



# Sri Chaitanya IIT Academy., India.

A.P. T.S. KARNATAKA TAMILNADU MAHARASTRA DELHI RANCHI

A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

SEC: Sr.Super60\_STERLING BT

JEE-MAIN

Date: 07-06-2025

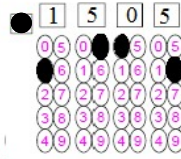
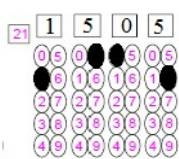
Time: 09:00AM to 12:00PM

QMT-11

Max. Marks: 300

## IMPORTANT INSTRUCTION:

- Immediately fill in the Admission number on this page of the Test Booklet with **Blue/Black Ball Point Pen** only.
- The candidates should not write their Admission Number anywhere (except in the specified space) on the Test Booklet/ Answer Sheet.
- The test is of **3 hours** duration.%
- The Test Booklet consists of **75 Questions**. The maximum marks are **300**.
- There are **three** parts in the question paper 1,2,3 consisting of **Mathematics, Physics and Chemistry** having **25 Questions** in each subject and subject having **two sections**.  
(I) Section –I contains **20 Multiple Choice Questions** with only one correct option.  
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.  
(II) Section-II contains **05 Numerical Value Type Questions**.  
■ The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).  
To cancel any attempted question bubble on the question number box.  
For example: To cancel attempted Question 21. Bubble on 21 as shown below



Question Answered for Marking      Question Cancelled for Marking

Marking scheme: +4 for correct answer, 0 if **not attempt** and -1 in all other cases.

- Use **Blue / Black Point Pen only** for writing particulars / marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**
- No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electron device etc, except the Identity Card inside the examination hall.
- Rough work is to be done on the space provided for this purpose in the Test Booklet only.
- On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
- Do not fold or make any stray marks on the Answer Sheet**

Name of the Candidate (in Capital): \_\_\_\_\_

Admission Number:

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Candidate's Signature: \_\_\_\_\_

Invigilator's Signature: \_\_\_\_\_



**07-06-25\_Sr.Super60\_STERLING BT\_Jee-Main\_QMT-11\_Test Syllabus**

**MATHEMATICS** : TOPICS COVERED FROM 20TH MAY 2024 TO 31ST MAY 2025 - 50% + PRESENT WEEK 50%

**PHYSICS** : 50% ON SYLLABUS COVERED FROM 20-05-2024 TO 30-05-25 & 50 % ON 02-06-2025 TO 05-06-2025

**CHEMISTRY** : TOPICS COVERED FROM 20TH MAY 2024 TO 16TH MAY 2025 -50% + PRESENT WEEK(02-06-25 TO 06-06-25) 50%



**MATHEMATICS****Max Marks: 100****SECTION-I (SINGLE CORRECT ANSWER TYPE)**

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.**

- Consider the regions  $R = \{(x, y) \in R \times R, x \geq 0 \text{ and } y^2 \leq 4 - x\}$   
Let F be the family of all circles that are contained in R and have centres on X-axis. Let C be the circle that has largest radius (r) among the circles in F.  
Let  $(\alpha, \beta)$  be a point where circle C meets curve  $y^2 = 4 - x$ . Then  $\alpha + 2r =$   
1) 5                      2) 6                      3) 7                      4) 8
- $16^{x^2+y} + 16^{y^2+x} = 1$  then  $32(x^4 + y^4) =$   
1) 8                      2) 7                      3) 4                      4) None of these
- Region R contains all the points  $(x, y)$  such that  $x^2 + y^2 \leq 100$  and  $\sin(x + y) \geq 0$  area of region in R is  
1)  $40\pi$                       2)  $50\pi$                       3)  $60\pi$                       4)  $70\pi$
- For a positive number  $n$ , let  $f(n)$  be value of  $f(n) = \frac{4n + \sqrt{4n^2 - 1}}{\sqrt{2n+1} + \sqrt{2n-1}}$   
then  $f(1) + f(2) + f(3) + \dots + f(40) =$   
1) 362                      2) 363                      3) 364                      4) none
- The number of integers  $x$  so that  $\sqrt{x + \sqrt{x + \sqrt{x + \dots + \sqrt{x}}}} < 8$  for any number of radicals  
1) 55                      2) 56                      3) 57                      4) 54
- In the sequence  $\{x_n\}$ ,  $x_1 = 1$ ,  $x_{n+1} = \frac{\sqrt{3}x_n + 1}{\sqrt{3} - x_n}$  for  $n \in N$   $\sum_{k=1}^{2008} x_k =$   
1) 0                      2) 1                      3) 2                      4) None
- $\sum_{n=1}^{100} i^n =$  \_\_\_\_\_ (where  $i = \sqrt{-1}$ )  
1) 0                      2) 1                      3) -1                      4) None
- If the four complex numbers  $Z, \bar{Z}, \bar{Z} - 2\operatorname{Re}(\bar{Z})$  and  $Z - 2\operatorname{Re}(Z)$  represent the vertices of a square of side 4 units in argand plane then  $|Z|$  is equal to  
1)  $4\sqrt{2}$                       2) 4                      3)  $2\sqrt{2}$                       4) 2

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**THE PERFECT HAT-TRICK WITH ALL-INDIA RANK 1**  
**IN JEE MAIN 2023 JEE ADVANCED 2023 AND NEET 2023**

**JEE MAIN 2023**  
SINGARAJI  
VENKAT MOUDUNYA  
SRI CHAITANYA  
EDUCATIONAL INSTITUTIONS  
RANK 1  
300  
300



**RANK 1**

**JEE Advanced 2023**  
VAVILALA  
CHIDVILAS REDDY  
SRI CHAITANYA  
EDUCATIONAL INSTITUTIONS  
RANK 1  
341  
360



**RANK 1**

**NEET 2023**  
BORA VARUN  
CHAKRABARTI  
SRI CHAITANYA  
EDUCATIONAL INSTITUTIONS  
RANK 1  
720  
720



**RANK 1**



9. If  $z = -2e^{i\left(-\frac{\pi}{3}\right)}$ , and  $|z| = \alpha$  and  $\arg(z) = \beta$ , then  $(\alpha, \beta) =$
- 1)  $(2, -\frac{\pi}{3})$       2)  $(2, \frac{2\pi}{3})$       3)  $(-2, -\frac{\pi}{3})$       4) None of these
10. If  $z^2 + |z| = 0$ ,  $z$  is a complex number. The number of possible  $z$  are.
- 1) 1      2) 2      3) 3      4) 5
11. If  $z_1, z_2$  are complex numbers such that  $\operatorname{Re}(z_1) = |z_1 - 1|$ ,  $\operatorname{Re}(z_2) = |z_2 - 1|$   
 $\arg(z_1 - z_2) = \frac{\pi}{6}$ , then  $\operatorname{Im}(z_1 + z_2)$  equal to
- 1)  $\frac{2}{\sqrt{3}}$       2)  $2\sqrt{3}$       3)  $\frac{\sqrt{3}}{2}$       4)  $\frac{1}{\sqrt{3}}$
12. If  $z_1, z_2$  and  $z_3, z_4$  are two pairs of complex conjugate numbers,  
then  $\arg\left(\frac{z_1}{z_4}\right) + \arg\left(\frac{z_2}{z_3}\right) =$
- 1) 0      2)  $\frac{\pi}{2}$       3)  $\frac{3\pi}{2}$       4)  $\pi$
13.  $z = \frac{(\cos 3\theta - i \sin 3\theta)^5 (\sin 5\theta + i \cos 5\theta)^4}{(\cos 4\theta - i \sin 4\theta)^6}$  where  $\theta = \frac{\pi}{6}$  then  $z =$
- 1)  $e^{-i\frac{\pi}{6}}$       2)  $e^{i\frac{\pi}{6}}$       3)  $e^{i\frac{11\pi}{6}}$       4)  $e^{-i\frac{11\pi}{6}}$
14. If  $a > 0$ ,  $z = \frac{(1+i)^2}{a-i}$ , has a magnitude  $\sqrt{\frac{2}{5}}$ , then  $\bar{z} =$
- 1)  $-\frac{1}{5} - \frac{3i}{5}$       2)  $-\frac{3}{5} - \frac{1i}{5}$       3)  $\frac{1}{5} - \frac{3i}{5}$       4)  $-\frac{1}{5} + \frac{3i}{5}$

JEE MAIN  
2023SINGARAJI  
VENKAT MOUNDHIA  
SRI CHAITANYA  
EDUCATIONAL INSTITUTIONS  
RANK 1st Place  
300  
300  
2023RANK  
1JEE Advanced  
2023VAVILALA  
CHIDVILAS REDDY  
SRI CHAITANYA  
EDUCATIONAL INSTITUTIONS  
RANK 1st Place  
341  
360  
2023RANK  
1NEET  
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CHAKRABARTHI  
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EDUCATIONAL INSTITUTIONS  
RANK 1st Place  
720  
720  
2023RANK  
1





15. Match the complex numbers given in column I with their square roots in column II and choose the correct option from codes given below:

Column I	Column I
A) $-15 - 8i$	1) $-1 + 3i, 1 - 3i$
B) $-8 - 6i$	2) $-1 + 4i, 1 - 4i$
C) $1 - i$	3) $\pm \frac{1}{\sqrt{2}} \mp \frac{1}{\sqrt{2}}i$
D) $-i$	4) $\pm \sqrt{\frac{\sqrt{2}+1}{2}} \mp i \sqrt{\frac{\sqrt{2}-1}{2}}$

Correct choose option:

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

16.  $\left| z - \frac{2}{z} \right| = 1$ . If range of  $|z|$  is  $[a, b]$ . Then,  $a + b =$

- 1) 3                      2) 5                      3) 7                      4) 9

17.  $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$  then  $f(100) =$

- 1) 0                      2) 1                      3) 100                      4) -100

18. If A and B are symmetric matrices then  $AB - BA$  is a

- 1) symmetric matrix                      2) skew-symmetric matrix  
3) Diagonal matrix                      4) Null matrix

19. If  $\vec{a}, \vec{b}, \vec{c}$  are unit vectors then  $|\vec{a} - \vec{b}|^2 + |\vec{b} - \vec{c}|^2 + |\vec{c} - \vec{a}|^2$  does not exceed

- 1) 4                      2) 9                      3) 8                      4) 6

20. If edges of a tetrahedron are  $\vec{a}, \vec{b}, \vec{c}$

**Statement-I:** Volume of a tetrahedron is given by  $\left| \frac{1}{6} [\vec{a} \vec{b} \vec{c}] \right|$  where  $[\vec{a} \vec{b} \vec{c}] = |\vec{a} \cdot (\vec{b} \times \vec{c})|$

**Statement-II:** The volume of tetrahedron determined by vectors  $\vec{a}, \vec{b}, \vec{c}$  is  $\frac{3}{4}$  cubic units. Then the volume of a tetrahedron determined by

vectors  $3(\vec{a} \times \vec{b}), 4(\vec{b} \times \vec{c}), 5(\vec{c} \times \vec{a})$  will be 222.5 cubic units.

Then which of the following is correct.





- 1) Both statement-I and statement-II are correct
- 2) Both statement-I and statement-II are incorrect
- 3) Statement-I is incorrect, statement-II is correct
- 4) Statement-I is correct, statement-II is incorrect

**SECTION-II (NUMERICAL VALUE TYPE)**

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

**Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.**

21. If  $xdy = y(dx + ydy)$  and  $y > 0$ ,  $y(1) = 1$  then  $y(-3) =$

22. If  $f(t) = \int_0^{\pi} \frac{2x \, dx}{1 - \cos^2 t \sin^2 x}$  where  $0 < t < \pi$ , then value of  $\int_0^{\frac{\pi}{2}} \frac{\pi^2}{f(t)} \, dt$

23. If  $\frac{3}{2 + \cos \theta + i \sin \theta} = a + ib$ , then  $(a - 2)^2 + b^2 =$

24. Let  $z \in C$  be such that  $|z| < 1$  if  $w = \frac{5 + 3z}{5(1 - z)}$ , the minimum integral value of  $5 \operatorname{Re}(w)$  is

25. If  $z$  and  $w$  are two complex numbers such that  $|zw| = 1$  and  $\arg(z) - \arg(w) = \frac{\pi}{2}$  then  $|\bar{z}w| =$

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RANK 1st Place  
**300**  
SCORE**RANK**  
**1****JEE Advanced**  
**2023**VAVILALA  
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RANK 1st Place  
**341**  
**360**  
SCORE**RANK**  
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**2023**BORA VARUN  
CHAKRAVARTHI  
SRI CHAITANYA  
RANK 1st Place  
**720**  
**720**  
SCORE**RANK**  
**1**

## PHYSICS

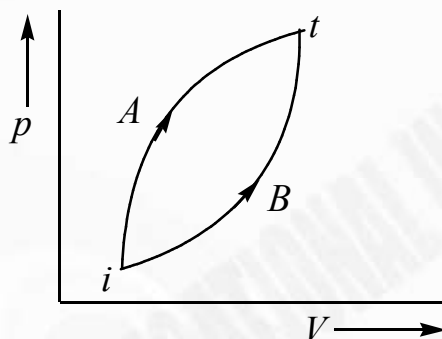
Max Marks: 100

## SECTION-I (SINGLE CORRECT ANSWER TYPE)

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.**

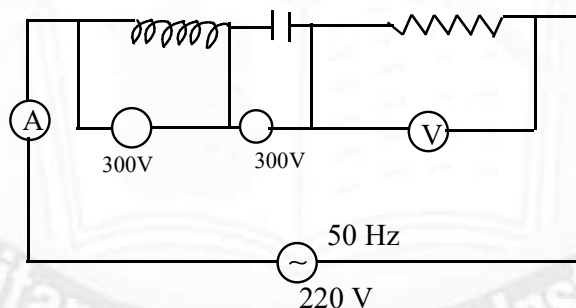
26. Following figure shows two processes  $A$  and  $B$  for a gas. If  $\Delta Q_A$  and  $\Delta Q_B$  are the amount of heat absorbed by the system in two cases,  $\Delta U_A$  and  $\Delta U_B$  are changes in internal energies respectively, then



- 1)  $\Delta Q_A > \Delta Q_B$ ,  $\Delta U_A > \Delta U_B$       2)  $\Delta Q_A < \Delta Q_B$ ,  $\Delta U_A < \Delta U_B$   
 3)  $\Delta Q_A > \Delta Q_B$ ,  $\Delta U_A = \Delta U_B$       4)  $\Delta Q_A = \Delta Q_B$ ,  $\Delta U_A = \Delta U_B$
27. A  $100 \mu F$  capacitor in series with a  $40 \Omega$  resistor is connected to a  $110 V$ ,  $60 \text{ Hz}$  supply. Calculate the maximum current in the circuit.
- 1)  $1.57 A$       2)  $3.24 A$       3)  $6.28 A$       4)  $2.5 A$
28. A DC of  $2 A$  and an AC of peak value  $2 A$  flow through a resistance of  $2 \Omega$  and  $1 \Omega$  respectively. Calculate the ratio of heat produced in the two resistance in the same time interval.
- 1)  $1:1$       2)  $1:2$       3)  $8:1$       4)  $4:1$
29. A circuit connected to an AC source of  $e = e_0 \sin(100t)$  with  $t$  in seconds, gives a phase difference of  $\frac{\pi}{4}$  between the emf  $e$  and current  $i$ . Which of the following circuits will exhibit this?
- 1)  $RC$  circuit with  $R = 1 k\Omega$  and  $C = 1 \mu F$   
 2)  $RL$  circuit with  $R = 1 k\Omega$  and  $L = 1 mH$   
 3)  $RC$  circuit with  $R = 1 k\Omega$  and  $C = 10 \mu F$   
 4)  $RL$  circuit with  $R = 1 k\Omega$  and  $L = 10 mH$



30. Statement–I: The D.C and A.C both can be measured by hot wire instrument.  
Statement–II: The hot wire instrument is based on the principle of magnetic effect of current.
- 1) Statement–I is true, statement–II is true; statement–II is correct explanation for statement–I
  - 2) Statement–II is true, statement–I is true; statement–II is not correct explanation for statement–I
  - 3) Statement–I is true, statement –II is false
  - 4) Statement–I is false, statement–II is true
31. Statement – I: The electrostatic energy stored in capacitor plus magnetic energy stored in inductor will always be zero in a series LCR circuit driven by ac voltage source under condition of resonance.  
Statement – II: The complete voltage of ac source appears across the resistor in a series LCR circuit driven by ac voltage source under condition of resonance.
- 1) Statement–I is true, statement–II is true; statement–II is correct explanation for statement–I
  - 2) Statement–II is true, statement–I is true; statement–II is not correct explanation for statement–I
  - 3) Statement–I is true, statement–II is false
  - 4) Statement–I is false, statement–II is true
32. In the circuit shown below what will be the reading of the voltmeter and ammeter?  
(Total impedance of circuit  $Z = 100 \Omega$ )



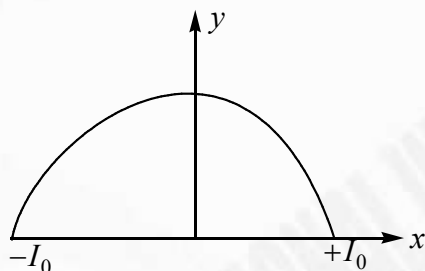
- 1) 200V, 1 A      2) 800V, 2 A      3) 100 V, 2 A      4) 220V, 2.2 A
33. Statement – I: For practical purposes, the earth is used as a reference at zero potential in electrical circuits.  
Statement – II: the electrical potential of a sphere of radius  $R$  with charge  $Q$  uniformly distributed on the surface is given by  $\frac{Q}{4\pi\epsilon_0 R}$







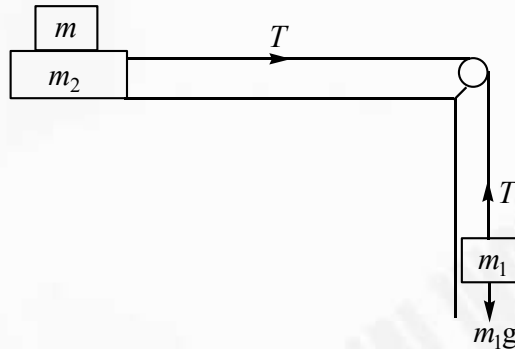
- 1) Statement – I is true, statement – II is true; statement –II is correct explanation for statement – I  
 2) Statement – II is true, statement – I is true; statement –II is not correct explanation for statement – I  
 3) Statement – I is true, statement – II is false  
 4) Statement – I is false, statement – II is true
34. Determine the rms value of semicircular wave which has a maximum value  $I_0$  \_\_\_\_\_ A



- 1)  $\sqrt{\frac{2}{3}}I_0$       2)  $\sqrt{\frac{3}{2}}I_0$       3)  $\sqrt{\frac{1}{2}}I_0$       4)  $\sqrt{2}I_0$
35. The number of turns of primary and secondary coils of a transformer is 5 and 10 respectively and mutual inductance of the transformer is 25 H. Now, number of turns in primary and secondary are made 10 and 5 respectively. Mutual inductance of transformer will be  
 1) 25 H      2) 12.5 H      3) 50 H      4) 6.25 H
36. A telephone wire of length 200 km has a capacitance of  $0.014 \mu F$  per km. If it carries an AC frequency 5 kHz, what should be the value of an inductor required to be connected in series so that the impedance of the circuit is minimum?  
 1) 0.35 mH      2) 3.5 mH      3) 2.5 mH      4) Zero
37. If surface tension (S), moment of inertia (I) and Plank's constant ( $h$ ), were to be taken as the fundamental units, the dimensional formula for linear momentum would be  
 1)  $S^{1/2} I^{1/2} h^{-1}$       2)  $S^{3/2} I^{1/2} h^0$       3)  $S^{1/2} I^{5/2} h^{-2}$       4)  $S^{1/2} I^{3/2} h^{-1}$
38. A particle moves from the point  $(2.0\hat{i} + 4.0\hat{j})m$  at  $t = 0$  with an initial velocity  $(5.0\hat{i} + 4.0\hat{j})ms^{-1}$ . It is acted upon by a constant force which produces a constant acceleration  $(4.0\hat{i} + 4.0\hat{j})ms^{-2}$ . What is the distance of the particle from the origin at time 2 s?  
 1) 5 m      2)  $20\sqrt{2} m$       3)  $10\sqrt{2} m$       4) 15 m

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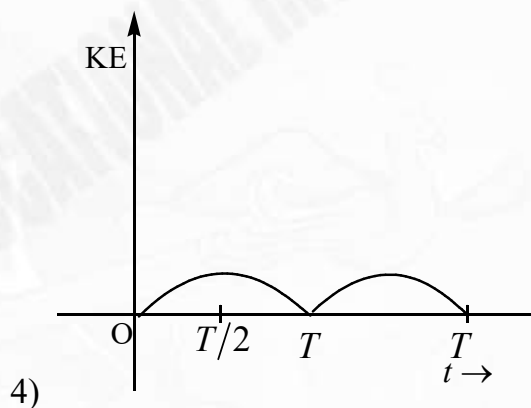
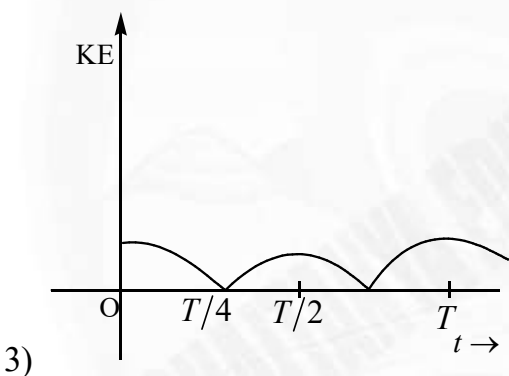
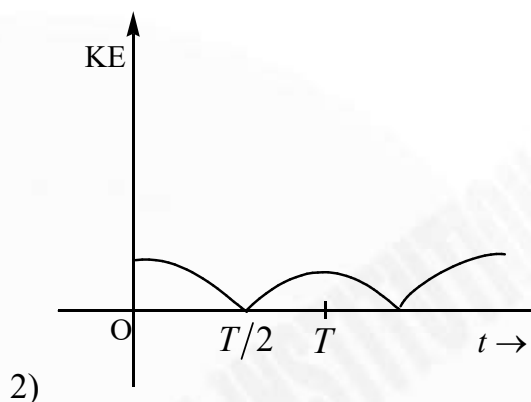
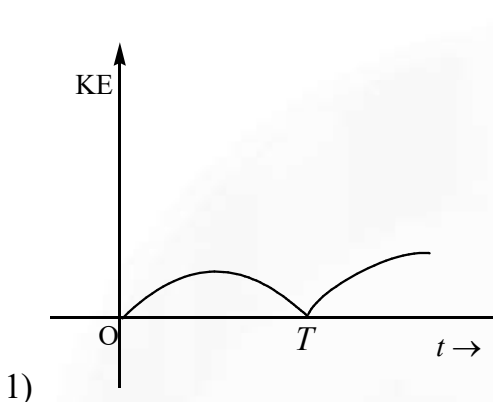
39. Two masses  $m_1 = 5 \text{ kg}$  and  $m_2 = 10 \text{ kg}$  connected by an inextensible string over a frictionless pulley, are moving as shown in the figure. The coefficient of friction of horizontal surface is 0.15. The minimum weight  $m$  that should be put on top of  $m_2$  to stop the motion is



- 1) 23.33 kg      2) 18.3 kg      3) 27.3 kg      4) 43.3 kg
40. A body of mass  $m = 10^{-2} \text{ kg}$  is moving in a medium and experiences a frictional force  $F = -kv^2$ . Its initial speed is  $v_0 = 10 \text{ ms}^{-1}$ . If, after 10s, its energy is  $\frac{1}{8}mv_0^2$ , the value of  $k$  will be
- 1)  $10^{-3} \text{ kg s}^{-1}$       2)  $10^{-4} \text{ kg m}^{-1}$       3)  $10^{-1} \text{ kg m}^{-1} \text{ s}^{-1}$       4)  $10^{-3} \text{ kg m}^{-1}$
41. Distance of the centre of mass of a solid uniform cone from its vertex is  $z_0$ . If the radius of its base is  $R$  and its height is  $h$ , then  $z_0$  is equal to
- 1)  $\frac{3h}{4}$       2)  $\frac{h^2}{4R}$       3)  $\frac{5h}{8}$       4)  $\frac{3h^2}{8R}$
42. From a solid sphere of mass  $M$  and radius  $R$ , a cube of maximum possible volume is cut. Moment of inertia of cube about an axis passing through its centre and perpendicular to one of its faces is
- 1)  $\frac{MR^2}{32\sqrt{2}\pi}$       2)  $\frac{4MR^2}{9\sqrt{3}\pi}$       3)  $\frac{MR^2}{16\sqrt{2}\pi}$       4)  $\frac{4MR^2}{3\sqrt{3}\pi}$
43. A particle is moving with a uniform speed in a circular orbit of radius  $R$  in a central force inversely proportional to the  $n$ th power of  $R$ . If the period of rotation of the particle is  $T$ , then
- 1)  $T \propto R^{n/2}$       2)  $T \propto R^{3/2}$       3)  $T \propto R^{\frac{n}{2}+1}$       4)  $T \propto R^{\frac{n+1}{2}}$



44. A particle is executing simple harmonic motion with a time period  $T$ . At time  $t = 0$ , it is at its position of equilibrium. The kinetic energy-time graph of the particle will look, like



45. Two rods of different materials having coefficients of thermal expansion  $\alpha_1, \alpha_2$  and Young's moduli  $Y_1, Y_2$  respectively are fixed between two rigid massive walls. The rods are heated such that they undergo the same increase in temperature. There is no bending of the rods. If  $\alpha_1 : \alpha_2 = 2 : 3$ , the thermal stresses developed in the two rods are equal provided  $Y_1 : Y_2$  is equal to
- 1) 2 : 3      2) 1 : 1      3) 3 : 2      4) 4 : 9

### SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

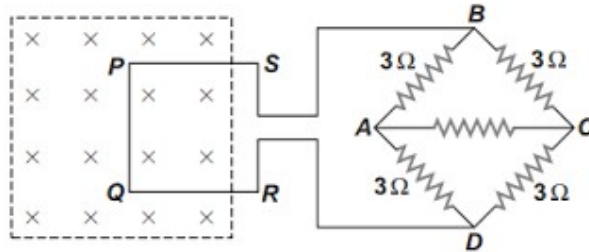
**Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases**

46. An alternating voltage  $E = 200\sqrt{2} \sin(100t)$  volt is connected to a  $1\mu F$  capacitor through an ac ammeter. The reading of the ammeter \_\_\_\_\_ mA

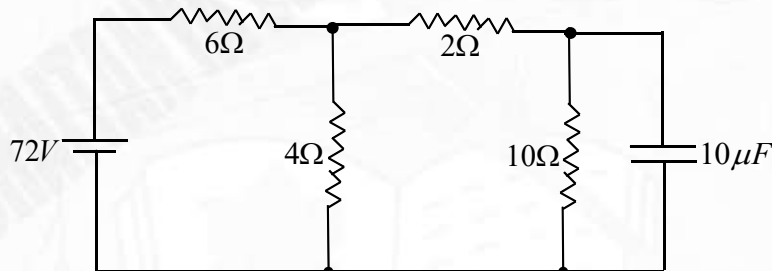




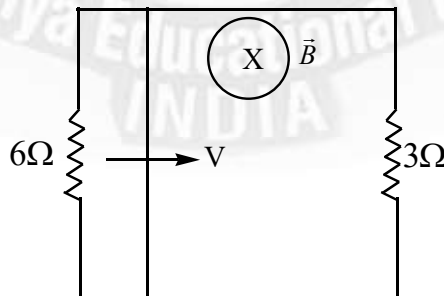
47. A square metal wire loop PQRS of side 10 cm and resistance  $1\ \Omega$  is moved with constant velocity  $V_c$  in a uniform magnetic field of induction  $B = 2\ \text{Wbm}^2$ , as shown in figure. The magnetic field lines are perpendicular to the plane of the loop (directed into the paper). The loop is connected to network ABCD of resistors each of value  $3\ \Omega$ . The resistance of the lead wires SB and RD are negligible. The speed of the loop so as to have a steady current of 1mA in the loop is \_\_\_\_\_  $10^{-3}\text{ms}^{-1}$



48.  $130\sqrt{2}\text{V}, 50\text{ Hz}$  ac source is applied across a series LR circuit having  $L = \frac{175}{11}\text{mH}$  and  $R = 12\ \Omega$ . Calculate the impedance of the circuit \_\_\_\_\_  $\Omega$
49. Determine the charge on the capacitor in the following circuit \_\_\_\_\_  $\mu\text{C}$



50. A rectangular loop with a sliding connector of length  $l = 1.0\text{ m}$  is situated in a uniform magnetic field  $B = 2\text{ T}$ . Perpendicular to the plane of loop. Resistance of connector is  $r = 2\ \Omega$ . Two resistance of  $6\ \Omega$  and  $3\ \Omega$  are connected as shown in figure. The external force required to keep the connector moving with a constant velocity  $v = 2\text{ ms}^{-1}$  is \_\_\_\_\_ N

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**CHEMISTRY****Max Marks: 100****SECTION-I (SINGLE CORRECT ANSWER TYPE)**

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.**

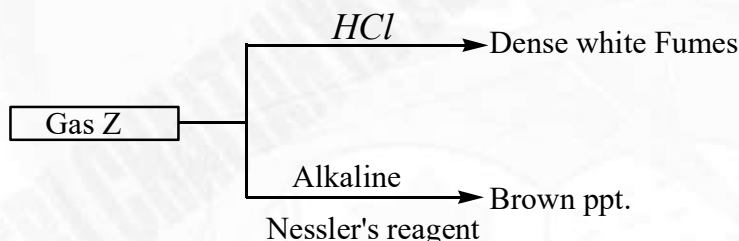
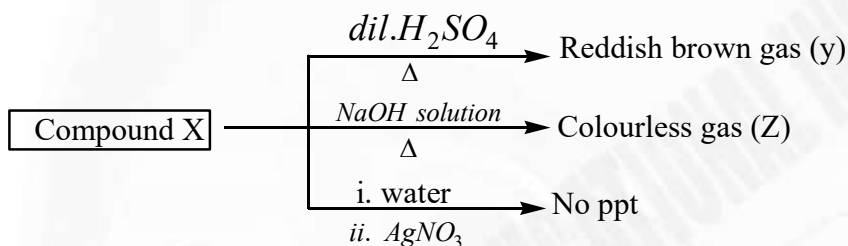


$$K_a(\text{HCOOH}) = 1.77 \times 10^{-4}, \quad K_a(\text{CH}_3\text{COOH}) = 1.8 \times 10^{-5}$$

emf of the cell is (Neglect the liquid-liquid junction potential)

- 1) 0.0591 V      2) -0.0591 V      3) 0.02955 V      4) -0.02955 V

52. X, Y and Z are \_\_\_\_\_ respectively.



- 1)  $(\text{NH}_4)_2\text{SO}_4, \text{SO}_2, \text{NH}_3$       2)  $\text{NH}_4\text{NO}_2, \text{NO}_2, \text{NH}_3$   
 3)  $\text{NH}_4\text{Br}, \text{Br}_2, \text{NH}_3$       4)  $(\text{NH}_4)_2\text{CO}_3, \text{CO}_2, \text{NH}_3$

53. Arrange the following in order of magnitude of work done by the system/on the system at constant temperature

- a)  $|W_{\text{reversible}}|$  for expansion in infinite stage  
 b)  $|W_{\text{irreversible}}|$  for expansion in single stage  
 c)  $|W_{\text{reversible}}|$  for compression in infinite stage  
 d)  $|W_{\text{irreversible}}|$  for compression in single stage

Choose the correct answer from the options given below:

- 1)  $a > b > c > d$       2)  $d > c = a > b$       3)  $c = a > d > b$       4)  $a > c > b > d$



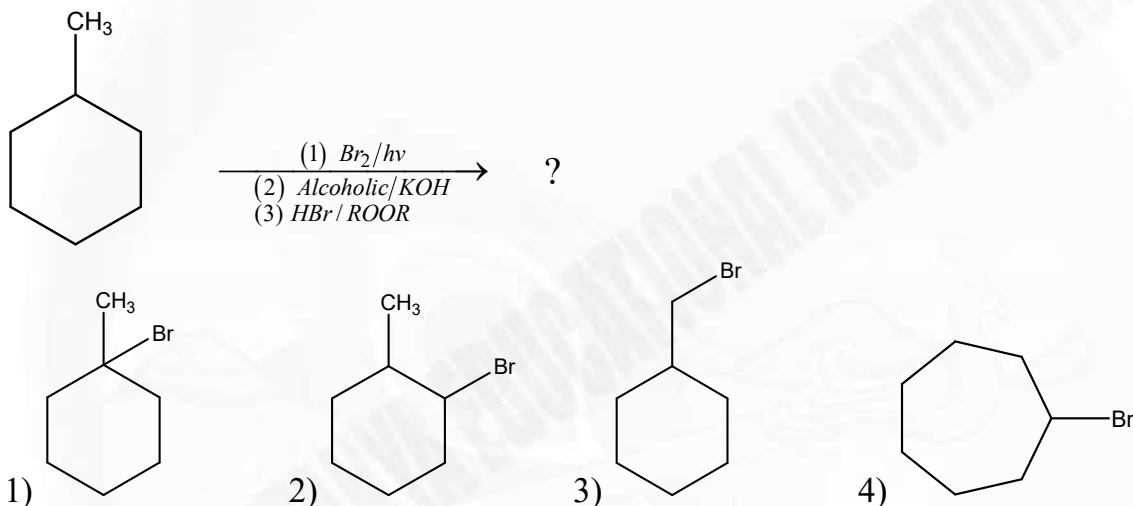
54. The correct orders among the following are

- A. Atomic radius:  $B < Al < Ga < In < Tl$   
B. Electronegativity:  $Al < Ga < In < Tl < B$   
C. Density:  $Tl < In < Ga < Al < B$   
D. 1st Ionisation Energy:  $In < Al < Ga < Tl < B$

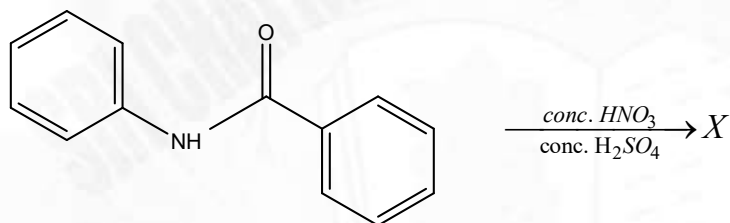
Choose the correct answer from the options given below:

- 1) B and D only    2) A and C only    3) C and D only    4) A and B only

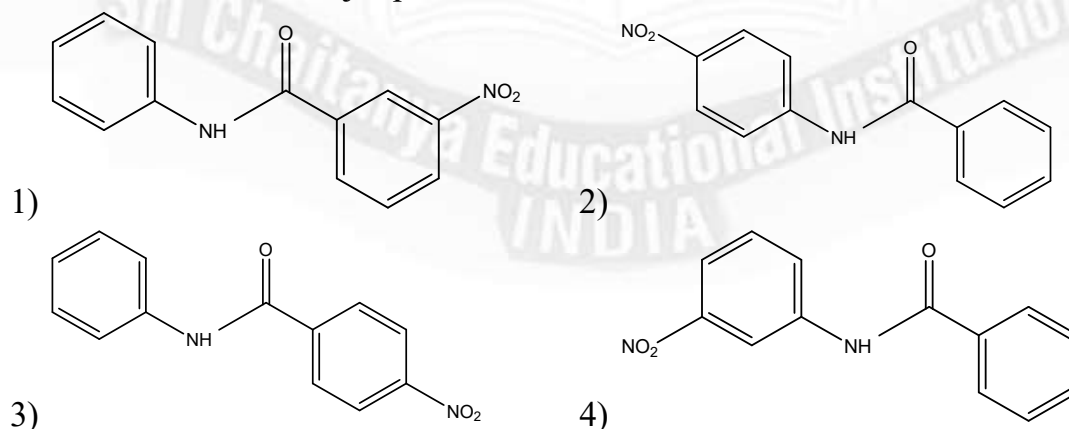
55. Predict the major product of the following reaction sequence:



56. In the following reaction,



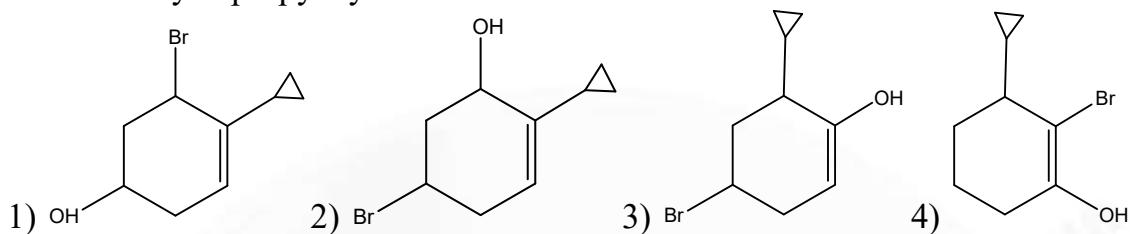
the structure of the major product 'X' is



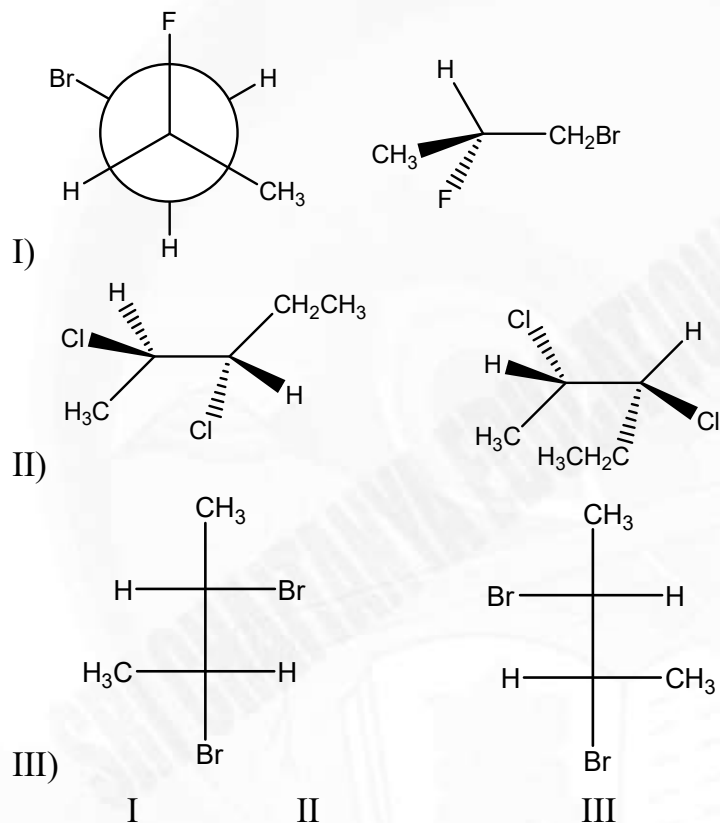




60. 5-Bromo-2-cyclopropyl cyclohex-2-enol have correct structure is



61. Indicate whether each of the following pairs are



- |                |               |             |
|----------------|---------------|-------------|
| I              | II            | III         |
| 1) Enantiomers | Diastereomers | Enantiomers |
| 2) Identical   | Enantiomers   | Enantiomers |
| 3) Enantiomers | Diastereomers | Identical   |
| 4) Enantiomers | Identical     | Identical   |

62. **Statement I :** Upon heating a borax bead dipped in cupric sulphate in a luminous flame, the colour of the bead becomes green.

**Statement II :** The green colour observed is due to the formation of copper(I) metaborate.

In the light of the above statements, choose the most appropriate answer from the options given below :







- 1) Both Statement I and Statement II are true
- 2) Statement I is true but Statement II is false
- 3) Both Statement I and Statement II are false
- 4) Statement I is false but Statement II is true

63. Assertion (A): Among the two O–H bonds in  $H_2O$  molecule, the energy required to break the first O–H bond and the other O–H bond is the same.

Reason (R): This is because the electronic environment around oxygen is the same even after breakage of one O–H bond.

- 1) A and R both are correct, and R is correct explanation of A.
- 2) A and R both are correct, but R is not the correct explanation of A
- 3) A is true but R is false
- 4) A and R both are false

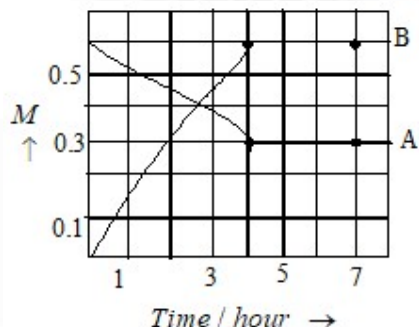
64. A substance on treatment with dil.  $H_2SO_4$  Liberates a colourless gas which produces

i) Trubidity with baryta water and (ii) turns acidified dichromate solution green.

The reaction indicates the presence of

- 1)  $C_2O_3^{2-}$
- 2)  $S^{2-}$
- 3)  $SO_3^{2-}$
- 4)  $NO_2^-$

65. The progress of the reaction  $A_{(g)} \rightleftharpoons nB_{(g)}$  with time is shown



Equilibrium constant  $K_C$  of the above graphical study is

- 1) 1.2
- 2) 0.83
- 3) 0.5
- 4) 2

66. Which one among the following pairs of ions cannot be separated by  $H_2S$  in dilute hydrochloric acid?

- 1)  $Zn^{2+}, Cu^{2+}$
- 2)  $Cu^{2+}, Hg^{2+}$
- 3)  $Al^{3+}, Hg^{2+}$
- 4)  $Cu^{2+}, Mn^{2+}$



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67. When a concentrated solution of sulphanilic acid and 1-naphthylamine is treated with nitrous acid (273 K) and acidified with acetic acid, the mass (g) of 0.1 mole of product formed is:

(Given molar mass in  $g\ mol^{-1}$  H : 1, C : 12, N : 14, O : 16, S : 32)

- 1) 343                      2) 330                      3) 33                      4) 66

68. Choose the correct tests with respective observations.

A)  $CuSO_4$  (acidified with acetic acid) +  $K_4[Fe(CN)_6] \rightarrow$  chocolate brown precipitate.

B)  $FeCl_3 + K_4[Fe(CN)_6] \rightarrow$  Prussian blue precipitate

C)  $ZnCl_2 + K_4[Fe(CN)_6] \rightarrow$  White or bluish white precipitate

D)  $MgCl_2 + K_4[Fe(CN)_6] \rightarrow$  blue precipitate

E)  $BaCl_2 + K_4[Fe(CN)_6]$ , neutralised with NaOH  $\rightarrow$  White precipitate

Choose the correct answer from the options given below:

- 1) A, D and E only                      2) B, D and E only  
3) A, B and C only                      4) C, D and E only

69. A salt which gives  $CO_2$  with hot  $H_2SO_4$  and also decolourizes acidified  $KMnO_4$  on warming is

- 1)  $HCO_3^-$                       2)  $CO_3^{2-}$                       3) Oxalate ion                      4) Acetate ion

70. A solution of a metal ion when treated with KI gives a red precipitate which dissolves in excess KI to give a colourless solution. Moreover, the solution of metal ion on treatment with a solution of cobalt (II) thiocyanate gives rise to a deep blue crystalline precipitate. The metal ion is

- 1)  $Pb^{2+}$                       2)  $Hg^{2+}$                       3)  $Cu^{2+}$                       4)  $Co^{2+}$

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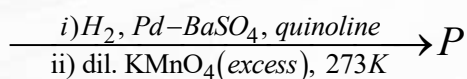
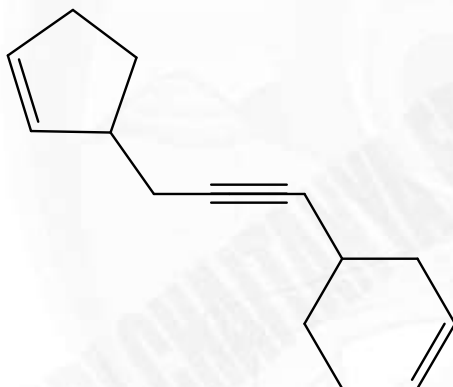
71. The rate of a first order reaction is  $0.04\ mole\ L^{-1}\ sec^{-1}$  at 10 minutes

and  $0.03\ mole\ L^{-1}\ sec^{-1}$  at 20 minutes respectively after initiation. Find the half life of the reaction (nearest integer)





72.  $EDTA^{4-}$  is ethylenediaminetetraacetate ion. The total number of N-Co-O bond angles in  $[Co(EDTA)]^{-1}$  complex ion is
73. The minimum pH required to prevent the precipitation of  $ZnS$  in a solution containing  $0.01M ZnCl_2$  and saturated with  $0.1M H_2S$  is  
 $(K_{sp} \text{ of } (ZnS) = 10^{-21}, K_{a_1} \times K_{a_2} \text{ of } H_2S = 10^{-20})$
74. Molar mass of the salt from  $NaBr, NaNO_3, KI$  and  $CaSO_4$  which does not evolve coloured vapours on heating with concentrated  $H_2SO_4$  is \_\_\_\_\_  $gmol^{-1}$ , (molar mass in : Na:23, K:39, O:16, Br: 80, I:127, F:19, Ca : 40)
75. Total number of hydroxyl groups present in a molecule of the major product P is .....







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