Sri Chaitanya IIT Academy.,India.

A.P T.S KARNATAKA TAMILNADU MAHARASTRA DELHI RANCHI

A right Choice for the Real Aspirant

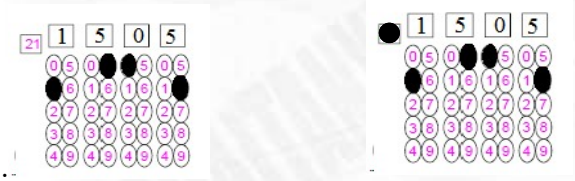
ICON Central Office - Madhapur - Hyderabad

SEC: Sr.Super60_STERLING BT	**JEE-MAIN**	**Date: 14-06-2025**
Time: 09:00AM to 12:00PM	**WTM-34**	**Max. Marks: 300**

IMPORTANT INSTRUCTION:

1. Immediately fill in the Admission number on this page of the Test Booklet with **Blue/Black** Ball Point **Pen** only.
2. The candidates should not write their Admission Number anywhere (except in the specified space) on the Test Booklet/ Answer Sheet.
3. The test is of **3 hours** duration.!
4. The Test Booklet consists of **75 Questions.** The maximum marks are **300.**
5. 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.
6. Use **Blue / Black Point Pen only** for writing particulars / marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**
7. 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.
8. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
9. 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.**
10. **Do not fold of make any stray marks on the Answer Sheet**

Name of the Candidate (in Capital): _____

Admission Number: | | | | | | | | | |

Candidate's Signature:_____ **Invigilator's Signature:** _____

14-06-25_Sr.Super60_STERLING BT_Jee-Main_WTM-34_Test Syllabus

MATHEMATICS : COMPLETE COMPLEX NUMBERS

PHYSICS : MAGNETISM AND MATTER: Bar magnet as an equivalent solenoid, Magnetic field lines, Magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, Torque on a magnetic dipole in a uniform magnetic field, Para, Dia and ferromagnetic substances, The effect of temperature on magnetic properties, EM Waves

CHEMISTRY : ALKYL HALIDES :Preparation and Reactions of alkyl halides, Mechanism of Nucleophilic Substitution reactions (SN1, SN2)

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.

1. The number of complex z satisfying $|z+\bar{z}|+|z-\bar{z}|=4 \, and \, |z+2i|+|z-2i|=4$ is / are

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

2. Let $A(Z_1), B(Z_2) and \, C(Z_3)$ be the vertices of an equilateral ΔABC, then the value of $Arg\left(\frac{z_2+z_3-2z_1}{z_3-z_2}\right)$ is equal to

   1) $\frac{\pi}{3}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{6}$

3. If $x^2+x+1=0$, then the value of $\left(x+\frac{1}{x}\right)^2+\left(x^2+\frac{1}{x^2}\right)^2+....+\left(x^{27}+\frac{1}{x^{27}}\right)^2$ is

   1) 27 2) 72 3) 45 4) 54

4. If $|z_1-1|\le 1, |z_2-2|\le 2, |z_3-3|\le 3$, then the greatest value of $|z_1+z_2+z_3|$ is

   1) 6 2) 7 3) 9 4) 12

5. If $a=\cos\frac{2\pi}{7}+i\sin\frac{2\pi}{7}$, the quadratic equation whose roots are $\alpha=a+a^2+a^4 \, and \, \beta=a^3+a^5+a^6 \, is$

   1) $x^2+x+2=0$ 2) $x^2-5x+7=0$ 3) $x^2-x+2=0$ 4) $x^2+x-2=0$

6. The complex numbers $z_1, z_2 \, and \, z_3$ satisfying $\frac{z_1-z_3}{z_2-z_3}=\frac{1-i\sqrt{3}}{2}$ are the vertices of a triangle which is

   1) of area $\sqrt{3}$ 2) right angled and isosceles

   3) equilateral 4) obtuse angled and isosceles

7. If $a\neq 1$ is any of 7^{th} roots of unity, then real part of $\alpha^{2009}+3\alpha^{2010}+5\alpha^{2011}+....+$ upto to 7 terms is

   1) 7 2) 14 3) -7 4) -14

8. If $\log_{\tan 30^\circ}\left(\frac{2|z|^2+2|z|-3}{|z|+1}\right)<-2$ then

1) $|z|<\frac{3}{2}$ 2) $|z|>\frac{3}{2}$ 3) $|z|>2$ 4) $|z|<2$

9. Let z be a complex number satisfying $|z|^3+2z^2+4\bar{z}-8=0, where\ \bar{z}$ denotes the complex conjugate of z. Let the imaginary part of z be nonzero.

Match each entry in List-I to the correct entries in List-II

LIST-I		LIST-II	
I	$\|z\|^2$ is equal to	P	12
II	$\|z-\bar{z}\|^2$ is equal to	Q	4
III	$\|z\|^2+\|z+\bar{z}\|^2$ is equal to	R	8
IV	$\|z+1\|^2$ is equal to	S	10
		T	7

The correct option is

1) I-P, II-R, III-T, IV-S 2) I-Q, II-P, III-R, IV-T

3) I-Q, II-S, III-T, IV-P 4) I-Q, II-R, III-T, IV-S

10. The complex number $Z=\frac{i-1}{\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}}$ is equal to

1) $\sqrt{2}i\left(\cos\frac{5\pi}{12}-i\sin\frac{5\pi}{12}\right)$ 2) $\sqrt{2}\left(\cos\frac{5\pi}{12}+i\sin\frac{5\pi}{12}\right)$

3) $\sqrt{2}\left(\cos\frac{\pi}{12}+i\sin\frac{\pi}{12}\right)$ 4) $\cos\frac{\pi}{12}-i\sin\frac{\pi}{12}$

11. Let z be a complex number such that $\left|\frac{z-2i}{z+i}\right|=2, z\neq -i.$. Then z lies on the circles of radius 2 and centre

1) (0, 0) 2) (0, -2) 3) (2, 0) 4) (0, 2)

12. Let S_1, S_2 *and* S_3 be three sets defined as:

$$S_1 = \{z \in \mathbb{C} : |z-1| \le \sqrt{2}\}; S_2 = \{z \in \mathbb{C} : \mathrm{Re}((1-i)z \ge 1)\}; S_3 = \{z \in \mathbb{C} : \mathrm{Im}(z) \le 1\}$$

Then the set $S_1 \cap S_2 \cap S_3$

1) is a singleton
2) has exactly two elements
3) has infinitely many elements
4) has exactly three elements

13. A complex number z is said to be unimodular is $|z| = 1$. Suppose z_1 *and* z_2 are complex numbers such that $\frac{z_1 - 2z_2}{2 - z_1 z_2}$ is unimodular and z_2 is not unimodular. Then the point z_1 lies on

1) a circle of radius 2
2) a circle of radius $\sqrt{2}$
3) a straight line parallel to x-axis
4) a straight line parallel to y-axis

14. Statement – I: If argument of $z_1 = \frac{\pi}{3}$, argument of $z_2 = \frac{\pi}{4}$, then $Arg(z_1 z_2) = \frac{7\pi}{12}$

Statement – II: $Arg(z_1 z_2) = Arg(z_1) + Arg(z_2)$

1) Statement – I is true, Statement – II is true
2) Statement - I is false, Statement - II is false
3) Statement – I is true, Statement – II is false
4) Statement – I is false, Statement – II is true.

15. Let w_1 be the point obtained by the rotation of $z_1 = 5 + 4i$ about the origin through a right angle in the anticlockwise direction and w_2 be the point obtained by the rotation of $z_2 = 3 + 5i$ about the origin through a right angle in the clockwise direction. Then the principal argument of $w_1 - w_2$ is equal to

1) $-\pi + \tan^{-1}\frac{33}{5}$
2) $-\pi - \tan^{-1}\frac{33}{5}$
3) $-\pi + \tan^{-1}\frac{8}{9}$
4) $\pi - \tan^{-1}\frac{8}{9}$

16. If $\mathrm{Re}\left(\frac{z-1}{2z+i}\right)=1$, where z =x+iy, then the point (x, y) lies on a :

1) circle whose centre is at $\left(-\frac{1}{2},-\frac{3}{2}\right)$ 2) straight line whose slope is $-\frac{2}{3}$

3) straight line whose slope is $\frac{3}{2}$ 4) circle whose diameter is $\frac{\sqrt{5}}{2}$

17. Let O be the origin and A be the point $z_1=3+2i$. If B is the point $z_2, \mathrm{Re}(z_2)<0$ such that OAB is a right angled isosceles triangle with OB as hypotenuse, then

1) $Arg(z_2)=\tan^{-1}\left(\frac{1}{5}\right)$ 2) $|z_2-z_1|=\sqrt{10}$

3) $|z_2|=\sqrt{26}$ 4) $Arg|z_2-z_1|=\pi-\tan^{-1}\left(\frac{2}{3}\right)$

18. Let z and ω be complex numbers such that $\bar{z}+i\bar{\omega}=0$ and $\arg z\omega=\pi$ Then arg z equals

1) $\frac{5\pi}{4}$ 2) $\frac{\pi}{2}$ 3) $\frac{3\pi}{4}$ 4) $\frac{\pi}{4}$

19. If $\frac{3+i\sin\theta}{4-i\cos\theta}, \theta\in[0,2\pi]$ is a real number, then an argument of $\sin\theta+i\cos\theta$ is

1) $\pi-\tan^{-1}\left(\frac{4}{3}\right)$ 2) $\pi-\tan^{-1}\left(\frac{3}{4}\right)$ 3) $-\tan^{-1}\left(\frac{3}{4}\right)$ 4) $\tan^{-1}\left(\frac{4}{3}\right)$

20. Let a complex number be $w=1-\sqrt{3}i$. Let another complex number z be such that $|zw|=1$ and $\arg(z)-\arg(w)=\frac{\pi}{2}$. Then the area of the triangle with vertices origin, z and w is equal to

1) $\frac{1}{2}$ 2) 2 3) 4 4) $\frac{1}{4}$

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 $z = x + 3i$, then the value of $\int_2^4 \left[\arg \left| \frac{z-i}{z+i} \right| \right] dx$, where [.] denotes the greatest integer function and $i = \sqrt{-1}$ is

22. Let α,β be the roots of the equation $x^2 - \sqrt{6}x + 3 = 0$ such that. $\text{Im}(\alpha) > \text{Im}(\beta)$ let a ,b be integers not division by 3 and n be natural number such that $\frac{\alpha^{99}}{\beta} + \alpha^{98} = 3^n(a+ib), i = \sqrt{-1}$ then n +a +b is equal to

23. Let A, B, C be three sets of complex numbers defined below

$$A = \{z : |z+1| \le 2 + \text{Re}(z)\}; B = \{z : |z-1| \ge 1\}; C = \left\{ z : \left| \frac{z-1}{z+1} \right| \ge 1 \right\}$$

The number of points having integral coordinates in the region $A \cap B \cap C$ is

24. Let $z \in C$ and if $A = \left\{ z : \arg(z) = \frac{\pi}{4} \right\} and\ B = \left\{ z : \arg(z-3-3i) = \frac{2\pi}{3} \right\}$ then $n(A \cap B)$ is equal to

25. If z is a complex number,then the number of common roots of the equation $z^{1985} + z^{100} + 1 = 0$ and $z^3 + 2z^2 + 2z + 1 = 0$ is equal to

PHYSICS **Max Marks: 100**

SECTION-I (SINGLE CORRECT ANSWER TYPE)

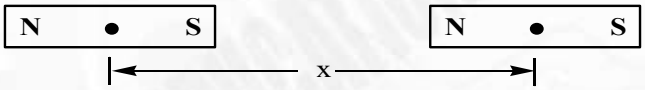
This section contains **20 Multiple Choice Questions.** Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

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

26. A magnet makes 40 oscillations per minute at a place having magnetic field induction of $0.1\times10^{-5}T$. At another place, it takes 2.5s to complete one vibration. The value of earth's horizontal field at that place is

1) $0.25\times10^{-6}T$ 2) $0.36\times10^{-6}T$ 3) $0.66\times10^{-8}T$ 4) $1.2\times10^{-6}T$

27. The mid points of two small magnetic dipoles of length d in end-on positions, are separated by a distance $x(x>>d)$. The magnitude of force between them is proportional to x^{-n} where n is_____



1) 3 2) 4 3) 2 4) 1

28. A deflection magnetometer is placed with its arm along the east-west direction and a bar magnet is placed along the arm of the magnetometer. Due to the magnet, the deflection observed is θ and the period of oscillation of the needle in the magnetometer is T, When the magnet is removed, the period oscillation is T_0. The relation between T and T_0 is

1) $T^2=T_0^2\cos\theta$ 2) $T=T_0\cos\theta$ 3) $T=\dfrac{T_0}{\cos\theta}$ 4) $T^2=\dfrac{T_0}{\cos\theta}$

29. A magnetic needle free to rotate in a horizontal plane is placed at the centre of a circular current-carrying coil whose axis is perpendicular to the magnetic meridian at that place. It is also known that the magnetic declination at this place is zero and, in this condition, the magnetic needle is pointing towards the north-west. Now, if we reserve the direction of current in the coil, then the magnetic needle will

1) point north-west 2) point north-east

3) point south-east 4) point south-west

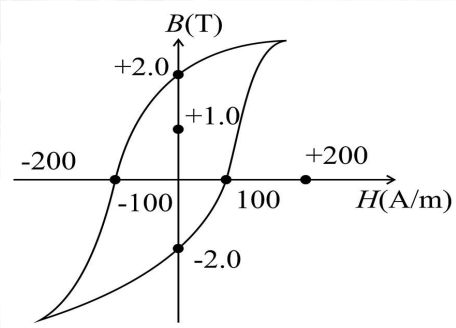
30. Two identical short bar magnets each having magnetic moment M are placed at a distance of 2d with their axes perpendicular to each other in a horizontal plane. The magnetic induction at a point midway between them is

1) $\frac{\sqrt{2\mu_0 M}}{4\pi d^3}$ 2) $\frac{\sqrt{3\mu_0 M}}{4\pi d^3}$ 3) $\frac{\mu_0 M}{4\pi d^3}$ 4) $\frac{\sqrt{5}\mu_0 M}{4\pi d^3}$

31. A deflection magnetometer is placed with its arm along the east-west direction (tan A position) and a short bar magnet is placed symmetrically along it axis at some distance with its north pole pointing towards east. In this position the needle of the magnetometer shows a deflection of 60^0. If we double the distance of the bar magnet, then the deflection will be

1) $\sin^{-1}\left[\frac{\sqrt{3}}{8}\right]$ 2) $cos^{-1}\left[\frac{\sqrt{3}}{8}\right]$ 3) $\tan^{-1}\left[\frac{\sqrt{3}}{8}\right]$ 4) $\cot^{-1}\left[\frac{\sqrt{3}}{8}\right]$

32. The B-H curve for a ferromagnet is shown in the figure. The ferromagnet is placed inside a long solenoid with 1000 turns cm^{-1}. The current should be passed in the solenoid to demagnetize the ferromagnet completely is

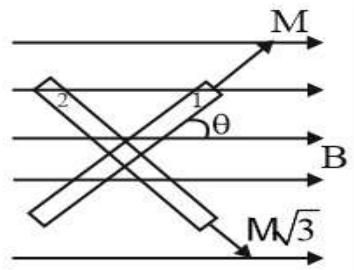


1) 2 mA 2) 20 μA 3) 1 mA 4) 40 μA

33. Two bar magnets A and B are placed one over the other and are allowed to vibrate in a vibration magnetometer. They make 20 oscillations per minute when the similar poles A and B are on the same side, while they make 15 oscillations per minute when their opposite poles lie on the same side. If M_A *and* M_B are the magnetic moments of A and B if M_A *and* M_B, the ratio of M_A *and* M_B is

1) 4:3 2) 25:7 3) 7:5 4) 25:16

34. Two short bar magnets of dipole moments M and $M\sqrt{3}$ are joined at right angles to form a cross as depicted in the figure. The value of θ for which the system remains in equilibrium in a uniform external magnetic field B is

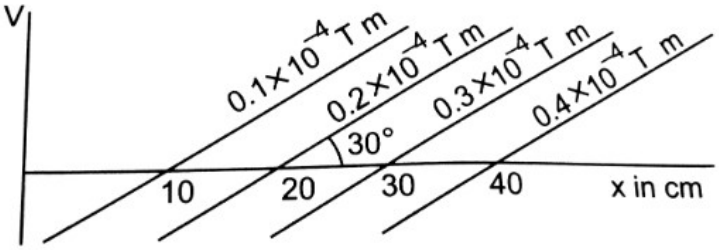


1) $\theta = 30^0$ 2) $\theta = 45^0$ 3) $\theta = 60^0$ 4) $\theta = 15^0$

35. A paramagnetic substance, in the form of a cube with sides 1 cm, has a magnetic dipole moment of $20\times10^{-6} JT^{-1}$, when a magnetic intensity of $60\times10^{3} Am^{-1}$ is applied. Its magnetic susceptibility is

1) 3.3×10^{-4} 2) 2.3×10^{-2} 3) 4.3×10^{-2} 4) 3.3×10^{-2}

36. Figure shows some equipotential surfaces of the magnetic scalar potential. Find the magnetic field at B at a point in the region



1) $10^{-4}T$ 2) $3\times10^{-4}T$ 3) $2\times10^{-4}T$ 4) $5\times10^{-4}T$

37. A monochromatic beam of light has a frequency $v = \frac{3}{2\pi}\times10^{12} Hz$ and is propagating along the direction $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$. It is polarized along the $\hat{k}$ direction. The acceptable form for the magnetic field is

1) $k\frac{E_0}{C}\left(\frac{\hat{i}-\hat{j}}{\sqrt{2}}\right)\cos\left[10^4\left(\frac{\hat{i}-\hat{j}}{\sqrt{2}}\right)\vec{r}-\left(3\times10^{12}\right)t\right]$ 2) $\frac{E_0}{C}\left(\frac{\hat{i}-\hat{j}}{\sqrt{2}}\right)\cos\left[10^4\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)\vec{r}-\left(3\times10^{12}\right)t\right]$

3) $\frac{E_0}{C}\hat{k}\cos\left[10^4\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)\vec{r}+\left(3\times10^{12}\right)t\right]$ 4) $\frac{E_0}{C}\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)\cos\left[10^4\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)\vec{r}+\left(3\times10^{12}\right)t\right]$

38. Given below in the left column are different modes communication using the kinds of waves given in the right column.

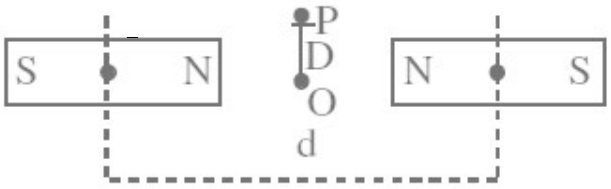
A) Optical Fiber Communication	P) Ultrasound
B) Radar	Q) Infrared Light
C) Sonar	R) Microwaves
D) Mobile Phones	S) Radio Waves

From the options given below, find the most appropriate match between entries in the left and the right column.

1) A-Q; B-S: C-R; D-P 2) A-S; B-Q; C-R; D-P
3) A-Q; B-S; C-P; D-S 4) A-R; B-P; C-S; D-Q

39. Assertion: Magnetism is relativistic
Reason: When we move along with the charge so that there is no motion relative to us, we find no magnetic field associated with the charge
1) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion
2) If both Assertion and Reason are correct and the Reason is not a correct explanation of the Assertion
3) If the Assertion is correct but Reason is incorrect
4) If both the Assertion and Reason is incorrect

40. Two identical bar magnets are fixed with their centers at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at a distance D from the centre O as shown in the figure



The forces on the charge Q is
1) directed perpendicular to the plane of paper 2) Zero
3) directed along OP 4) directed along PO

41. Assertion: Electromagnetic are made of soft iron
Reason: Coercivity of soft iron is small
1) If both Assertion and Reason are correct and the Reason is the correct explanation of the Assertion
2) If both Assertion and Reason are correct and the Reason is not a correct explanation of the Assertion
3) If the Assertion is correct but Reason is incorrect
4) If both the Assertion and Reason is incorrect

42. Statement1: The sensitivity of a moving coil galvanometer is increased by placing a suitable magnetic material as a core inside the coil.
Statement 2: Soft iron has a high magnetic permeability and cannot be easily magnetized or demagnetized.
1) Statement 1 is true; Statement 2 is true; Statement 2 is the correct explanation for statement 1.
2) Statement 1 is true; Statement 2 is true; Statement 2 is the not correct explanation for statement 1.
3) Statement 1 is true but statement 2 is false
4) statement 1 is false but statement 2 is true

43. In terms of potential difference V, electric current I, permittivity ε_0, permeability μ_0 and speed of light c, the dimensionally correct equation (s) is (are):
A) $\mu_0 I^2 = \varepsilon_0 V^2$ B) $\varepsilon_0 I = \mu_0 V$ c) $I = \varepsilon_0 cV$ D) $\mu_0 cI = \varepsilon_0 V$
Choose the correct answer from the following
1) A and D only 2) B and C only 3) A, B and C 4) A and C

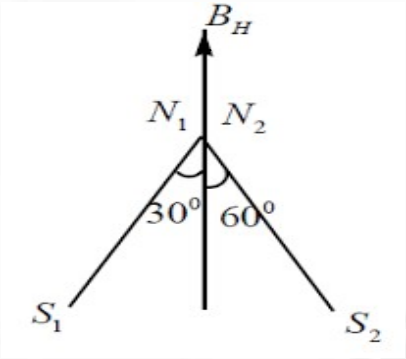
44. The electric field associated with an electromagnetic wave propagating in a dielectric medium is given by $\vec{E} = 30(2\hat{x} + \hat{y})\sin\left[2\pi\left(5\times10^4 t - \frac{10^7}{3}z\right)\right] Vm^{-1}$. which of the following option(s) is (are) correct? [Given: The speed of light in vacuum, $c = 3\times10^8 m\,s^{-1}$]
A) $B_x = -2\times10^{-7}\sin\left[2\pi\left(5\times10^{14}t - \frac{10^7}{3}z\right)\right] Wbm^{-2}$
B) $B_y = -2\times10^{-7}\sin\left[2\pi\left(5\times10^{14}t - \frac{10^7}{3}z\right)\right] Wbm^{-2}$
C) The wave is polarized in the xy-plane with polarization angle 30^0 with respect to the x-axis.
D) The refractive index of the medium is 2.
1) A and D only 2) B and C only 3) A, B and C 4) A and C

45. The time of vibration of a dip needle vibration in the vertical plane in the magnetic meridian is 3s. When the same magnitude needle is made to vibrate in the horizontal plane, the time of vibration is $3\sqrt{2}s$. The angle of dip will be
1) 90 2) 60 3) 45 4) 30

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. Two small magnets X and Y of dipole moments M_1 and M_2 are fixed perpendicular to each other with their north poles in contact. This arrangement is placed on a floating body so as to move freely in earth's magnetic field as shown in figure then the ratio of magnetic moment is $\sqrt{2^n - 1}$ then n is



47. An iron rod is subjected to cycles of magnetization at the rate of 50Hz. Given the density of the rod is $8\times10^3 kg/m^3$ and specific heat is $0.11\times10^{-3} cal/kg^0C$. The rise in temperature per minute, if the area enclosed by the B-H loop corresponds to energy of $10^{-2} J$ is (assume there is no radiation losses) $\left(\sqrt{8^y}+0.1\right)^0 C$ then y is

48. Seawater at a frequency $f = 9\times10^2 Hz$, has permittivity $\varepsilon = 80\varepsilon_0$ and resistivity $\rho = 0.25\Omega m$ Imagine a parallel plate capacitor is immersed in seawater and is driven by an alternating voltage source $V(t) = V_0 \sin(2\pi ft)$. Then the conduction current density becomes 10^x times the displacement current density after time $t = \frac{1}{800} s$. The value of x is _____.

$\left(Given \frac{1}{4\pi\varepsilon_0} = 9\times10^9 Nm^2C^{-2}\right)$

49. A plane electromagnetic wave of frequency 25GHz is propagating in vacuum along the z-direction. At a particular point in space and time, the magnetic field is given by $\vec{B} = 5\times10^{-8}\hat{j}T$. The corresponding electric field $\vec{E}$ is $x\hat{i}\,V/m$ (speed of light C=$3\times10^8 ms^{-1}$). What is the value of 'x'?

50. A plane electromagnetic wave of frequency 500 MHz is travelling in vacuum along the y-direction. At a particular point in space and time, $\vec{B} = 8.0\times10^{-8}\hat{z}T$. The value of electric field at this point is $-N\hat{x}V/m$ ($speed\ of\ light = 3\times10^8 ms^{-1}$, $\hat{x},\hat{y},\hat{z}$ are unit vectors along x, y and z directions). What is the value of N?

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.

51. Given below are two statements

Statement-1: CH_3-O-CH_2-Cl will undergo S_N1 reaction through it is a primary halide

Statement-2: Polar aprotic solvents favours S_N2 reaction

Choose the most appropriate answer

1) Both statement-1 and statement-2 are correct
2) Both statement-1 and statement-2 are incorrect
3) Statement-1 is correct but statement-2 is incorrect
4) Statement-1 is incorrect but statement-2 is correct

52. The structures of major products A and B formed in the following reactions are

$$A \xleftarrow{KNO_2} CH_3CH_2CH_2Br \xrightarrow{AgCN} B$$

1) $CH_3CH_2CH_2-ONO, CH_3CH_2CH_2-CN$
2) $CH_3CH_2CH_2-NO_2, CH_3CH_2CH_2-NC$
3) $CH_3CH_2CH_2-ONO, CH_3CH_2CH_2-NC$
4) $CH_3CH_2CH_2-NO_2, CH_3CH_2CH_2-CN$

53. Given below are two statements

Statement-1: High concentration of strong nucleophile with secondary alkyl halide which do not have bulky substituents will follow S_N2 Mechanism.

Statement-2: Racemisation occurs in both $S_N1 and\ S_N2$ reactions

Choose the most appropriate answer

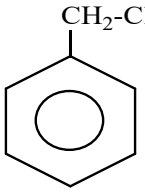
1) Both statement-1 and statement-2 are correct
2) Both statement-1 and statement-2 are incorrect
3) Statement-1 is correct but statement-2 is incorrect
4) Statement-1 is incorrect but statement-2 is correct

54. Assertion (A): Vinyl halides do not undergo nucleophilic substitution easily.

Reason (R): The bond cleavage is difficult because C-X bond gets partial double bond due to resonance.

1) Both (A) and (R) correct and (R) is correct explanation of (A)
2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
3) (A) is correct but (R) is wrong
4) (A) is wrong but (R) is correct

55. Which of the following halide/s will show S_N1 reaction

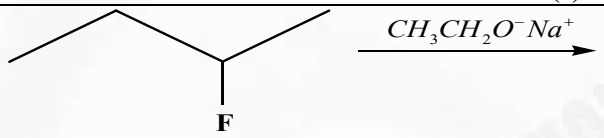
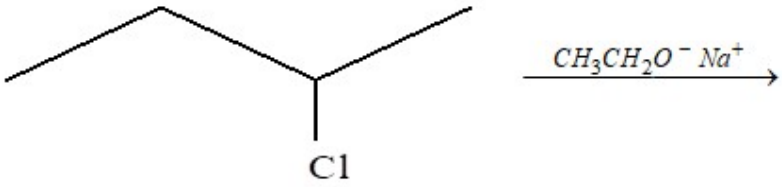
A) $CH_2=CH-CH_2-Cl$ B) $CH_3-CH=CH-Cl$ C) 

D) $CH_3-\overset{CH_3}{\underset{CH_3}{C}}-Cl$

Choose the most appropriate answer

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

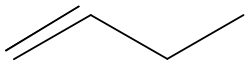
56. Match the following

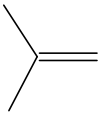
	COLUMN (I)		COLUMN (II)
A		P	Inversion
B		Q	Racemisation
C	$ph-\overset{Br}{\underset{CH_3}{C}}-CH_2-CH_3 \xrightarrow{H_2O}$	R	Haffmann product
D	$CH_3-\underset{D}{CH}-Cl \xrightarrow{OH^-_{aq}}$	S	Saytzeff's product

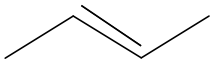
1) A-R, B-S, C-Q, D-P 2) A-P, B-Q, C-R, D-S

3) A-R, B-Q, C-S, D-P 4) A-S, B-R, C-P, D-Q

57. The increasing order of the boiling points of the major products A, B and C of the following reactions will be

(I)  + HBr $\xrightarrow{(C_6H_5CO)_2O_2}$ A

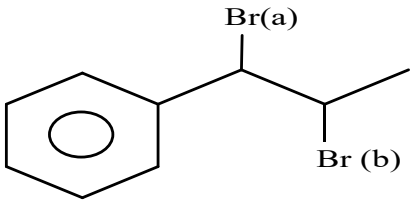
(II)  + HBr ⟶ B

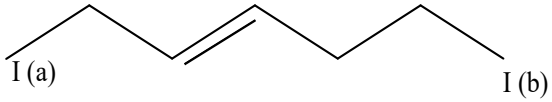
(III)  + HBr ⟶ C

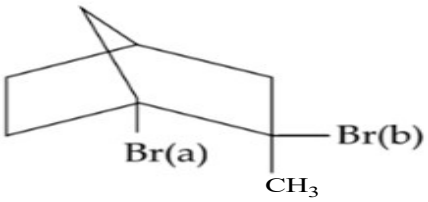
1) II<III<I 2) III<I<II 3) I<II<III 4) I<III<II

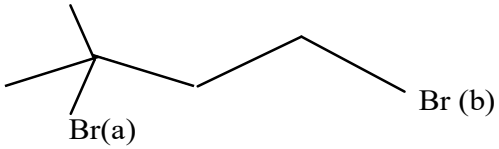
58. Choose the halogen which is most reactive towards S_N1 in the given compounds

A, B, C and D.

A) 

B) 

C) 

D) 

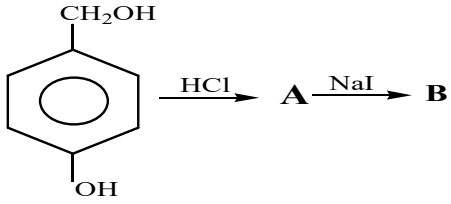
1) A-Br(a); B-I(a); C-Br(b); D-Br(a) 2) A-Br(b); B-I(a); C-Br(a); D-Br(a)

3) A-Br(b); B-I(b); C-Br(a); D-Br(b) 4) A-Br(a); B-I(a); C-Br(a); D-Br(a)

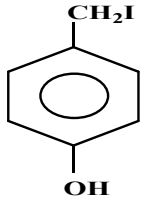
59. The synthesis of alkyl fluroides is best accomplished by

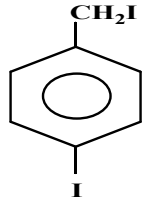
1) Finkelstein reaction 2) Swart's reaction

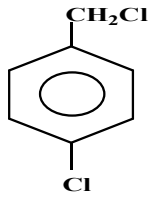
3) Sandmeyer's reaction 4) Gatterman's reaction

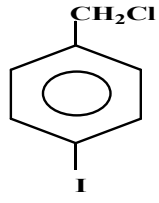


60. In the above reaction product 'B is

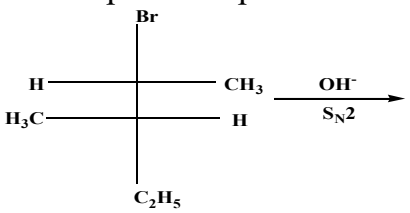
1) 

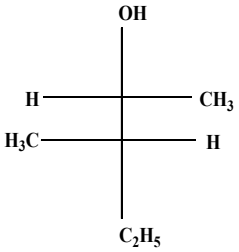
2) 

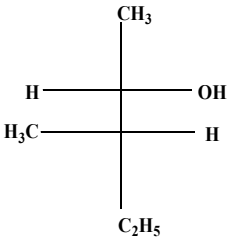
3) 

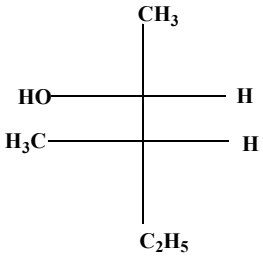
4) 

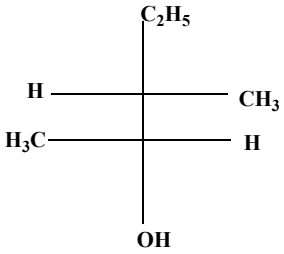
61. In the following reaction the most probable product will be



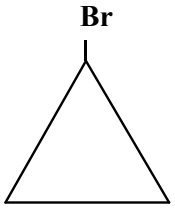
1) 

2) 

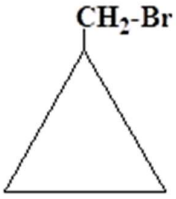
3) 

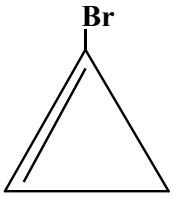
4) 

62. Which of the following alkyl halide undergoes S_N1 reaction more easily?

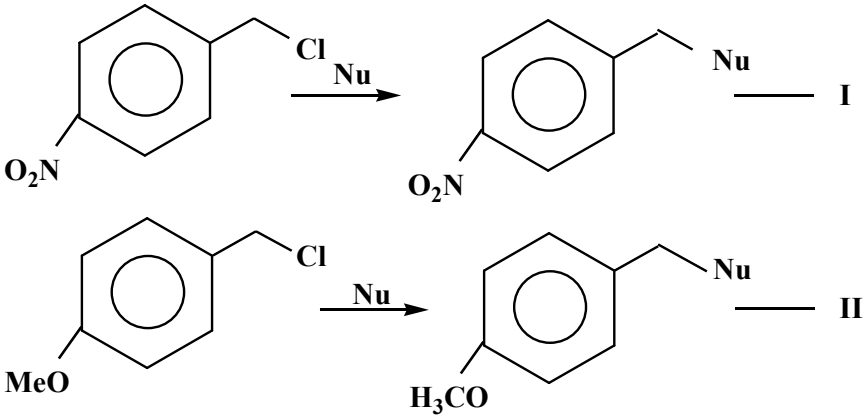
1) 

2) CH_3Cl

3) 

4) 

63.



Where Nu= Nucleophilic

Find the correct statement

1) Reaction (I) and (II), both are 1st order
2) Reaction (I) and (II), both are 2nd order
3) Reaction (I), is 2nd order and reaction (II), is 1st order
4) Reaction (I), is 1st order and reaction (II), is 2nd order

64. Which of the following alkenes when treated with HBr yields majorly an anti-Markovnikov's product?

1) $Cl-CH=CH_2$ 2) $CH_3-CH=CH_2$

3) $H_3CO-CH=CH_2$ 4) $O_2N-CH=CH_2$

65. Assertion (A): $CH_2=CH-CH_2-Cl$ is an example of allyl halide

Reason (R): In allyl halides halogen is attached to sp^2 hybridised carbon atom

1) Both (A) and (R) correct and (R) is correct explanation of (A)
2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
3) (A) is correct but (R) is wrong
4) (A) is wrong but (R) is correct

66. $CH_3-Cl+NaI \xrightarrow{acetone} CH_3-I+NaCl$. This reaction is

1) Wurtz reaction 2) fitting reaction 3) Finkelstein reaction 4) Swart's reaction

67. What is 'X' in the following reaction

$C_2H_5Cl \xrightarrow{X} C_2H_5OH$

1) C_2H_5ONa 2) $alc\ KOH$ 3) Aq KOH 4) $NaNH_2$

68. $CH_3-\underset{\underset{Br}{|}}{CH}-CH_3 \xrightarrow{alc\ KOH} A \xrightarrow[peroxide]{HBr} B \xrightarrow[Et_2O]{Na} C$ is

1) n-hexane 2)2, 3-dimethyl butane 3) propene 4) propane

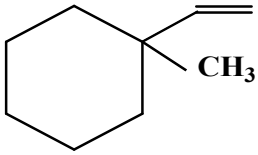
69. The major product in the following reaction is

$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3 \xrightarrow[h\nu]{Br_2} ?$

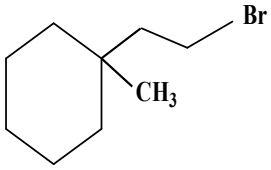
1) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_2-Br$ 2) $CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{Br}{|}}{CH}-CH_3$

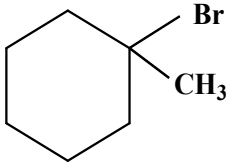
3) $\underset{\underset{Br}{|}}{CH_2}-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3$ 4) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{C}}-CH_2-CH_3$

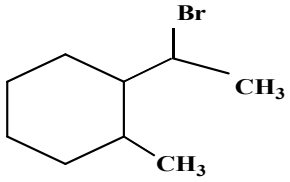
70.

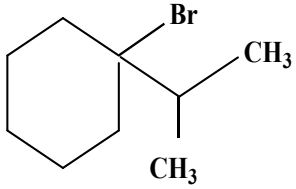


$\xrightarrow[CCl_4]{HBr}$ **Major product is**

1) 

2) 

3) 

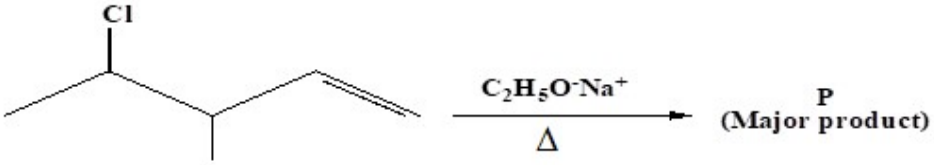
4) 

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**).

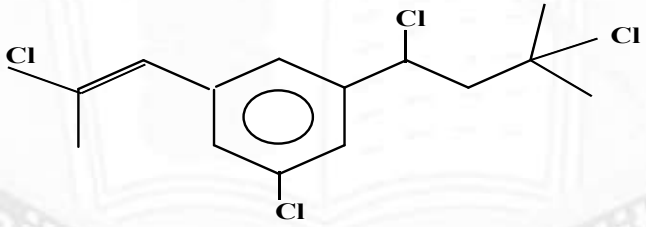
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

71. Consider the following reaction

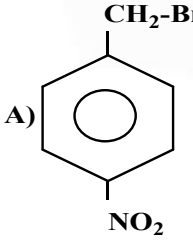


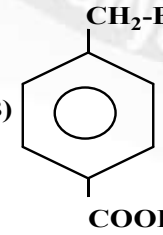
The number of π electrons present in the product 'p' is _____

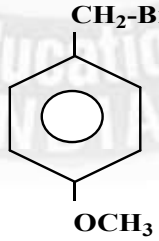
72. Number of moles of AgCl formed when the following compound undergoes S_N1 reaction in presence of $AgNO_3$ solution is _____

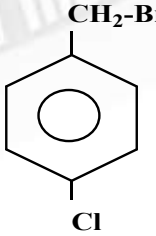


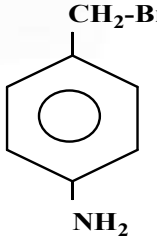
73. How many of the following compounds undergoes S_N2 mechanism?

A) 

B) 

C) 

D) 

E) 

74. How many of the following will give saytzeff product as major?

$(A)\ CH_3-\underset{\underset{F}{|}}{CH}-CH_2-CH_3 \xrightarrow{alc\ KOH}$

$(B)\ CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3 \xrightarrow[CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-O^-Na^+]{}$

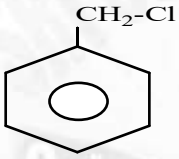
$(C)\ CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-CH_3 \xrightarrow{alc\ KOH}$

$(D)\ CH_2=CH-CH_2-\underset{\underset{Cl}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_3 \xrightarrow{alc\ KOH}$

75. How many of the following compounds undergoes S_N1 reaction with more rate than $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_3$?

$(A)\ CH_3-Cl$ $(B)\ CH_3-CH_2-Cl$ $(C)\ CH_3-CH_2-CH_2-Cl$

$(D)\ CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$ $(E)\ CH_3-\underset{\underset{I}{|}}{CH}-CH_3$ $(F)\ CH_2=CH-CH_2-Br$

(G) 

$(H)\ C_6H_5-\underset{\underset{Cl}{|}}{CH}-C_6H_5$

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JEE MAIN 2025

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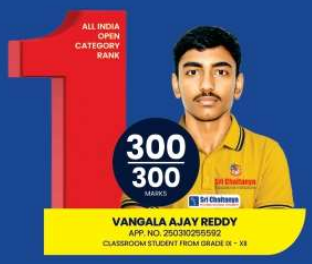

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BELOW 100	BELOW 500	BELOW 10	BELOW 100	BELOW 1000
31	95	10	98	579
ALL INDIA OPEN CATEGORY RANKS	ALL INDIA OPEN CATEGORY RANKS	ALL INDIA CATEGORY RANKS COUNT	ALL INDIA CATEGORY RANKS COUNT	ALL INDIA CATEGORY RANKS COUNT

TOTAL QUALIFIED RANKS FOR JEE ADVANCED-2025 22,094

*DLP/AITS

JEE 2025 STARS SHINE BRIGHT

Sri Chaitanya Tops JEE ADVANCED

ALL INDIA OPEN CATEGORY RANKS

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AKSHAT KUMAR CHAURASIA
H.T.No. 254065055*

BELOW 100	BELOW 500	BELOW 1000	BELOW 1000	NUMBER OF QUALIFIED RANKS
29	113	205	745	4,212
ALL INDIA OPEN CATEGORY RANKS	ALL INDIA OPEN CATEGORY RANKS	ALL INDIA OPEN CATEGORY RANKS	ALL INDIA CATEGORY RANKS COUNT	

*DLP/AITS