x-3y)^n$ when $x=\frac{7}{2}, y=\frac{3}{7}$ and $n=13$ is
(A) $13.3^5.7^9$
(B) $13.3^4.7^9$
(C) $26.3^5.7^9$
(D) $26.3^4.7^9$

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20. If $C_0, C_1, C_2, \ldots, C_8$ are the binomial coefficients in the expansion of $(1+x)^8$ then $\sum_{r=1}^{8} r^3 \frac{C_r}{C_{r-1}} =$
(A) 540
(B) 336
(C) 105
(D) 270

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21. If $\frac{x+3}{(x+1)(x^2+2)} = \frac{a}{x+1} + \frac{bx+c}{x^2+2}$, then $a-b+c =$
(A) 0
(B) 1
(C) 3
(D) 2

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22. If $3\sin\theta + 4\cos\theta = 3$ and $\theta \neq (2n+1)\frac{\pi}{2}$, then $\sin 2\theta =$
(A) $\frac{336}{625}$
(B) $\frac{7}{25}$
(C) $\frac{24}{25}$
(D) $-\frac{336}{625}$ (Interpreted from Option 4 marked correct)

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23. $\frac{\cos 15^\circ \cos^2 22\frac{1}{2}^\circ - \sin 75^\circ \sin^2 52\frac{1}{2}^\circ}{\cos^2 15^\circ - \cos^2 75^\circ} =$
(A) 1
(B) $1_{\frac{}{2}}$
(C) $1_{\frac{}{4}}$
(D) $1_{\frac{}{8}}$

24. $\mathbf{16}\ \sin 12^\circ \cos 18^\circ \sin 48^\circ =$
(A) $\sqrt{10-2\sqrt{5}}$
(B) $\sqrt{10+2\sqrt{5}}$
(C) $\sqrt{5}-1$
(D) $\sqrt{5}+1$

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25. Number of solutions of the equation $\sin^2\theta + 2\cos^2\theta - \sqrt{3}\sin\theta\cos\theta = 2$ **lying in the interval** $(-\pi, \pi)$ **is**
(A) 2
(B) 3
(C) 4
(D) 5

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26. If $0 \le x < \frac{3}{4}$ **then the number of values of** x **satisfying the equation** $\tan^{-1}(2x-1) + \tan^{-1}(2x) = \tan^{-1}(4x) - \tan^{-1}(2x+1)$ **is**
(A) 0
(B) 1
(C) 2
(D) 3

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27. If $\sinh^{-1} x = \cosh^{-1} y = \log(1+\sqrt{2})$ **then** $\tan^{-1}(x+y) =$
(A) $67\frac{1}{2}^\circ$
(B) 75°
(C) $22\frac{1}{2}^\circ$
(D) 15°

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28. In a triangle ABC, if $c^2 - a^2 = b(\sqrt{3}c - b)$ **and** $b^2 - a^2 = c(c-a)$**, then** $|\mathbf{ACB} =$
(A) 30°
(B) 60°
(C) 45°
(D) 90°

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29. Let ABC be a triangle right angled at B. If $a = 13$ **and** $c = 84$**, then** $r + R =$
(A) 42.5
(B) 169
(C) 98
(D) 48.5

30. If $\bar{a} = (x + 2y - 3)\bar{i} + (2x - y + 3)\bar{j}$ and $\bar{b} = (3x - 2y)\bar{i} + (x - y + 1)\bar{j}$ are two vectors such that $\bar{a} = 2\bar{b}$, then $y - 5x =$
(A) 10
(B) -10
(C) 8
(D) -8

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31. $7\bar{i} - 4\bar{j} + 7\bar{k}$, $\bar{i} - 6\bar{j} + 10\bar{k}$, $-\bar{i} - 3\bar{j} + 4\bar{k}$, $5\bar{i} - \bar{j} + \bar{k}$ are the position vectors of the points A, B, C, D respectively. If $p\bar{i} + q\bar{j} + r\bar{k}$ is the position vector of the point of intersection of the diagonals of the quadrilateral ABCD, then $p + q + r =$
(A) 4
(B) 5
(C) 0
(D) 1

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32. If $\bar{a} = \bar{i} + \sqrt{11}\bar{j} - 2\bar{k}$ and $\bar{b} = \bar{i} + \sqrt{11}\bar{j} - 10\bar{k}$ are two vectors then the component of $\bar{b}$ perpendicular to $\bar{a}$ is
(A) $3\bar{i} - \sqrt{11}\bar{j} - 4\bar{k}$
(B) $\bar{i} - \sqrt{11}\bar{j} - 5\bar{k}$
(C) $-(\bar{i} + \sqrt{11}\bar{j} + 6\bar{k})$
(D) $-5\bar{i} + \sqrt{11}\bar{j} + 3\bar{k}$

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33. Let $\bar{a} = \bar{i} + 2\bar{j} + 2\bar{k}$ and $\bar{b} = 2\bar{i} - \bar{j} + p\bar{k}$ be two vectors. If $(\bar{a}, \bar{b}) = 60°$, then $p =$
(A) $\frac{\sqrt{5}}{3\sqrt{2}}$
(B) $\frac{3\sqrt{5}}{\sqrt{7}}$
(C) $\frac{\sqrt{3}}{\sqrt{7}}$
(D) $\frac{\sqrt{5}}{\sqrt{7}}$

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34. Let π_1 be the plane determined by the vectors $\bar{i} + \bar{j}, \bar{i} + \bar{k}$ and π_2 be the plane determined by the vectors $\bar{j} - \bar{k}, \bar{k} - \bar{i}$. Let $\bar{a}$ be a non-zero vector parallel to the line of intersection of the planes π_1 and π_2. If $\bar{b} = \bar{i} + \bar{j} - \bar{k}$ then the angle between the vectors $\bar{a}$ and $\bar{b}$ is
(A) $\text{Cos}^{-1}\left(\sqrt{\frac{2}{3}}\right)$
(B) $\frac{\pi}{2}$
(C) $\text{Cos}^{-1}\left(\frac{1}{\sqrt{3}}\right)$
(D) $\text{Cos}^{-1}\left(\frac{\sqrt{2}}{3}\right)$

35. The variance of the discrete data 3, 4, 5, 6, 7, 8, 10, 13 is
(A) 7.5
(B) 8
(C) 9.5
(D) 9

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36. If a number x is drawn randomly from the set of numbers $\{1, 2, 3, \ldots, 50\}$, then the probability that number x that is drawn satisfies the inequation $x + \frac{10}{x} \leq 11$ is
(A) 4
(B) 9
(C) 4
(D) 1/5 (Note: Options in image are fractions like 4/50, 9/50 etc. Option 4 shows as "1/5", Option 1 as "4/something" but simplified or typo in OCR. Based on solution, correct answer is 1/5.)

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37. If a coin is tossed seven times, then the probability of getting exactly three heads such that no two heads occur consecutively is
(A) $\frac{5}{64}$
(B) $\frac{5}{32}$
(C) $\frac{5}{128}$
(D) $\frac{35}{128}$

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38. Two cards are drawn randomly from a pack of 52 playing cards one after the other with replacement. If A is the event of drawing a face card in first draw and B is the event of drawing a clubs card in second draw, then $P\left(\frac{B}{A}\right) =$
(A) $\frac{11}{12}$
(B) $\frac{12}{13}$
(C) $\frac{3}{4}$
(D) $\frac{1}{4}$

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39. If X is a random variable with probability distribution $P(X = k) = \frac{(2k+3)c}{3^k}$, $k = 0, 1, 2, \ldots, \infty$, then $P(X = 3) =$
(A) $\frac{1}{24}$
(B) $\frac{1}{18}$
(C) $\frac{1}{6}$
(D) $\frac{1}{3}$

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40. If a Poisson variate X satisfies the relation $P(X = 3) = P(X = 5)$, then $P(X = 4) =$
(A) $\frac{50}{3e^{\sqrt{20}}}$
(B) $\frac{20000}{3e^{20}}$
(C) $\frac{125}{3e^{10}}$
(D) $\frac{25}{3e^{\sqrt{20}}}$

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41. The equation of the locus of a point which is at a distance of 5 units from a fixed point (1,4) and also from a fixed line $2x + 3y - 1 = 0$ is
(A) $9x^2 + 12xy + 4y^2 - 30x - 108y + 222 = 0$
(B) $9x^2 - 12xy + 4y^2 - 30x - 98y + 220 = 0$
(C) $9x^2 + 12xy + 4y^2 - 22x - 108y + 222 = 0$
(D) $9x^2 - 12xy + 4y^2 - 22x - 98y + 220 = 0$

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42. If $2x^2 + xy - 6y^2 + k = 0$ is the transformed equation of $2x^2 + xy - 6y^2 - 13x + 9y + 15 = 0$ when the origin is shifted to the point (a, b) by translation of axes, then $k =$
(A) 1
(B) 0
(C) 21
(D) 15

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43. The line $L \equiv 6x + 3y + k = 0$ divides the line segment joining the points (3,5) and (4,6) in the ratio -5:4. If the point of intersection of the lines $L = 0$ and $x - y + 1 = 0$ is $P(g, h)$ then $h =$
(A) $2g$
(B) $2g - 1$
(C) $3g$
(D) $g + 1$

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44. A straight line through the point P(1,2) makes an angle θ with positive X-axis in anti-clockwise direction and meets the line $x + \sqrt{3}y - 2\sqrt{3} = 0$ at Q. If $PQ = \frac{1}{2}$, then $\theta =$
(A) $\frac{\pi}{6}$
(B) $\frac{5\pi}{6}$
(C) $\frac{2\pi}{3}$
(D) $\frac{\pi}{3}$

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45. The lines $x-2y+1=0$, $2x-3y-1=0$ and $3x-y+k=0$ are concurrent. The angle between the lines $3x-y+k=0$ and $mx-3y+6=0$ is $45°$. If m is an integer, then $m-k=$
(A) -6
(B) 18
(C) 6
(D) -18

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46. If $\tan^{-1}(2\sqrt{10})$ is the angle between the lines $ax^2+4xy-2y^2=0$ and $a \in Z$, then the product of the slopes of given lines is
(A) $\frac{3}{2}$
(B) $\frac{2}{3}$
(C) $-\frac{2}{3}$
(D) $-\frac{3}{2}$

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47. If the equation of the circumcircle of the triangle formed by the lines $L_1 \equiv x+y=0$, $L_2 \equiv 2x+y-1=0$, $L_3 \equiv x-3y+2=0$ is $\lambda_1 L_1 L_2+\lambda_2 L_2 L_3+\lambda_3 L_3 L_1=0$, then the expression involving λ's evaluates to
(Note: The expression image is partially cut off but evaluates to 3 as per the key).
(A) 1
(B) 2
(C) 3
(D) 4

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48. A circle C touches X-axis and makes an intercept of length 2 units on Y-axis. If the centre of this circle lies on the line $y=x+1$ then a circle passing through the centre of the circle C is
(A) $x^2+y^2-2x-4y+1=0$
(B) $x^2+y^2-26x-20y+19=0$
(C) $x^2+y^2-20x-26y+19=0$
(D) $x^2+y^2+2x-4y+1=0$

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49. If m_1, m_2 are the slopes of the tangents drawn through the point $(-1,-2)$ to the circle $(x-3)^2+(y-4)^2=4$, then $\sqrt{3}|m_1-m_2|=$
(A) 1
(B) 2
(C) 3
(D) 4

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50. A line meets the circle $x^2+y^2-4x-4y-8=0$ in two points A and B. If P(2,-2) is a point on the circle such that $PA=PB=2$ then the equation of the line AB is
(A) $2x+3y=0$
(B) $3x+2y=0$
(C) $2x+3=0$
(D) $2y+3=0$

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51. If the centre (α,β) of a circle cutting the circles $x^2+y^2-2y-3=0$ and $x^2+y^2+4x+3=0$ orthogonally lies on the line $2x-3y+4=0$, then $2\alpha+\beta=$
(A) 3
(B) -3
(C) 0
(D) 1

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52. The radius of a circle C_1 is thrice the radius of another circle C_2 and the centres of C_1 and C_2 are (1,2) and (3,-2) respectively. If they cut each other orthogonally and the radius of the circle C_1 is 3r, then the equation of the circle with r as radius and (1,-2) as centre is
(A) $x^2+y^2-2x+4y-3=0$
(B) $x^2+y^2-2x+4y+7=0$
(C) $x^2+y^2-2x+4y-7=0$
(D) $x^2+y^2-2x+4y+3=0$

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53. If the normals drawn at the points $P\left(\frac{3}{4},\frac{3}{2}\right)$ and $Q(3,3)$ on the parabola $y^2=3x$ intersect again on $y^2=3x$ at R, then R =
(A) $(12,6)$
(B) $\left(\frac{27}{4},-\frac{9}{2}\right)$
(C) $\left(\frac{3}{16},\frac{3}{4}\right)$
(D) $\left(\frac{1}{12},-\frac{1}{2}\right)$

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54. If θ is the acute angle between the tangents drawn from the point (1,5) to the parabola $y^2=9x$ then
(A) $\frac{\pi}{6}<\theta<\frac{\pi}{4}$
(B) $\frac{\pi}{3}<\theta<\frac{\pi}{2}$
(C) $0<\theta<\frac{\pi}{6}$
(D) $\frac{\pi}{4}<\theta<\frac{\pi}{3}$

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55. Let P be a point on the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ and let the perpendicular drawn through P to the major axis meet its auxiliary circle at Q. If the normals drawn

at P and Q to the ellipse and the auxiliary circle respectively meet in R, then the equation of the locus of R is
(A) $x^2 + y^2 = 5$
(B) $x^2 + y^2 = 13$
(C) $x^2 + y^2 = 25$
(D) $x^2 + y^2 = 1$

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56. The midpoint of the chord of the ellipse $x^2 + \frac{y^2}{4} = 1$ formed on the line $y = x + 1$ is
(A) $\left(\frac{4}{5}, \frac{9}{5}\right)$
(B) $\left(-\frac{1}{5}, \frac{4}{5}\right)$
(C) $\left(\frac{1}{5}, \frac{6}{5}\right)$
(D) $\left(-\frac{6}{5}, -\frac{1}{5}\right)$

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57. If the tangent drawn at the point $P(3\sqrt{2}, 4)$ on the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$ meets its directrix at $Q(\alpha, \beta)$ in fourth quadrant then $\beta =$
(A) $\frac{5\sqrt{2}-9}{4}$
(B) $-\frac{9}{5}$
(C) $\frac{12\sqrt{2}-20}{5}$
(D) $\frac{5}{4}$

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58. If $m : n$ is the ratio in which the point $\left(\frac{8}{5}, \frac{18}{5}\right)$ divides the line segment joining the points $(2, p/2)$ and $(p, -2p)$ where p is an integer then $\frac{3m+n}{3n} =$
(A) p
(B) $2p$
(C) $3p$
(D) $4p$

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59. If (α, β, γ) is the foot of the perpendicular drawn from a point $(-1, 2, -1)$ to the line joining the points $(2, -1, 1)$ and $(1, 1, -2)$, then $\alpha + \beta + \gamma =$
(Note: There is a likely typo in the question's Point P coordinate in the source PDF. Calculation assumes P(1,2,-1) to match option B).
(A) 2
(B) $\frac{1}{7}$
(C) 0
(D) 14

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60. If A(2,1,-1), B(6,-3,2), C(-3,12,4) are the vertices of a triangle ABC and the

equation of the plane containing the triangle ABC is $53x + by + cz + d = 0$, then $\frac{d}{b+c} =$
(A) -5
(B) 1
(C) 4
(D) -15

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61. If $\{x\} = x - [x]$ where $[x]$ is the greatest integer $\leq x$ and $\lim_{x\to 0^+} \frac{\cos^{-1}(1-\{x\}^2)\sin^{-1}(1-\{x\})}{\{x\}-\{x\}^4} = 0$, then $\tan\theta =$
(Note: The question likely implies the limit evaluates to a value related to $\tan\theta$ or the options. Solving the limit as $x \to 0^+$ leads to $\pi/\sqrt{2}$. However, based on the provided key, the answer corresponds to $1/\sqrt{3}$.)
(A) $\frac{1}{\sqrt{3}}$
(B) 1
(C) $\sqrt{3}$
(D) ∞

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62. For $a \neq 0$ and $b \neq 0$, if the real valued function $f(x) = \frac{\sqrt[5]{a(625+x)}-5}{\sqrt[5]{625+bx}-5}$ is continuous at $x = 0$, then $f(0) =$
(A) $\frac{4b}{5}$
(B) $\frac{5b}{4}$
(C) $\frac{5}{4b}$
(D) $\frac{4}{5b}$

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63. If $3^x y^x = x^{3y}$ then the value of $\frac{dy}{dx}$ at $x = 1$ is
(A) -3
(B) 3
(C) $\frac{1}{3}$
(D) $\frac{-1}{3}$

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64. The values of x at which the real valued function $f(x) = 7|2x + 1| - 19|3x - 5|$ is not differentiable is
(A) $1, -1$
(B) $\frac{1}{2}, -\frac{5}{3}$
(C) $-\frac{1}{2}, \frac{5}{3}$
(D) $0, 1$

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65. If $y = (1 - x^2)\tanh^{-1} x$ then $\frac{d^2y}{dx^2} =$

(A) $\frac{2xy}{(1+x^2)^2}$
(B) $-\frac{(x+y)}{(1-x^2)^2}$
(C) $\frac{2xy}{1-x^2}$
(D) $\frac{2(x+y)}{1-x^2}$ (Interpreted with negative sign context from calculation)

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66. If $f(x) = \log_{(x^2-2x+1)}(x^2 - 3x + 2)$, $x \in R - \{1, 2\}$ and $x \neq 0$, then $f'(3) =$
(A) 1
(B) 0
(C) $\log_e 4$
(D) $\log_4 e$

---

67. If the normal drawn at the point P on the curve $y^2 = x^3 - x + 1$ makes equal intercepts on the coordinate axes, then the equation of the tangent drawn to the curve at P is
(A) x - y = 0
(B) x - y = 4
(C) x - y = 1
(D) x - y = 2

---

68. If a balloon lying at an altitude of 30 m from an observer at a particular instant is moving horizontally at the rate of 1 m/s away from him, then the rate at which the balloon is moving away directly from the observer at the 40^{th} second is (in m/s)
(A) 1.2
(B) 0.9
(C) 0.6
(D) 0.8

---

69. The approximate value of $\sqrt{6560}$ is
(A) 80.9939
(B) 80.9838
(C) 78.9939
(D) 78.9838

---

70. A real valued function $f : [4, \infty) \to R$ is defined as $f(x) = (x^2 + x + 1)^{(x^2-3x-4)}$, then f is
(A) monotonically decreasing function
(B) monotonically increasing function

(C) increasing in (4,5) and decreasing in (5, ∞)
(D) decreasing in (4,5) and increasing in (5, ∞)

---

71. If a normal is drawn at a variable point P(x, y) on the curve $9x^2 + 16y^2 - 144 = 0$, then the maximum distance from the centre of the curve to the normal is
(A) 1
(B) 7
(C) 12
(D) 4

---

72. $\int e^{-x}(x^3 - 2x^2 + 3x - 4)dx =$
(A) $-e^{-x}(x^3 - x^2 + 5x - 1) + c$
(B) $e^{-x}(x^3 - x^2 + 5x - 1) + c$
(C) $e^{-x}(x^3 + x^2 + 5x + 1) + c$
(D) $-e^{-x}(x^3 + x^2 + 5x + 1) + c$

---

73. $\int(1 + \tan^2 x)(1 + 2x \tan x)dx =$
(A) $x \sec x + c$
(B) $x \tan^2 x + c$
(C) $x \sec^2 x + c$
(D) $x \tan x + c$

---

74. $\int \frac{x^2 \tan^{-1} x}{(1+x^2)^2} dx =$
(A) $\frac{(\tan^{-1} x)^2}{4} - \frac{x \tan^{-1} x}{2(1+x^2)} + \frac{1-x^2}{4(1+x^2)} + c$
(B) $\frac{(\tan^{-1} x)^2}{4} + \frac{4x \tan^{-1} x+1-x^2}{8(1+x^2)} + c$
(C) $\frac{(\tan^{-1} x)^2}{4} - \frac{x \tan^{-1} x}{1+x^2} - \frac{1-x^2}{4(1+x^2)} + c$
(D) $\frac{(\tan^{-1} x)^2}{4} - \frac{4x \tan^{-1} x-1+x^2}{8(1+x^2)} + c$

---

75. $\int \frac{\log x}{(1+x)^2} dx =$
(A) $1\frac{}{2\left[\frac{1}{1+x} + \frac{\log x}{(1+x)^2} - \log(x^2+x)\right]+c}$
(B) $1\frac{}{2\left[\frac{1}{1+x} - \frac{\log x}{(1+x)} - \log(1+x^2)\right]+c}$
(C) ...
(D) $\left[-\frac{\log x}{1+x} + \log\left(\frac{x}{1+x}\right)\right] + c$

---

76. $\int_0^{\pi/4} \frac{1}{5\cos^2 x+16\sin^2 x+8\sin x\cos x}dx =$
(A) $\tan^{-1}\left(\frac{4}{5}\right)$
(B) $2\tan^{-1}\left(\frac{3}{5}\right)$
(C) $1\frac{}{8\tan^{-1}\left(\frac{8}{9}\right)}$
(D) $1\frac{}{4\tan^{-1}\left(\frac{7}{8}\right)}$

---

77. $\int_8^{18} \frac{1}{(x+2)\sqrt{x-3}}dx =$
(A) $\pi\frac{}{6\sqrt{5}}$
(B) $\pi\frac{}{6}$
(C) $\pi\frac{}{3}$
(D) $\pi\frac{}{3\sqrt{5}}$

---

78. If $[\cdot]$ denotes the greatest integer function, then $\int_1^2 [x^2]dx =$
(A) $5+\sqrt{2}+\sqrt{3}$
(B) $5+\sqrt{2}-\sqrt{3}$
(C) $5-\sqrt{2}-\sqrt{3}$
(D) $5-\sqrt{2}+\sqrt{3}$

---

79. The differential equation of a family of hyperbolas whose axes are parallel to coordinate axes, centres lie on the line $y = 2x$ and eccentricity is $\sqrt{3}$ is
(A) $(2x-y)y_2 + y_1^2 - 2y_1 = y_1^3 + 2$
(B) $(y-2x)y_2 + y_1^2 + 2y_1 = y_1^3 + 2$
(C) $(y-2x)y_2 - y_1^2 + 2y_1 = y_1^3 - 2$
(D) $(y+2x)y_2 + y_1^2 + 2y_1 = y_1^3 - 2$

---

80. The general solution of the differential equation $(x^3-y^3)dx = (x^2y-xy^2)dy$ is
(A) $y = x\log(c|x+y|)$
(B) $y = \log(c|x+y|)$
(C) $xy = \log(c|x+y|)$
(D) $x + y + \log|x+y| + c = 0$

Physics

---

81. The phenomenon of physics that deals with the constitution and structure of matter at the minute scales of atoms and nuclei is

(A) Microscopic domain
(B) Macroscopic domain
(C) Classical physics
(D) Thermodynamics

---

82. If the length of a rod is measured as 830600 mm, then the number of significant figures in the measurement is
(A) 5
(B) 3
(C) 6
(D) 4

---

83. A particle initially at rest is moving along a straight line with an acceleration of $2\,\mathrm{ms}^{-2}$. At a time of $3\,\mathrm{s}$ after the beginning of motion, the direction of acceleration is reversed. The time from the beginning of the motion in which the particle returns to its initial position is
(A) $(3+\sqrt{3})s$
(B) $(2+\sqrt{2})s$
(C) $3(2+\sqrt{2})s$
(D) $2(3+\sqrt{3})s$

---

84. If a body projected with a velocity of $19.6\,\mathrm{ms}^{-1}$ reaches a maximum height of $9.8\,\mathrm{m}$, then the range of the projectile is (Neglect air resistance)
(A) 19.6 m
(B) 39.2 m
(C) 78.4 m
(D) 9.8 m

---

85. A force separately produces accelerations of $18\,\mathrm{ms}^{-2}$, $9\,\mathrm{ms}^{-2}$ and $6\,\mathrm{ms}^{-2}$ in three bodies of masses P, Q and R respectively. If the same force is applied on a body of mass P + Q + R, then the acceleration of that body is
(A) $3\,\mathrm{ms}^{-2}$
(B) $6\,\mathrm{ms}^{-2}$
(C) $2\,\mathrm{ms}^{-2}$
(D) $33\,\mathrm{ms}^{-2}$

---

86. A body of mass 500 g is falling from rest from a height of 3.2 m from the ground. If the body reaches the ground with a velocity of $6\,\mathrm{ms}^{-1}$, then the energy lost by the body due to air resistance is (Acceleration due to gravity = $10\,\mathrm{ms}^{-2}$)

(A) 14 J
(B) 7 J
(C) 21 J
(D) 28 J

---

87. A body of mass 'm' moving with a velocity of 'v' collides head on with another body of mass '2m' at rest. If the coefficient of restitution between the two bodies is 'e', then the ratio of the velocities of the two bodies after collision is
(A) $\frac{1+e}{1-2e}$
(B) $\frac{1+2e}{1-e}$
(C) $\frac{1-e}{1+2e}$
(D) $\frac{1-2e}{1+e}$

---

88. A thin uniform circular disc of mass $\frac{10}{\pi^2}$ kg and radius 2 m is rotating about an axis passing through its centre and perpendicular to its plane. The work done to increase the angular speed of the disc from 90 rev/min to 120 rev/min is
(A) 35 J
(B) 70 J
(C) 140 J
(D) 210 J

---

89. A solid cylinder of mass 2 kg, length 40 cm and radius 10 cm is placed in contact with a solid sphere of mass 0.5 kg and radius 10 cm such that the centres of the two bodies lie along the geometrical axis of the cylinder. The distance of the centre of mass of the system of two bodies from the centre of the sphere is
(A) 27 cm
(B) 15 cm
(C) 24 cm
(D) 18 cm

---

90. If the amplitude of a damped harmonic oscillator becomes half of its initial amplitude in a time of 10 s, then the time taken for the mechanical energy of the oscillator to become half of its initial mechanical energy is
(A) 2.5 s
(B) 20 s
(C) 10 s
(D) 5 s

---

91. A body is projected from the earth's surface with a speed $\sqrt{5}$ times the escape speed (V_e). The speed of the body when it escapes from the gravitational influence of the earth is
(A) $2V_e$
(B) V_e
(C) $3V_e$
(D) $5V_e$

---

92. A metal rod of area of cross-section 3cm^2 is stretched along its length by applying a force of 9×10^4N. If the Young's modulus of the material of the rod is $2 \times 10^{11}\text{Nm}^{-2}$, the energy stored per unit volume in the stretched rod is
(A) $13.5 \times 10^5\,\text{Jm}^{-3}$
(B) $9 \times 10^5\,\text{Jm}^{-3}$
(C) $2.25 \times 10^5\,\text{Jm}^{-3}$
(D) $4.5 \times 10^5\,\text{Jm}^{-3}$

---

93. An air bubble rises from the bottom to the top of a water tank in which the temperature of the water is uniform. The surface area of the bubble at the top of the tank is 125% more than its surface area at the bottom of the tank. If the atmospheric pressure is equal to the pressure of 10 m water column, then the depth of water in the tank is
(A) 16.25 m
(B) 27 m
(C) 19 m
(D) 23.75 m

---

94. If W_1 is the work done in increasing the radius of a soap bubble from 'r' to '2r' and W_2 is the work done in increasing the radius of the soap bubble from '2r' to '3r', then $W_1 : W_2 =$
(A) 3:5
(B) 1:1
(C) 2:3
(D) 3:4

---

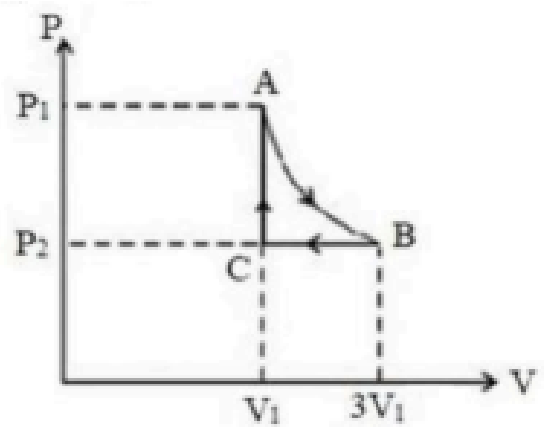
95. To increase the length of a metal rod by 0.4%, the temperature of the rod is to be increased by (Coefficient of linear expansion of the metal = $20 \times 10^{-6}\,^\circ\text{C}^{-1}$)
(A) 373 K
(B) 473 K
(C) 200 K
(D) 100 K

---

96. The power of a refrigerator that can make 15 kg of ice at $0°$C from water at $30°$C in one hour is
(A) 6600 W
(B) 1925 W
(C) 2200 W
(D) 4620 W

---

97. Three moles of an ideal gas undergoes a cyclic process ABCA as shown in the figure. The pressure, volume and absolute temperature at points A, B and C are respectively (P_1, V_1, T_1), $(P_2, 3V_1, T_1)$ and (P_2, V_1, T_2). Then the total work done in the cycle ABCA is (R- Universal gas constant).



(A) $RT_1[3\ln(3) + 2]$
(B) $RT_1[3\ln(2)]$
(C) $3RT_1(\ln 3)$
(D) $RT_1[3\ln(3) - 2]$

---

98. The pressure of a mixture of 64 g of oxygen, 28 g of nitrogen and 132 g of carbon dioxide gases in a closed vessel is P. Under isothermal conditions if entire oxygen is removed from the vessel, the pressure of the mixture of remaining two gases is
(A) P
(B) $\frac{3P}{2}$
(C) $\frac{P}{3}$
(D) $\frac{2P}{3}$

---

99. A sound wave of frequency 210 Hz travels with a speed of 330 ms^{-1} along the positive x-axis. Each particle of the wave moves a distance of 10 cm between the two extreme points. The equation of the displacement function (s) of this wave is (x in metre, t in second)
(A) $s(x,t) = 0.10\sin[4x - 1320t]$ m

(B) $s(x,t) = 0.05\sin[4x - 1320t]$ m
(C) $s(x,t) = 0.05\sin[1320x - 4t]$ m
(D) $s(x,t) = 0.10\sin[1320x - 4t]$ m

---

100. A string vibrates in its fundamental mode when a tension T_1 is applied to it. If the length of the string is decreased by 25% and the tension applied is changed to T_2, the fundamental frequency of the string increases by 100%, then $\frac{T_2}{T_1} =$
(Linear density of the string is constant)
(A) $\frac{3}{8}$
(B) $\frac{2}{3}$
(C) $\frac{8}{9}$
(D) $\frac{9}{4}$

---

101. An object of height 3.6 cm is placed normally on the principal axis of a concave mirror of radius of curvature 30 cm. If the object is at a distance of 10 cm from the principal focus of the mirror, then the height of the real image formed due to the mirror is
(A) 5.4 cm
(B) 3.6 cm
(C) 1.8 cm
(D) 2.7 cm

---

102. Monochromatic light of wavelength 6000 Å incidents on a small angled prism. If the angle of the prism is 6°, the refractive indices of the material of the prism for violet and red lights are respectively 1.52 and 1.48, then the angle of dispersion produced for this incident light is
(A) 30°
(B) 36°
(C) 24°
(D) 0°

---

103. In Young's double slit experiment, if the distance between 5^{th} bright and 7^{th} dark fringes is 3 mm, then the distance between 5^{th} dark and 7^{th} bright fringes is
(A) 6 mm
(B) 3 mm
(C) 5 mm
(D) 4 mm

---

104. Four electric charges $2\,\mu$C, Q, $4\,\mu$C and $12\,\mu$C are placed on x-axis at

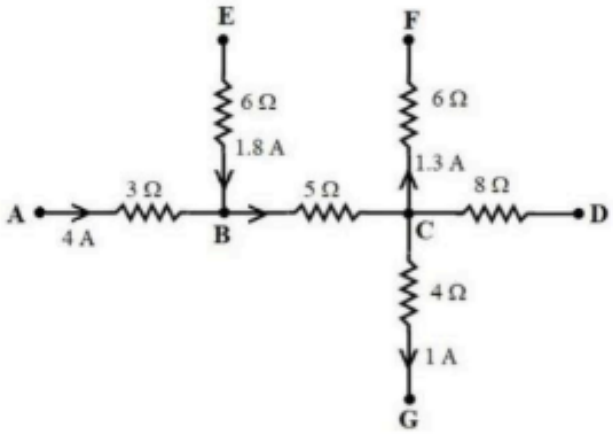
distances $x = 0$, 1 cm, 2 cm and 4 cm respectively. If the net force acting on the charge at origin is zero, then $Q =$
(A) -3.5 μC
(B) -1.75 μC
(C) -2.75 μC
(D) -5.5 μC

---

105. If a particle of mass 10 mg and charge $2\,\mu$C at rest is subjected to a uniform electric field of potential difference 160 V, then the velocity acquired by the particle is
(Note: "Potential difference 160 V" usually implies accelerating through that potential, or E is related. Assuming acceleration through potential difference V = 160 V based on context of "velocity acquired".)
(A) 9 ms^{-1}
(B) 4 ms^{-1}
(C) 6 ms^{-1}
(D) 8 ms^{-1}

---

106. The potential difference between points C and D of the electrical circuit shown in the figure is



(A) 28 V
(B) 32 V
(C) 24 V
(D) 20 V

---

107. The length of a potentiometer wire is 2.5 m and its resistance is 8 Ω. A cell of negligible internal resistance and emf of 2.5 V is connected in series with a resistance of 242 Ω in the primary circuit. The potential difference between two points separated by a distance of 20 cm on the potentiometer wire is
(A) 1.6 mV

(B) 4.8 mV
(C) 6.4 mV
(D) 3.2 mV

---

108. The magnetic field due to a current carrying circular coil on its axis at a distance of $\sqrt{2}d$ from the centre of the coil is B. If d is the diameter of the coil, then the magnetic field at the centre of the coil is
(A) 18B
(B) 27B
(C) 3B
(D) 9B

---

109. A square coil of side 10 cm having 200 turns is placed in a uniform magnetic field of 2 T such that the plane of the coil is in the direction of magnetic field. If the current through the coil is 3 mA, then the torque acting on the coil is
(A) 12×10^{-3} Nm
(B) 24×10^{-3} Nm
(C) 6×10^{-3} Nm
(D) Zero

---

110. The magnetic field at a point P on the axis of a short bar magnet of magnetic moment M is B. If another short bar magnet of magnetic moment 2M is placed on the first magnet such that their axes are perpendicular and their centres coincide. The resultant magnetic field at the point P due to both the magnets is
(A) 3B
(B) $\sqrt{3}B$
(C) $\sqrt{2}B$
(D) 2B

---

111. A circular coil of area 3×10^{-2} m^2, 900 turns and a resistance of 1.8 Ω is placed with its plane perpendicular to a uniform magnetic field of 3.5×10^{-5} T. The current induced in the coil when it is rotated through 180° in half a second is
(A) 2.1 mA
(B) 1.8 mA
(C) 1.5 mA
(D) 2.7 mA

---

112. An electric bulb, an open coil inductor, an ac source and a key are all connected in series to form a closed circuit. The key is closed and after some time an iron rod is inserted into the interior of the inductor, then

(A) The glow of the bulb increases
(B) The glow of the bulb remains unchanged
(C) The glow of the bulb decreases
(D) The bulb does not glow

---

113. If the rate of change in electric flux between the plates of a capacitor is $9\pi \times 10^3\,\mathbf{Vms^{-1}}$, then the displacement current inside the capacitor is
(A) $0.36\,\mu$A
(B) $0.25\,\mu$A
(C) $3.14\,\mu$A
(D) $4\,\mu$A

---

114. 20 kV electrons can produce X-rays with a minimum wavelength of
(A) 0.248 Å
(B) 0.41 Å
(C) 0.099 nm
(D) 0.062 nm

---

115. The ratio of wavelengths of second line in Balmer series and the first line in Lyman series of hydrogen atom is
(A) 2:1
(B) 9:4
(C) 4:1
(D) 3:2

---

116. A radioactive material of half-life 2.5 hours emits radiation that is 32 times the safe maximum level. The time (in hours) after which the material can be handled safely is
(A) 10
(B) 25
(C) 5
(D) 12.5

---

117. If the number of uranium nuclei required per hour to produce a power of 64 kW is 7.2×10^{18}, then the energy released per fission is
(A) 0.64×10^{-10} J
(B) 3.2×10^{-13} J
(C) 0.32×10^{-10} J
(D) 3.2×10^{-10} J

118. According to a graph drawn between the input and output voltages of a transistor connected in common emitter configuration, the region in which transistor acts as a switch is
(A) Cutoff or saturation region
(B) Active region
(C) Active or saturation region
(D) Cutoff or active region

---

119. If the energy gap of a semiconductor used for the fabrication of an LED is nearly 1.9 eV, then the color of the light emitted by the LED is
(A) White
(B) Red
(C) Green
(D) Blue

---

120. When the receiving antenna is on the ground, the range of a transmitting antenna of height 980 m is (Radius of the earth = 6400 km)
(A) 56 km
(B) 112 km
(C) 72.4 km
(D) 224 km

---

121. The energy associated with electron in first orbit of hydrogen atom is -2.18×10^{-18} J. The frequency of the light required (in Hz) to excite the electron to fifth orbit is ($h = 6.6 \times 10^{-34}$ Js)
(A) 2.17×10^{16}
(B) 3.17×10^{14}
(C) 2.17×10^{15}
(D) 3.17×10^{15}

---

122. In Sr (Z = 38), the number of electrons with $l = 0$ is x, number of electrons with $l = 2$ is y. $(x - y)$ is equal to
(A) 0
(B) 8
(C) -2
(D) 2

---

123. Match the following

List - 1 (Element)	**List - 2 ($\Delta_{eg}H$ in kJ mol^{-1})**
A. O	I. -200
B. F	II. -349
C. Cl	III. -141
D. S	IV. -328
	V. +48

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

---

124. Observe the data. Identify the most reactive metal.

Element	Δ_iH_1	Δ_iH_2	$\Delta_{eg}H$
I	520	7300	-60
II	490	3051	-48
III	1681	3374	-328
IV	2372	5251	+48

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

---

125. The sum of bond order of O_2^+, O_2^-, O_2 and O_2^{2+} is equal to
(A) 5
(B) 4
(C) 6
(D) 9

---

126. Statement - I: Hybridisation is not same in both SF_6 and BrF_5. Statement - II: BrF_5 is Square pyramidal while SF_6 is octahedral in shape.
(A) Both statements I and II are correct
(B) Statement I is correct, but statement II is not correct
(C) Statement I is not correct, but statement II is correct
(D) Both statements I and II are not correct

---

127. At T(K) root mean square (rms) velocity of argon (molar mass 40 g mol^{-1}) is 20 ms^{-1}. The average kinetic energy of the same gas at T(K) (in J mol^{-1}) is
(A) 8
(B) 16
(C) 4
(D) 2

128. 4.0 g of a mixture containing Na_2CO_3 and $NaHCO_3$ is heated to 673K. Loss in mass of the mixture is found to be 0.62g. The percentage of sodium carbonate in the mixture is
(A) 42
(B) 58
(C) 48
(D) 52

---

129. At 298K, if the standard Gibbs energy change $\Delta_r G^{\ominus}$ of a reaction is -115 kJ, the value of $\log_{10} K_p$ will be ($R = 8.314$ J $K^{-1}mol^{-1}$)
(A) +20.15
(B) -20.15
(C) -10.30
(D) +10.30

---

130. 200 mL of an aqueous solution of HCl (pH = 2) is mixed with 300 mL of aqueous solution of NaOH (pH = 12) and is diluted to 1.0 L. The pH of the resulting solution is
(A) 10.3
(B) 11.0
(C) 11.3
(D) 11.7

---

131. Identify the electron rich hydrides from the following
(A) B_2H_6, AlH_3
(B) NaH, MgH_2
(C) HCl, H_2S
(D) CH_4, SiH_4

---

132. The incorrect statement about Castner-Kellner cell process is
(A) Sodium hydroxide is prepared
(B) Brine solution is the electrolyte
(C) Mercury acts as anode and carbon rod acts as cathode
(D) Chlorine gas liberates at anode

---

133. By using which process, sodium carbonate is generally prepared?
(A) Deacon's process
(B) Castner-Kellner process

(C) Nelson cell process
(D) Solvay process

---

134. Which of the following is an incorrect statement about the compounds of group 13 elements?
(A) All the trihalides exist except TlI_3
(B) Trihalides on hydrolysis form tetrahedral species
(C) Diborane is an example of electron precise hydride
(D) Hydrolysis of diborane gives boric acid

---

135. The incorrect statement about the oxidation states of group 14 elements is
(A) In addition to +4, +2 carbon also shows negative oxidation states
(B) Tin in +2 state acts as a reducing agent
(C) Lead in +2 state acts as good reducing agent
(D) Lead in +4 state acts as a good oxidising agent

---

136. In drinking water, if the maximum prescribed concentration of copper is x mg dm^{-3}, the maximum prescribed concentration of zinc will be
(A) 1.5 x
(B) $\frac{x}{1.5}$
(C) $\frac{6}{10}x$
(D) $\frac{5}{6}x$

---

137. The empirical formula of the compound 'D' formed in the given reaction sequence is

$$C_2H_4 \xrightarrow{Br_2|CCl_4} A \xrightarrow[\text{(ii) } NaNH_2]{\text{(i) alc. KOH}} B \xrightarrow[\text{polymerization}]{\text{cyclic}} C \xrightarrow[\text{dry } AlCl_3\text{,dark, cold}]{CH_3Cl \text{ (excess)}} D$$

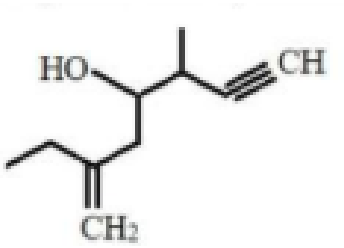
(A) CHCl
(B) CCl
(C) CH_2Cl
(D) $CHCl_2$

---

138. Which one of the following mixtures can be separated by steam distillation technique?
(A) n-Hexane + n-Heptane
(B) $CHCl_3$ + Aniline
(C) Aniline + H_2O
(D) Glucose + NaCl

---

139. The IUPAC name of the following compound is:



(A) 3-Methenyl-6-methyloct-7-yn-5-ol
(B) 2-Ethyl-5-methylhept-1-en-6-yn-4-ol
(C) 2-Ethyl-5-methylhept-1-yn-6-en-4-ol
(D) 3-Methyl-6-ethylhept-6-en-1-yn-4-ol

---

140. An alkyne has the molecular formula C_6H_{10}. The number of 1-alkyne isomers (excluding stereoisomers) possible for it is
(A) 2
(B) 5
(C) 3
(D) 4

---

141. A metal crystallises in two cubic phases, fcc and bcc with edge lengths 3.5 Å and 3 Å respectively. The ratio of densities of fcc and bcc is approximately
(A) 1.36
(B) 1.26
(C) 2.16
(D) 6.13

---

142. Observe the following data given in the table. (K_H = Henry's law constant). The correct order of their solubility in water is

Gas	CO_2	Ar	HCHO	CH_4
K_H (k bar at 298 K)	1.67	40.3	1.83×10^{-5}	0.413

(A) $CO_2 > CH_4 > HCHO > Ar$
(B) $Ar > HCHO > CH_4 > CO_2$
(C) $HCHO > CH_4 > CO_2 > Ar$
(D) $CO_2 > HCHO > CH_4 > Ar$

---

143. The Gibbs energy change of the reaction (in kJ mol^{-1}) corresponding to the following cell $Cr|Cr^{3+}(0.1M)||Fe^{2+}(0.01M)|Fe$ is
(Given: $E^\circ_{Cr^{3+}|Cr} = -0.75V$; $E^\circ_{Fe^{2+}|Fe} = -0.45V$, $1F = 96,500\,C\ mol^{-1}$)

(A) -150.9
(B) +150.9
(C) -173.7
(D) +173.7

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144. For a first order decomposition of a certain reaction, rate constant is given by the equation $\log k(\mathbf{s}^{-1}) = 7.14 - \frac{1\times10^4\mathbf{K}}{T}$**. The activation energy of the reaction (in kJ mol**$^{-1}$**) is (**$R = 8.3\,\mathbf{J\ K^{-1}mol^{-1}}$**)**
(A) 161.1
(B) 171.1
(C) 181.1
(D) 191.1

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145. The source of an enzyme is malt and that enzyme converts X into Y. X and Y respectively are
(A) Starch, maltose
(B) Maltose, glucose
(C) Proteins, peptides
(D) Glucose, fructose

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146. In the extraction of iron using blast furnace to remove the impurity (X), chemical (Y) is added to the ore. X and Y are respectively
(A) $SiO_2, MgCO_3$
(B) FeO, SiO_2
(C) $SiO_2, CaCO_3$
(D) $SiO_2, FeCO_3$

---

147. Thionyl chloride on reaction with white phosphorus gives a compound of phosphorus 'C' which on hydrolysis gives an oxo acid 'O'. The correct statements about C and O are
I. Shape of 'C' is pyramidal
II. 'O' is a dibasic acid
III. 'O' is a monobasic acid
IV. 'C' on reaction with acetic acid gives 'O'
Options: (A) I & II only
(B) II & IV only
(C) I, III & IV only
(D) I, II & IV only

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

(A) Chlorine oxidises ferrous salts to ferric salts in acidic medium
(B) Chlorine oxidises iodine to periodic acid in water
(C) Chlorine acts as a bleaching agent due to oxidation
(D) Chlorine is manufactured by Deacon's process

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149. Consider the following
Assertion (A): Phosphorus can form both phosphorus (III) and phosphorus (V) chlorides but nitrogen cannot form nitrogen (V) chloride.
Reason (R): The electronegativity of nitrogen is more than that of phosphorus.
The correct answer is
(A) Both (A) and (R) are correct, (R) is the correct explanation of (A)
(B) (A) is correct, but (R) is not correct
(C) Both (A) and (R) are correct, (R) is not the correct explanation of (A)
(D) (A) is not correct, but (R) is correct

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150. $E^{\circ}_{\mathbf{M^{3+}|M^{2+}}}$ **(in V) is highest for**
(A) Fe
(B) Mn
(C) Cr
(D) V

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151. Arrange the following complexes in the increasing order of their spin only magnetic moment (in B.M)
I. $[Fe(CN)_6]^{3-}$
II. $[MnCl_4]^{2-}$
III. $[Mn(CN)_6]^{3-}$
IV. $[Cr(NH_3)_6]^{3+}$
(A) II ¡ IV ¡ I ¡ III
(B) III ¡ II ¡ I ¡ IV
(C) I ¡ IV ¡ II ¡ III
(D) I ¡ III ¡ IV ¡ II

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152. Neoprene is the polymer of a monomer X. IUPAC name of X is
(A) 1,3-Butadiene
(B) 2-Methyl-1,3-butadiene
(C) 2-Iodo-1,3-butadiene
(D) 2-Chloro-1,3-butadiene

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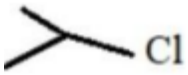
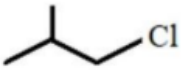
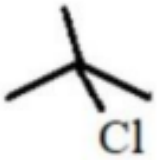
153. On prolonged heating with HI, glucose gives a compound 'C', which can be obtained by Wurtz reaction using sodium metal and compound 'D'. Identify 'D'

(A) 

(B) 

(C) 

(D) 

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154. Match the following:

List - 1 (Chemical)	List - 2 (Type)
A. Bithionol	I. Artificial sweetener
B. Saccharin	II. Antifertility drug
C. Sodium benzoate	III. Antiseptic
D. Norethindrone	IV. Food preservative

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

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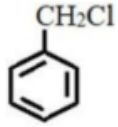
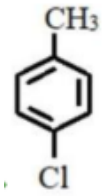
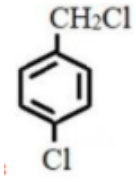
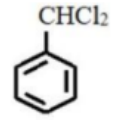
155. What is the product 'Z' in the following reaction sequence?

$C_6H_5N_2Cl \xrightarrow[HCl]{Cu_2Cl_2} X \xrightarrow[Na/\text{dry ether}]{CH_3Cl} Y \xrightarrow[dark]{Cl_2/Fe} Z$

(A) 

(B) 

(C) 

(D) 

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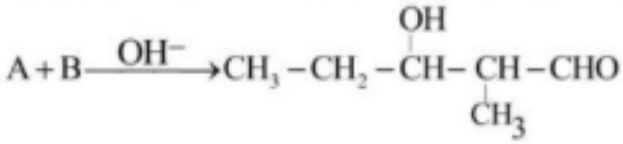
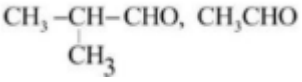
156. Identify the compounds A and B involved in the formation of given aldol



(A) $CH_3CH_2CH_2OH, CH_3CH_2CHO$
(B) CH_3COCH_3, CH_3CH_2CHO
(C) CH_3CH_2CHO, CH_3CH_2CHO
(D) 

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157. In which of the following, intramolecular hydrogen bonding is present?
(A) Resorcinol
(B) Catechol
(C) Quinol
(D) o-Cresol

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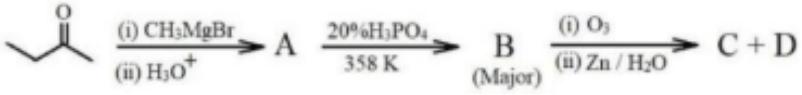
158. The products C and D are



(Reaction Scheme: Acetone + CH_3MgBr followed by H_3O^+ gives A. A heated with H_3PO_4 at 358 K gives B (Major). B undergoes Ozonolysis (O_3, Zn/H_2O) to give C + D.)
(A) Ethanoic acid, ethanal
(B) Ethanol, Propanone
(C) Ethanal, Propanone
(D) Propanal, Propanone

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159. Identify the incorrect match with respect to compounds to be distinguished and reagent used
(A) CH_3OH, CH_3CH_2OH — (I_2 + NaOH solution)
(B) 
(C)
(D)

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160. The reagent which is used to distinguish primary, secondary and tertiary amines from the mixture is

(A) Fehling's reagent
(B) Tollens reagent
(C) Lucas reagent
(D) Hinsberg's reagent
