JEE Mains 2026 22 Jan Shift 1 Question Paper(Memory Based)

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1. If the sum of first 4 terms of an A.P. is 6 and the sum of first 6 terms is 4, then the sum of first 12 terms of the A.P. is
(1) -22
(2) -21
(3) -23
(4) -24

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2. Arrange the given metal ions in increasing order of number of unpaired electrons in the *low spin complexes* formed by $\mathbf{Mn^{3+}, Cr^{3+}, Fe^{3+}, Co^{3+}}$.
(1) $Co^{3+} < Fe^{3+} < Mn^{3+} < Cr^{3+}$
(2) $Co^{3+} < Mn^{3+} < Fe^{3+} < Cr^{3+}$
(3) $Cr^{3+} < Mn^{3+} < Co^{3+} < Fe^{3+}$
(4) $Cr^{3+} < Mn^{3+} < Co^{3+} < Fe^{3+}$

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3. Two discs have the same moment of inertia about their axes. Their thicknesses are t_1 and t_2 and they have the same density. If $\frac{R_1}{R_2} = \frac{1}{2}$, then find $\frac{t_1}{t_2}$.
(1) $\frac{1}{16}$
(2) 16
(3) $\frac{1}{4}$
(4) 4

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4. The coefficient of x^{48} in

$$1(1+x) + 2(1+x)^2 + 3(1+x)^3 + \cdots + 100(1+x)^{100}$$

is
(1) ${}^{101}C_{46} - 100$
(2) $100({}^{101}C_{49}) - {}^{101}C_{50}$
(3) $100({}^{101}C_{46}) - {}^{101}C_{47}$
(4) ${}^{101}C_{47} - {}^{101}C_{46}$

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5. In a series R–L circuit, the voltage of the battery is 10 V. Resistance and inductance are 10 Ω and 10 mH respectively. Find the energy stored in the inductor when the current reaches $\frac{1}{e}$ times its maximum value.
(1) 0.67 mJ
(2) 1.33 mJ
(3) 0.33 mJ
(4) 0.50 mJ

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6. If

$$A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix},$$

then find the value of

$$\left|A^{2025} - 3A^{2024} + A^{2023}\right|.$$

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7. Match the following (List–I with List–II) and choose the correct option.

	List–I		**List–II**
(a)	$[Ag(NH_3)_2]^+$	(i)	Fehling's solution
(b)	Zn–Hg / HCl	(ii)	Clemmensen's reduction
(c)	NH_2–NH_2/KOH	(iii)	Tollen's reagent
(d)	Cu^{2+}/OH^-	(iv)	Wolff–Kishner reduction

(1) a(i), b(ii), c(iii), d(iv)
(2) a(iv), b(iii), c(ii), d(i)
(3) a(iii), b(ii), c(iv), d(i)
(4) a(i), b(ii), c(iv), d(iii)

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8. If the domain of the function

$$f(x) = \frac{1}{\ln(10 - x)} + \sin^{-1}\left(\frac{x+2}{2x+3}\right)$$

is

$$(-\infty, -a] \cup (-1, b) \cup (b, c),$$

then find the value of $(b + c + 3a)$**.**
(1) 22
(2) 24
(3) 23
(4) 21

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9. Statement–I: Sucrose is dextrorotatory and upon hydrolysis it becomes laevorotatory.
Statement–II: Sucrose on hydrolysis gives glucose and fructose such that the laevorotation of glucose is more than the dextrorotation of fructose.
Choose the correct option.
(1) Both Statement–I and Statement–II are correct
(2) Both Statement–I and Statement–II are incorrect
(3) Statement–I is correct, Statement–II is incorrect
(4) Statement–II is correct, Statement–I is incorrect

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10. Let $M = \{1, 2, 3, \ldots, 16\}$ **and** R **be a relation on** M **defined by** xRy **if and only if** $4y = 5x - 3$**. Then, the number of ordered pairs required to be added to** R **to make it symmetric is**
(1) 2
(2) 3
(3) 4
(4) 5

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11. The solution of the differential equation

$$x\,dy - y\,dx = \sqrt{x^2 + y^2}\,dx$$

(where c is the constant of integration) is

(1) $\sqrt{x^2+y^2} = cx^2 - y$
(2) $\sqrt{x^2+y^2} = cx^2 + y$
(3) $\sqrt{x^2+y^2} = cx - y$
(4) $\sqrt{x^2+y^2} = cx + y$

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12. Which of the following is the correct order of reactivity of the given nucleophiles when treated with CH_3Br in methanol?

$$F^-,\ I^-,\ C_2H_5O^-,\ C_6H_5O^-$$

(1) $I^- > C_2H_5O^- > C_6H_5O^- > F^-$
(2) $I^- > F^- > C_2H_5O^- > C_6H_5O^-$
(3) $I^- > C_2H_5O^- > F^- > C_6H_5O^-$
(4) $C_6H_5O^- > F^- > I^- > C_2H_5O^-$

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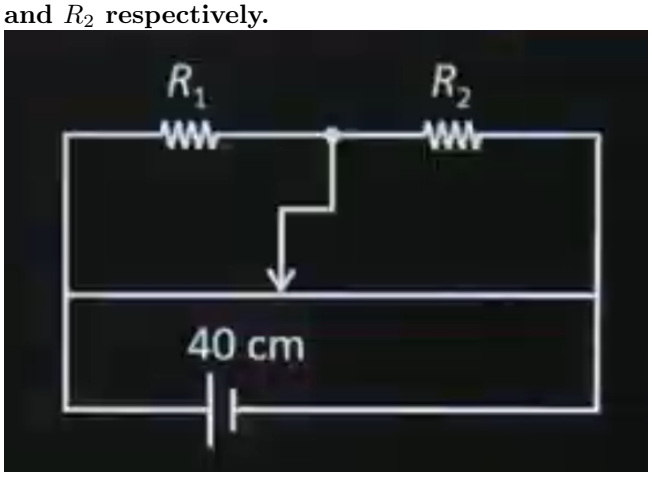
13. In a potentiometer, the null point for two resistances R_1 and R_2 is at 40 cm as shown. If a $16\,\Omega$ resistance is connected in parallel to R_2, the null point shifts to 50 cm. Find the values of R_1 and R_2 respectively.



(1) $16\,\Omega,\ 48\,\Omega$
(2) $32\,\Omega,\ \dfrac{32}{3}\,\Omega$
(3) $\dfrac{16}{3}\,\Omega,\ 8\,\Omega$
(4) $\dfrac{32}{3}\,\Omega,\ 32\,\Omega$

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14. The number of values of x satisfying

$$\tan^{-1}(4x) + \tan^{-1}(6x) = \frac{\pi}{6}, \quad x \in \left[-\frac{1}{2\sqrt{6}}, \frac{1}{2\sqrt{6}}\right]$$

is

(1) 1
(2) 0
(3) 2
(4) 3

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15. The value of

$$\int_{\frac{\pi}{2}}^{\pi} \frac{dx}{[x]+4}$$

where $[\cdot]$ denotes the greatest integer function, is

(1) $\frac{\pi}{20}+\frac{7}{20}$

(2) $\frac{7\pi}{20}-\frac{7}{60}$

(3) $\frac{7\pi}{20}-\frac{1}{60}$

(4) $\frac{7\pi}{20}+\frac{1}{60}$

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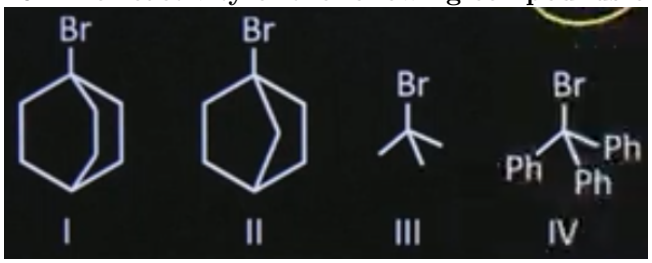
16. The reactivity of the following compounds on the basis of the S_N1 mechanism is



(I), (II), (III), (IV) as shown in the figure.

(1) IV > III > I > II

(2) II > IV > III > I

(3) III > IV > I > II

(4) IV > III > II > I

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17. Given below are two statements:

Statement–I: HX bond length is higher in HCl than HF.

Statement–II: The lowest boiling point among hydrides of group 15 elements is for the hydride having covalency 4.

Choose the correct option.

(1) Both Statement–I and Statement–II are correct

(2) Both Statement–I and Statement–II are incorrect

(3) Statement–I is correct but Statement–II is incorrect

(4) Statement–I is incorrect but Statement–II is correct

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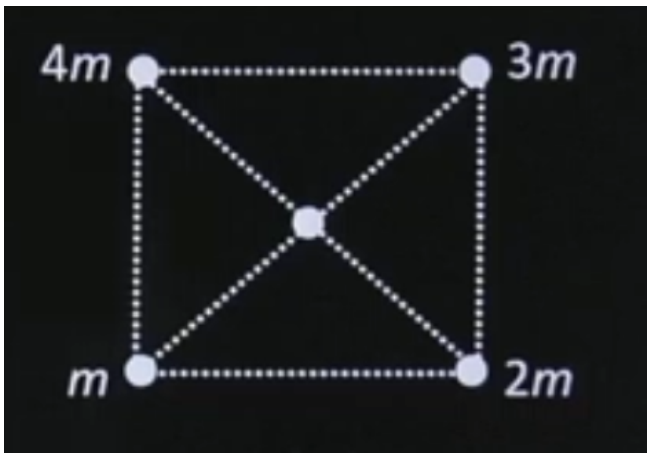
18. In the given situation, the force acting at the center on a $1\,\text{kg}$ mass is F_1. Now, if the masses $4m$ and $3m$ are interchanged, the force becomes F_2. Given that

$$\frac{F_1}{F_2}=\frac{2}{\sqrt{\alpha}},$$

find the value of α.



(1) $\alpha = 5$
(2) $\alpha = 3$
(3) $\alpha = 7$
(4) $\alpha = 1$

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19. Match the columns:

	Column–I		**Column–II (Dimensions)**
(A)	Thermal Conductivity	(P)	$[ML^2T^{-2}K^{-1}]$
(B)	Boltzmann Constant	(Q)	$[M^1L^{-1}T^{-2}]$
(C)	Spring Constant	(R)	$[M^1L^1T^{-3}K^{-1}]$
(D)	Surface Tension	(S)	$[M^1L^0T^{-2}]$
		(T)	$[M^1L^2T^{-3}K^{-1}]$
		(U)	$[ML^2T^{-2}]$

Choose the correct option.
(1) $A \to R,\ B \to P,\ C \to S,\ D \to S$
(2) $A \to T,\ B \to P,\ C \to U,\ D \to S$
(3) $A \to R,\ B \to T,\ C \to Q,\ D \to Q$
(4) $A \to T,\ B \to U,\ C \to S,\ D \to Q$

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20. If

$$\frac{\cos^2 48^\circ - \sin^2 12^\circ}{\sin^2 24^\circ - \sin^2 6^\circ} = \frac{\alpha + \sqrt{5}\,\beta}{2},$$

then the value of $(\alpha + \beta)$ is
(1) 3
(2) 2
(3) 4
(4) 1

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21. Which of the following is the correct order of bond length?
(A) C–H < C ≡ N < C = O < C–O
(B) C ≡ N < C–H < C–O < C = O
(C) C–H < C ≡ N < C–O < C = O
(D) C–O < C ≡ N < C = O < C–H

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22. Which of the following is the correct order of nucleophilic nature for the following reaction?

$$CH_3Br + Nu^- \longrightarrow CH_3Nu + Br^-$$

(1) $HO^- > PhO^- > CH_3COO^- > ClO_4^-$
(2) $PhO^- > HO^- > CH_3COO^- > ClO_4^-$
(3) $CH_3COO^- > HO^- > PhO^- > ClO_4^-$
(4) $HO^- > ClO_4^- > PhO^- > CH_3COO^-$

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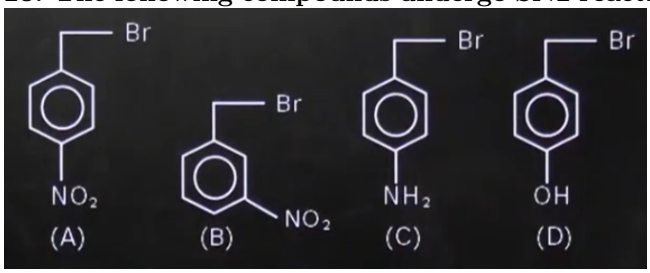
23. The following compounds undergo SN2 reaction. What is the correct order of SN2 reactivity?



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

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24. Let $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ **and** $B = \begin{bmatrix} 29 & 49 \\ 1 & 2 \end{bmatrix}$**. If** $(A^5 + B)\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$**, then find** (x, y)**.**

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25. Let one end of focal chord of the parabola $y^2 = 16x$ **be** $(16, 16)$**. If** $P(\alpha, \beta)$ **divides this focal chord internally in the ratio** $5 : 2$**, then the minimum value of** $\alpha + \beta$ **is equal to**
(A) 7
(B) 22
(C) 5
(D) 16

26.

$$\left(\frac{1}{{}^{15}C_0} + \frac{1}{{}^{15}C_1}\right)\left(\frac{1}{{}^{15}C_1} + \frac{1}{{}^{15}C_2}\right)\cdots\left(\frac{1}{{}^{15}C_{12}} + \frac{1}{{}^{15}C_{13}}\right) = \frac{\alpha^{13}}{{}^{14}C_0 \cdot {}^{14}C_1 \cdot {}^{14}C_2 \cdots {}^{14}C_{12}}$$

If so, then find the value of 30α**.**
