



TECHNO INDIA GROUP PUBLIC SCHOOL

1. Dt. 18-01-2025

JEE Main Mock Paper-1 (2025)

Time Allowed: **3 hours**

Maximum Marks: **300**

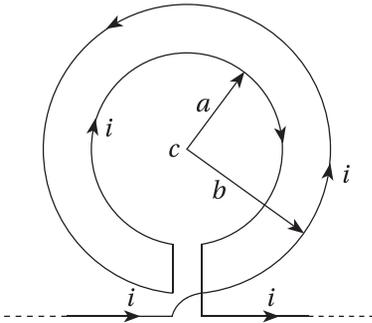
General Instructions:

1. There are three subjects in the question paper consisting of Physics (Q. no. 1 to 25), Chemistry (Q. no. 26 to 50), and Mathematics (Q. no. 51 to 75).
2. Each subject is divided into two sections. Section A consists of 20 multiple-choice questions & Section B consists of 5 numerical value-type questions.
3. There will be only one correct choice in the given four choices in Section A. For each question for Section A, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
4. For Section B questions, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
5. Any textual, printed, or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.
6. All calculations/written work should be done in the rough sheet, provided with the Question Paper.

Physics

SECTION-A

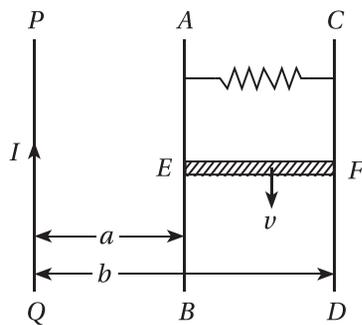
1.



with reference to the above figure, if net magnetic field at centre c is zero, then $a/b =$

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

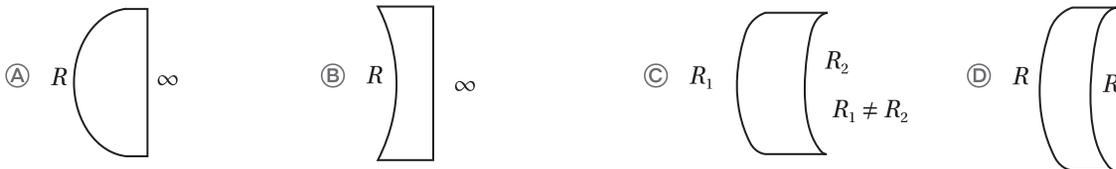
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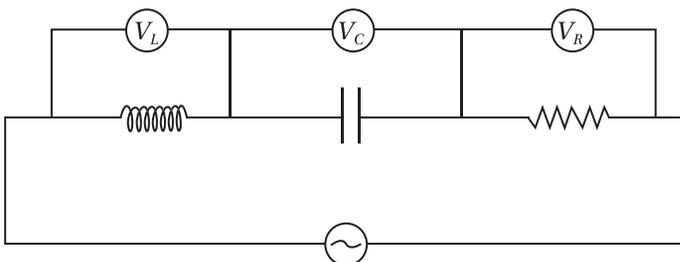
PQ is an infinite current-carrying conductor. AB and CD are smooth conducting rods on which a conductor EF moves with constant velocity v as shown in the figure. The force needed to maintain constant speed of EF is

- (A) $\frac{1}{vR} \left[\frac{\mu_0 I v}{2\pi} \ln \left(\frac{b}{a} \right) \right]^2$ (B) $\left[\frac{\mu_0 I v}{2\pi} \ln \left(\frac{b}{a} \right) \right]^2 \frac{1}{2vR}$ (C) $\frac{v}{R} \left[\frac{\mu_0 I v}{2\pi} \ln \left(\frac{b}{a} \right) \right]^2$ (D) $\frac{v}{2R} \left[\frac{\mu_0 I v}{2\pi} \ln \left(\frac{b}{a} \right) \right]^2$

3. Which one of the following spherical lenses does not exhibit dispersion? The radii of curvature of the surfaces of the lenses as given in diagrams.



4.



The applied supply voltage is $V = V_0 \sin\left(100\pi t + \frac{\pi}{6}\right)$

$V_L = 40$ Volt, $V_R = 40$ Volt, $Z = 5 \Omega$ and $R = 4 \Omega$

Column I

Column II

(A) Peak current (in A)	(P) $10\sqrt{2}$
(B) V_0 (Volt)	(Q) $50\sqrt{2}$
(C) V_{rms}	(R) 50
(D) X_C (in Ω)	(S) 1

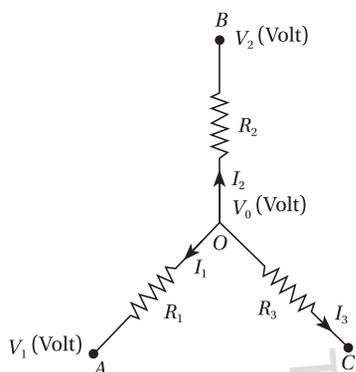
(A) $A \rightarrow Q, B \rightarrow R, C \rightarrow P, D \rightarrow S$

(B) $A \rightarrow R, B \rightarrow P, C \rightarrow S, D \rightarrow P$

(C) $A \rightarrow P, B \rightarrow R, C \rightarrow S, D \rightarrow Q$

(D) $A \rightarrow P, B \rightarrow Q, C \rightarrow R, D \rightarrow S$

5.



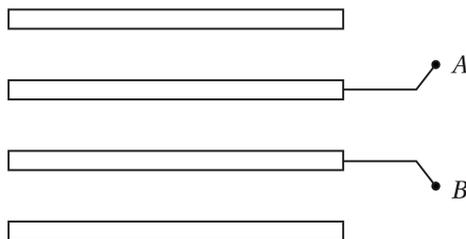
The potential at point O, $V_0 =$

- (A) $\left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3}\right) \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$
- (B) $\left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3}\right) \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$
- (C) $\left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3}\right)^{-1} \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$
- (D) $\frac{(V_1 + V_2 + V_3)}{(R_1 + R_2 + R_3)}$

6. Two point charges are placed at separation d in vacuum and the force between them is F . Now a dielectric slab of thickness $t = d/3$ and dielectric constant k is placed between the charges and the force becomes $9F/25$. Then the value of k is

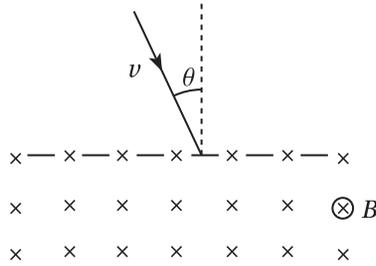
- (A) 5 (B) 6 (C) 9 (D) 7

7. In the following figure, area of each adjacent plate is A and d is separation between the plates adjacent. The capacitance of the system between points A and B is



- (A) $\frac{3A\epsilon_0}{2d}$ (B) $\frac{2A\epsilon_0}{d}$ (C) $\frac{A\epsilon_0}{2d}$ (D) $\frac{3A\epsilon_0}{d}$

8. A particle of mass m and positive charge q moving with a uniform velocity v , enters in uniform magnetic field B as shown in figure. How long does the particle stay inside the magnetic field.



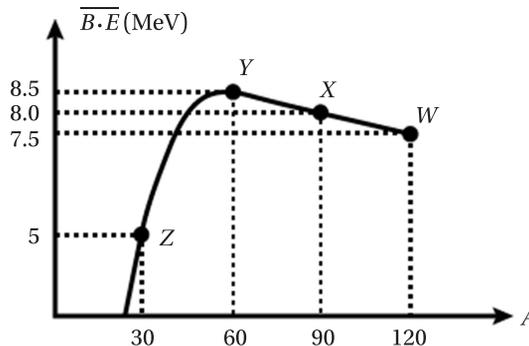
- (A) $t = \frac{2m\theta}{Bq}$ (B) $t = \frac{m(\pi - 2\theta)}{Bq}$ (C) $t = \frac{m(\pi + 2\theta)}{Bq}$ (D) $t = \frac{m\pi\theta}{Bq}$

9. The poynting vector of an electromagnetic wave is given by

$$\vec{S} = 2\hat{i} + 4\hat{j} + \sqrt{5}\hat{k}$$

The angle, which the direction of propagation of the wave makes with x -axis.

- (A) $\cos^{-1}(0.2)$ (B) $\cos^{-1}(0.3)$ (C) $\cos^{-1}(0.4)$ (D) $\cos^{-1}(0.6)$
10. Unpolarised light of intensity 32 Wm^{-2} passes through three polarisers, such that transmiss axis of last polariser is crossed with the first. If intensity of emerging light is 3 Wm^{-2} , then the angle between the transmission axis of the first two polarisers is
- (A) 60° (B) 30° (C) 45° (D) 90°
11. Two coherent sources of intensity ratio β interfere. Then the visibility is
- (A) $\frac{2\sqrt{\beta}}{1+\beta}$ (B) $\frac{\sqrt{\beta}}{1+\beta}$ (C) $\frac{\sqrt{\beta}}{2(1+\beta)}$ (D) $\frac{2\beta}{1+\beta}$
12. When the surface of certain metal is illuminated with the light of wavelength λ , the emitted photoelectrons posses a maximum kinetic energy k_{max} . The incident wavelength for which the emitted electrons will have a maximum kinetic energy of $2k_{\text{max}}$ is
- (A) $\frac{2hc\lambda}{hc + k_{\text{max}} \cdot \lambda}$ (B) $\frac{hc\lambda}{2(hc + k_{\text{max}} \cdot \lambda)}$ (C) $\frac{hc\lambda}{hc + k_{\text{max}} \cdot \lambda}$ (D) $\frac{hc}{k_{\text{max}} \cdot \lambda}$
13. Binding energy per nucleon versus mass number curve for nuclei is shown in the figure.



- W, X, Y, Z are four nuclei on the curve. The viable nuclear reaction is
- (A) $Y \rightarrow 2Z$ (B) $W \rightarrow X + Z$ (C) $W \rightarrow 2Y$ (D) $X \rightarrow Y + Z$
14. Two deuterium (${}_1\text{H}^2$) nuclei are traveling directly towards one another. When their separation is large compared with their diameters, they each have speed v as shown in figure



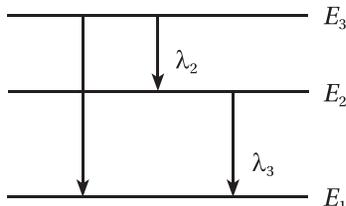
The diameter of a deuterium nucleus is 1.1×10^{-14} m. In order that they come into contact, $v =$

- (A) 2.5×10^6 m/s (B) 1.5×10^6 m/s (C) 10^6 m/s (D) 3×10^6 m/s

15. A radio active element decays by β -emission A detector records n beta particles in 2 s and in next 2 s, it records $0.75n$ beta particles. The mean life correct to nearest whole number is [$\log_e 2 = 0.693$, $\log_e 3 = 1.0986$]

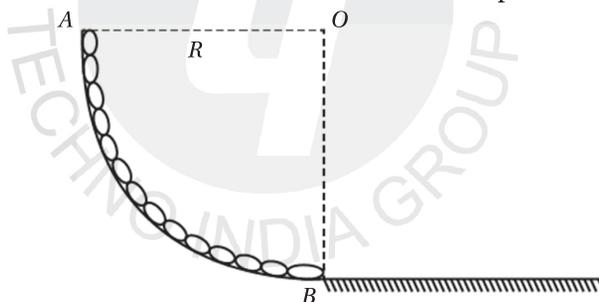
- (A) 2 s (B) 3 s (C) 5 s (D) 7 s

16. Figure shows the emission of spectral lines of wave lengths $\lambda_1, \lambda_2, \lambda_3$ due to transitions between the three energy levels associated with energies E_1, E_2 and E_3 .



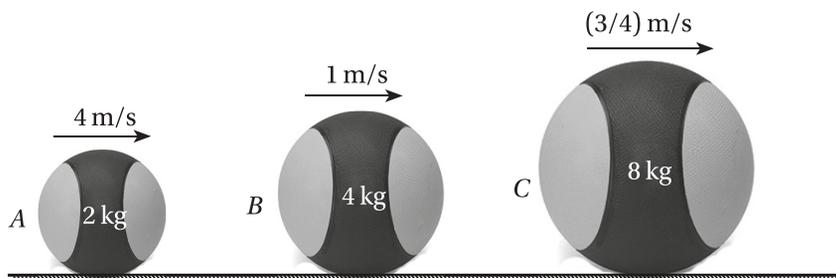
- (A) $\frac{1}{\lambda_1} = \frac{1}{\lambda_2} + \frac{1}{\lambda_3}$ (B) $\frac{1}{\lambda_2} = \frac{1}{\lambda_1} + \frac{1}{\lambda_3}$ (C) $\frac{1}{\lambda_3} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2}$ (D) $\lambda_1 = \lambda_2 + \lambda_3$

17. A smooth chain AB of mass m rests against a surface in the form of a quarter of a circle of radius R . If it is released from rest, the velocity of the chain after it comes over the horizontal part of the surface is



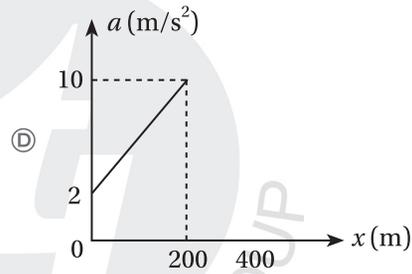
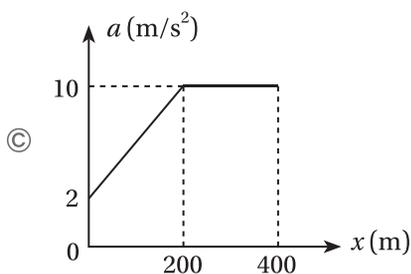
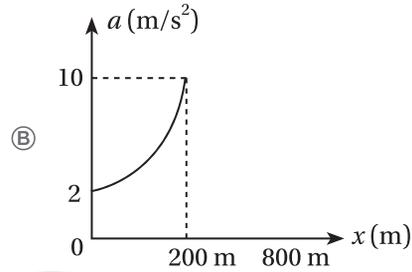
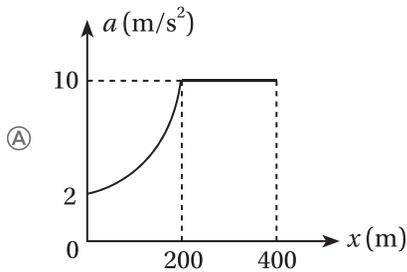
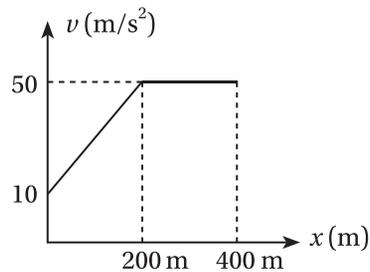
- (A) $\sqrt{2gR}$ (B) \sqrt{gR} (C) $\sqrt{2gR\left(1 - \frac{2}{\pi}\right)}$ (D) $\sqrt{2gR(2 + \pi)}$

18. Three balls A, B and C of masses 2 kg, 4 kg and 8 kg respectively, move along the same straight line and in the same direction, with velocities 4 m/s, 1 m/s and $\left(\frac{3}{4}\right)$ m/s. If A collides with B, subsequently B collides with C (take first A collides with B), then final velocities of A, and B are

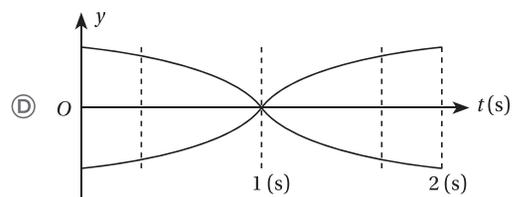
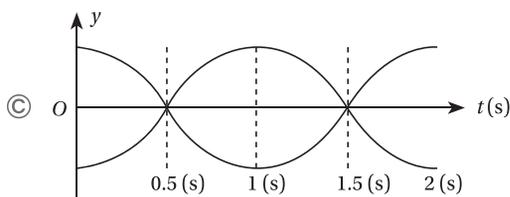
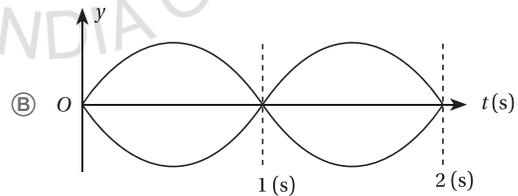
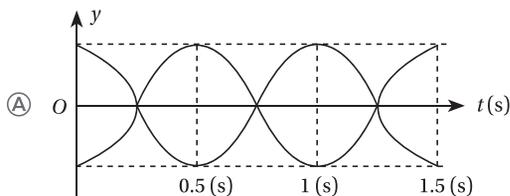


- (A) $v_A = 3$ m/s, $v_B = 2$ m/s (B) $v_A = 0$ m/s, $v_B = 3$ m/s (C) $v_A = 3$ m/s, $v_B = 0$ m/s (D) $v_A = 0$ m/s, $v_B = 0$ m/s

19. The velocity-displacement graph is shown below. The corresponding acceleration displacement graph is



20. The correct figure that shows, schematically the wave pattern produced by superposition of two waves of frequencies 9 Hz and 11 Hz is



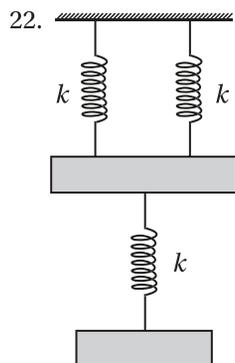
21. The moment of inertia of a pair of solid spheres each having a mass m and radius r kept in contact, about the tangent passing through the point of contact is $n \left(\frac{2mr^2}{5} \right)$. Then the value of n is _____.

(A) 7

(B) 6

(C) 4

(D) 3



Each of the above three springs are identical (they have the same equilibrium length and spring constant k). They are fixed together as shown in figure. Then $\left(\frac{6}{k}\right) \times$ equivalent spring constant is _____.

- (A) 6 (B) 5 (C) 4 (D) 3

23. A ball rolls off the top of a staircase with a horizontal velocity $u \text{ ms}^{-1}$. If the steps are h metre high and b metre wide, the ball will hit the edge of the n -th step if $n \left(\frac{gb^2}{hu^2}\right) =$ _____.

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

24. The maximum and minimum distances of a comet from the Sun are $8 \times 10^{12} \text{ m}$ and $1.6 \times 10^{12} \text{ m}$ respectively. If its velocity nearest to the Sun is 60 ms^{-1} , what will be its velocity in m/s when it is farthest _____.

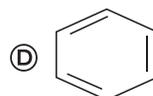
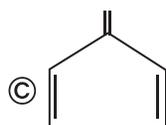
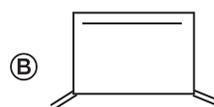
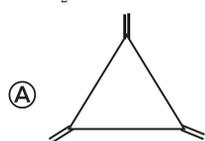
- (A) 12 (B) 6 (C) 120 (D) 60

25. Assume that a drop of liquid evaporates by decrease in its surface energy so that its temperature remains unchanged. Then $\frac{r\rho L}{T} =$ (Given : $T =$ Surface tension $\rho =$ density of liquid, $L =$ latent heat of evaporation, $r =$ minimum radius of drop) _____.

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

Chemistry

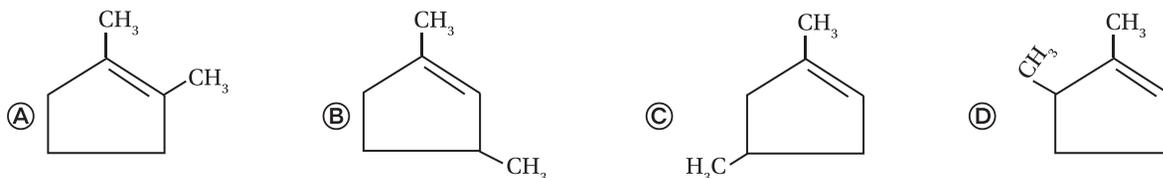
MCQ (one correct answer):



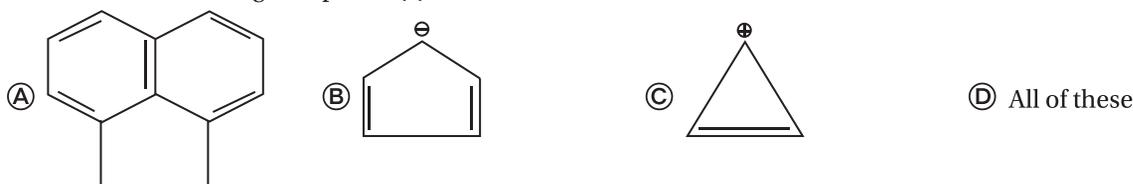
27. The correct set of four quantum numbers for the valence electron of rubidium atom $Z = 37$ is:

- (A) $5, 0, 1, +\frac{1}{2}$ (B) $5, 0, 0, +\frac{1}{2}$ (C) $5, 1, 0, +\frac{1}{2}$ (D) $5, 1, 1, +\frac{1}{2}$

28. Which compound would give 5-Keto-2-methyl hexanal upon ozonolysis?



29. Which of the following compound(s) is/are aromatic in nature?



30. Statement type question:

Given below are two statements:

Statement I: Tropolone is an aromatic compound and has 8π electrons.

Statement II: π electrons of $>C=O$ group in tropolone is involved in aromaticity.

In the light of the above statement choose the correct answer from the options given below:

- (A) Both statement I and statement II are true (B) Statement I is true but statement II is false
(C) Statement I is false but statement II is true (D) Both statement I and statement II are false

31. Calculate the pH of the following solution:

100 ml of 0.1M CH_3COOH mixed with 100 ml of 0.1 (M) NaOH. [Given $\text{p}K_a = 4.75$]

- (A) 2.87 (B) 4.75 (C) 8.72 (D) 9.72

32. Solution of 0.1(N) NH_4OH and 0.1(N) NH_4Cl has pH 9.25. $\text{p}K_b$ of NH_4OH is:

- (A) 9.25 (B) 4.75 (C) 3.75 (D) 8.25

33. Calculate the equivalent weight of NaOH in the following reaction:



- (A) 80 (B) 40 (C) 48 (D) 20

34. $\text{NH}_4\text{COONH}_2(\text{s}) \rightleftharpoons 2\text{NH}_3(\text{g}) + \text{CO}_2(\text{g})$; If equilibrium pressure of gaseous mixture is 3atm then K_p will be:

- (A) 4 (B) 27 (C) $\frac{4}{27}$ (D) $\frac{1}{27}$

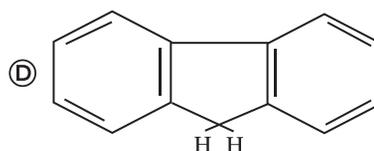
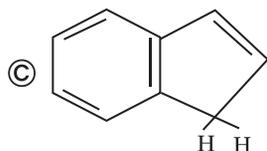
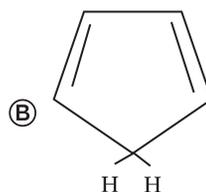
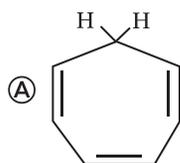
35. The values of heat of formation of SO_2 and SO_3 are -393.8 KJ and -198.2 KJ . The heat of formation of this reaction will be $\text{SO}_2 + \frac{1}{2}\text{O}_2 \longrightarrow \text{SO}_3$

- (A) -200KJ (B) -356.2KJ (C) $+200\text{KJ}$ (D) -396.2KJ

36. Calculate the entropy change when 2.8 g N_2 gas expands isothermally and reversibly from an initial volume of 1L to final volume of 10L at 27°C .

- (A) 19.15 J(K)^{-1} (B) 1.915 JK^{-1} (C) 0.83 JK^{-1} (D) 8.31 J(K)^{-1}

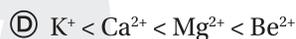
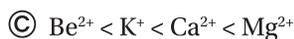
37. Pick out the most acidic species from the following:



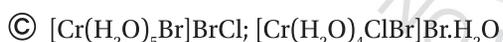
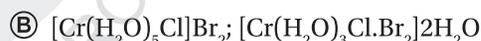
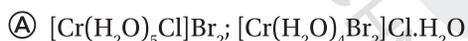
38. An organic compound (X) with molecular formula C_3H_6O is not readily oxidised. On reduction it gives C_3H_8O (Y) which reacts with HBr to give a bromide (Z) which is converted to Grignard's reagent reacts with 'X' to give 2, 3-dimethylbutan-2-ol. 'X', 'Y' and 'Z' respectively are



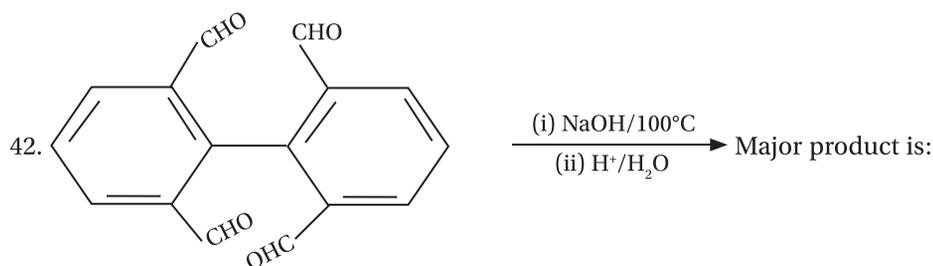
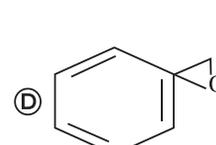
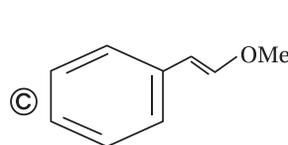
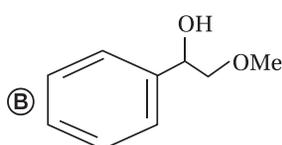
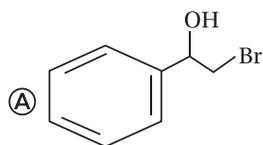
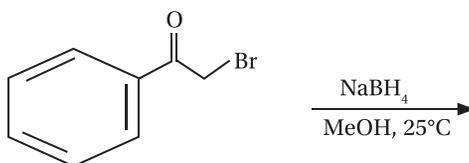
39. The charge/size ratio of a cation determine its polarising power. Which one of the following sequences represents the increasing order of the polarising power of the cationic species, K^+ , Ca^{2+} , Mg^{2+} , Be^{2+} ?

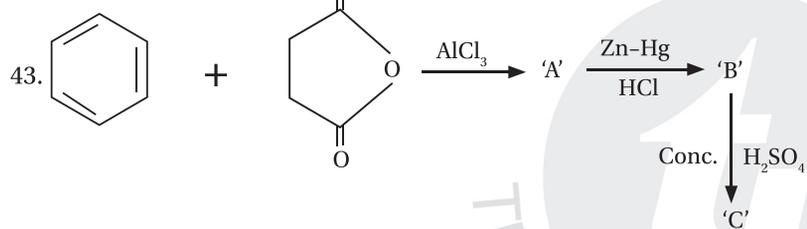


40. The two isomers of 'X' and 'Y' with the formula $Cr(H_2O)_5ClBr_2$ were taken for experiment on depression in freezing point. It was formed that one mole of 'X' gave depression corresponding to 2 moles of particles and one mole of 'Y' gave depression due to 3 moles of particles. The structural formulae of 'X' and 'Y' are respectively:

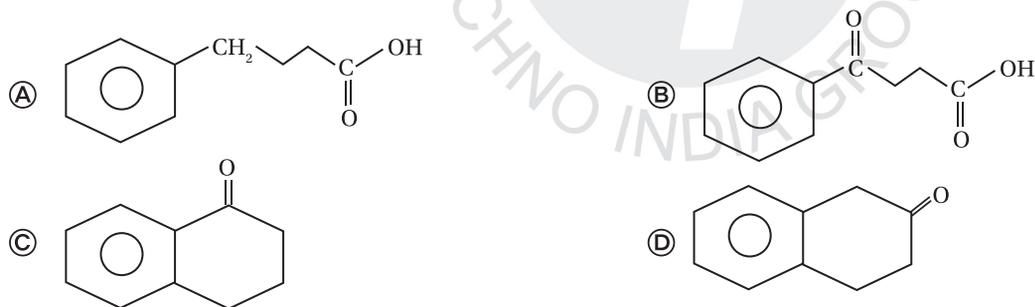


41. The major product of the following reaction is:

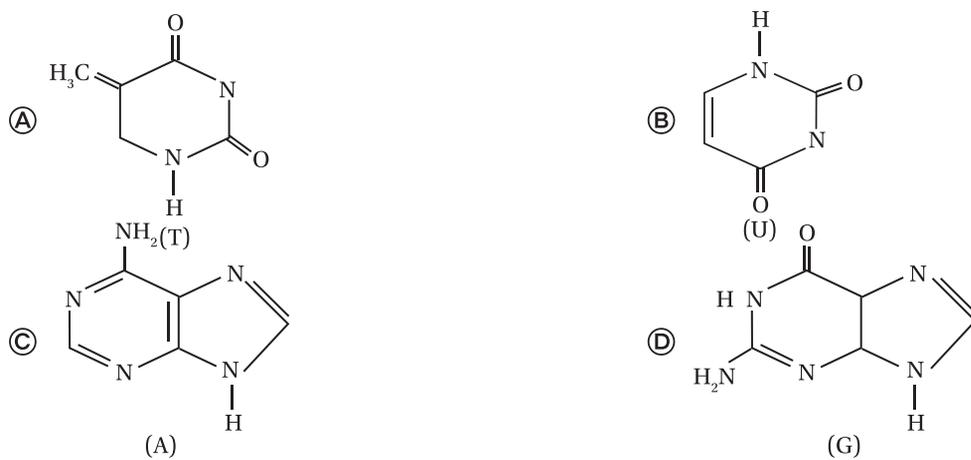




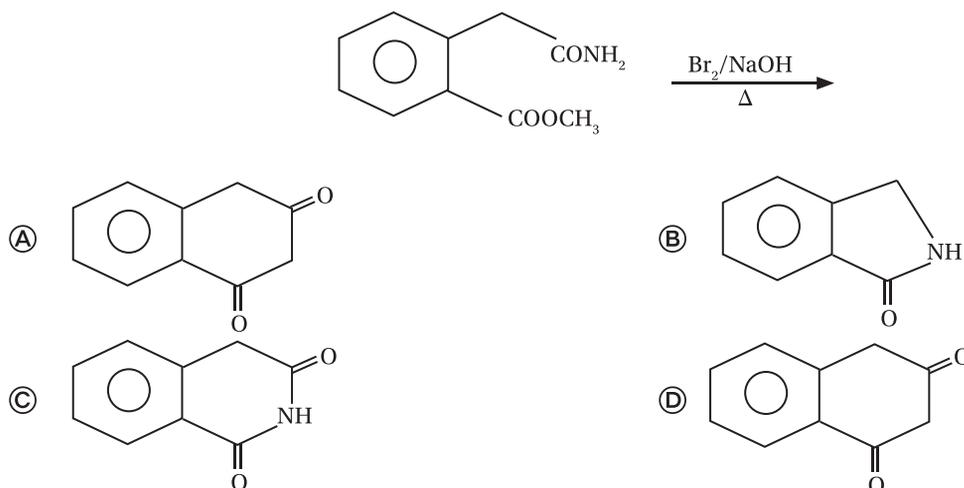
What is the structure of 'C' ?



44. The base present in RNA but not found in DNA is:



45. The major product formed in the following reaction is:



SECTION-B (Numerical Value type)

SECTION - B

(Numerical value type question):

46. The number of hydrogen bonds present in the structure of the nickel dimethylglyoxime complex is _____.
47. The volume in mL of 0.02 M $\text{K}_2\text{Cr}_2\text{O}_7$ solution required to react with 0.288g of ferrous oxalate in acidic medium is _____. (Molar mass of Fe = 56g (mole)⁻¹)
48. Among PbS, CuS, HgS, MnS, Ag₂S, NiS, CoS, Bi₂S₃, and SnS₂, the total number of black coloured sulphides is _____.
49. The freezing point of isobutane is -160°C . $\Delta H(\text{solid} \rightarrow \text{liquid})$ is $+4520\text{J (mol)}^{-1}$. For this fusion process, entropy change in J(mole)^{-1} is 10Y. The value of Y is _____.
50. The e.m.f of the cell $\text{Ni}|\text{Ni}^{2+} (0.1\text{M})||\text{Au}^{3+} (1.0\text{M})/\text{Au}$ [$E^\circ_{\text{Ni}/\text{Ni}^{2+}} = 0.25\text{V}$, $E^\circ_{\text{Au}/\text{Au}^{3+}} = -1.5\text{V}$] is _____.

Mathematics

51. Number of solution of equation $2\cos^2\theta - \sqrt{2}\sin^2\theta = 1$ in $[0, 2\pi]$ which are solutions of the equation $\sin 2\theta = \sqrt{2}\cos^2\theta$
- (A) 0 (B) 1 (C) 2 (D) 4
52. The number of solution of $x \in (-2\pi, 2\pi)$ of the question $(\sqrt{3}\cos x + \sin x)^{\sqrt{3\sin 2x + \cos 2x + 2}} = 4$
- (A) 0 (B) 2 (C) 4 (D) 8
53. Which of the following is always equal to $\sin^2 2\theta$
- (A) $\frac{1 + \cos 4\theta}{2}$ (B) $\frac{4\tan^2\theta}{1 + \tan^4\theta}$ (C) $\cos\theta(\cos\theta - \cos 3\theta)$ (D) $\sin\theta(\sin\theta - \sin 3\theta)$
54. In a ΔABC if $\tan A : \tan B : \tan C = 3:4:5$ then value of $\sin A \cdot \sin B \cdot \sin C$ is
- (A) $\frac{2}{\sqrt{5}}$ (B) $\frac{2\sqrt{5}}{7}$ (C) $\frac{2\sqrt{5}}{9}$ (D) $\frac{2}{3\sqrt{5}}$

55. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$ then $x^4 + y^4 + z^4 + 4x^2y^2z^2 = \lambda(y^2z^2 + z^2x^2 + x^2y^2)$ where $\lambda =$
 (A) 1 (B) -1 (C) 2 (D) -2
56. Area (in square units) bounded by the curves
 $f(x) = \cos^2x + \sec^2x$ and
 $g(x) = \sin^2x + \operatorname{cosec}^2x$ between $x = \frac{\pi}{4}$ and $x = \frac{\pi}{3}$ is
 (A) $\frac{30-11\sqrt{3}}{12}$ (B) $\frac{19\sqrt{3}-30}{12}$ (C) $\frac{10\sqrt{3}+11}{4\sqrt{3}}$ (D) $\frac{19+10\sqrt{3}}{4\sqrt{3}}$
57. Set of values of x in which $f(x) = |x^2 - 5x - 6|$ is monotonic, is
 (A) (-2, 2) (B) (2, 3) (C) (3, 6) (D) (5, 7)
58. If a function has two local extremum points then which of the following is always incorrect.
 (A) Both points are local maxima (B) One is local maxima & other is local minima
 (C) Function is invertible (D) At both points function has same value
59. Consider $f(x) = \frac{[x] - [-x]}{\{x\} + \{-x\}}$ where $[] \rightarrow \text{GIF}$, $\{ \} \rightarrow \text{F.P.F}$ then which of the following is correct
 (A) $f(x)$ is odd function $\forall x \in D_f$ (B) $f(x)$ is periodic function
 (C) $f(x)$ is discontinuous in its domain (D) Jump of discontinuity at $x = 1$ is 3.
60. Number of solution of the equation $(x-1)^2 + x \ln x = x$ is
 (A) 0 (B) 1 (C) 2 (D) 3
61. Number of complex number satisfying equation $z^3 = \bar{z}$ & $\arg(z+1) = \frac{\pi}{4}$ simultaneously is
 (A) 1 (B) 2 (C) 3 (D) 4
62. Four distinct numbers are randomly selected out of the set of first 20 natural numbers. Probability that no two of them are consecutive is
 (A) $\frac{28}{57}$ (B) $\frac{20}{63}$ (C) $\frac{19}{93}$ (D) $\frac{12}{59}$
63. Mean and variance of a set of 6 terms is 11 and 24 respectively and mean and variance of another set of 3 terms is 14 and 36 respectively. Then variance of all 9 terms is equal to
 (A) 40 (B) 30 (C) 50 (D) 35
64. Let $(1+x)(1+x+x^2)(1+x+x^2+x^3) \dots (1+x+x^2+\dots+x^{30}) = a_0 + a_1x + a_2x^2 + \dots + a^{465}x^{465}$ then sum of $a_0 + a_2 + a_4 \dots$ is
 (A) $(31)!$ (B) $\frac{(31)!}{2}$ (C) $(30)!$ (D) $\frac{(60)!}{2}$
65. Let, $a, b, c \in \mathbb{R}^+$ and $2ab^3 + a^2b^3 + b^3 = 243$. If $(2a + 3b + 2)$ assumes its least value, then $(a + b)$ is equal to.
 (A) 1 (B) 2 (C) 4 (D) 5
66. If the line $y = \sqrt{3}x$ cuts the curve $x^4 + ax^2y + bxy + cx + dy + 6 = 0$ at A, B, C and D, then the value of OA. OB. OC. OD. (where o is origin) is equal to
 (A) 96 (B) $\frac{3}{8}$ (C) $\frac{8}{3}$ (D) 6
67. In a triangle ABC the equation of side BC is $x - 7y + \lambda = 0$ with vertex A(1, 2) & internal angle bisector through B is $y = x$ then value of λ is
 (A) 5 (B) 3 (C) -3 (D) -5

