Sri Chaitanya IIT Academy.,India.

A.P T.S KARNATAKA TAMILNADU MAHARASTRA DELHI RANCHI

A right Choice for the Real Aspirant

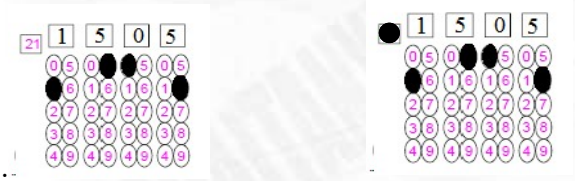
ICON Central Office - Madhapur - Hyderabad

SEC: Sr.Super60(Incoming)_STERLING BT	**JEE-MAIN**	**Date: 12-04-2025**
Time: 09:00AM to 12:00PM	**WTM-28**	**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:** _____

12-04-25_Sr.Super60(Incoming)_STERLING BT_Jee-Main_WTM-28_Test Syllabus

MATHEMATICS : Hyperbola: Standard equation of Hyperbola, Foci, Directrices, Axes, Latus Rectum, conjugate hyperbola, Asymptotes of a Hyperbola, Rectangular Hyperbola, Equations of tangent and normal of rectangular hyperbola (Deleted pertaining to JEE Main but still in JEE ADV Syllabus & BIEAP & TG)

PHYSICS : Cell and Battery the electromotive force(emf) of a cell, Internal resistance of a cell, Relation between Electromotive force and terminal voltage(Potential difference), Grouping of cells, Heating effects of currentUse of symmetry in solving complex electric circuits, Unbalanced wheatstone bridgeELECTRIC INSTRUMENTS: Conversion of a galvanometer into an ammeter and Potentiometer, Metre-bridge Post office box Potentiometer-(i) Comparison of emf of two primary cells. (ii) Determination of internal resistance of a cell (Deleted pertaining to JEE MAINS but still in JEE ADV Syllabus), Resistance and figure of merit of a galvanometer by half deflection method.

CHEMISTRY : LIQUID SOLUTIONS AND COLLIGATIVE PROPERTIES: Revision of concentration terms, Henry's law, Raoults Law, Ideal solution and non ideal solutions, Colligative properties, Abnormal Colligative Properties, Theory of distillation (Basic idea only)
ELECTRO CHEMISTRY- I : Galvanic Cells, Nernst Equation, Electro chemical series and its applications

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. Let the focii of a hyperbola be $(1,14)$ and $(1,-12)$. If it passes through the point $(1,6)$ then its length of semi latus rectum is (in units)

   1) $\frac{288}{5}$ 2) $\frac{144}{5}$ 3) $\frac{272}{5}$ 4) $\frac{576}{5}$

2. If $\alpha x+\beta y=91$ is the equation of chord of the hyperbola $\frac{x^2}{9}-\frac{y^2}{4}=1$ whose mid point is $\left(\frac{5}{2},\frac{1}{2}\right)$ then $\alpha-\beta=$

   1) 37 2) 46 3) 58 4) 72

3. Let $f(x)=x^2+9, g(x)=\frac{x}{x-9}$ $(x\neq 9)$ and $a=(fog)(10), b=(gof)(3)$ If 'e' and 'ℓ' denote the eccentricity and length of latusrectum of $\frac{x^2}{a}-\frac{y^2}{b}=1$ respectively then $8e^2-\ell^2=$

   1) 16 2) 8 3) 6 4) 12

4. If two points P and Q on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ whose centre C be such that CP is perpendicular to $\overline{CQ}$, $a<b$ then $\frac{1}{(CP)^2}+\frac{1}{(CQ)^2}=$

   1) $\frac{b^2-a^2}{2ab}$ 2) $\frac{1}{a^2}+\frac{1}{b^2}$ 3) $\frac{2ab}{a^2-b^2}$ 4) $\frac{1}{a^2}-\frac{1}{b^2}$

5. For $0<\theta<\frac{\pi}{2}$, If the eccentricity of the hyperbola $x^2-y^2\cos ec^2\theta=5$ is $\sqrt{7}$ times eccentricity of the ellipse $x^2\cos ec^2\theta+y^2=5$ then the value of $\theta+\frac{2\pi}{3}$ is

   1) π 2) $\frac{11\pi}{12}$ 3) $\frac{5\pi}{6}$ 4) $\frac{3\pi}{4}$

6. The length of the latus rectum and directrices of a hyperbola with eccentricity 'e' are 9 and $x=\pm\frac{4}{\sqrt{13}}$ respectively. Let the line $y-\sqrt{3}x+\sqrt{3}=0$ touch this hyperbola at (h,k). If m is the product of the focal distances of the point (h,k) then $4e^2+m=$

1) $\frac{61}{2}$ 2) $\frac{122}{3}$ 3) 61 4) 122

7. Let the focii of a hyperbola 'H' coincide with the focii of the ellipse $E:\frac{(x-1)^2}{100}+\frac{(y-1)^2}{75}=1$ and the eccentricity of the hyperbola H be the reciprocal of the eccentricity of Ellipse E. If the length of the transverse axis of H is 'α' and length of its conjugate axis is β. Then $2\beta^2-3\alpha^2=$

1) 242 2) 225 3) 237 4) 75

8. The focii of a hyperbola are $(\pm2,0)$ and its eccentricity is $\frac{3}{2}$. A tangent, perpendicular to the line $2x+3y=6,$ is drawn at a point in the first quadrant on the hyperbola. If the intercepts made by the tangents on the X and Y-axes are 'a' and 'b' respectively then $|6a|+|5b|=$

1) $\frac{4}{3}$ 2) 12 3) $\frac{20}{9}$ 4) 24

9. Let $H_n:\frac{x^2}{1+n}-\frac{y^2}{3+n}=1, n\in N$ Let 'k' be the smallest even value of 'n' such that the eccentricity of H_k is a rational number. If 'ℓ' is the lengths of the latusrectum of H_k then $7\ell=$

1)306 2)102 3) 51 4) 612

10. The equation of the hyperbola with focii (1,5)(1,-1) and eccentricity $\sqrt{3}$ is

1) $x^2-2y^2-2x+8y-4=0$ 2) $x^2-2y^2+2x+8y-3=0$

3) $x^2-2y^2-2x+8y-1=0$ 4) $x^2-2y^2+2x+8y-1=0$

11. Let $P(x_0,y_0)$ be the point on the hyperbola $3x^2-4y^2=36,$ which is nearest to the line $3x+2y=1$ then $\sqrt{2}(x_0+y_0)$ is

1) 3 2) –3 3) –9 4) 9

12. If a ray of light incident along the line $3x+\left(5-4\sqrt{2}\right)y=15$ gets reflected from the hyperbola $\frac{x^2}{16}-\frac{y^2}{9}=1$, then its reflected ray goes along the line

1) $3x-y\left(4\sqrt{2}+5\right)+15=0$ 2) $x\sqrt{2}-y+5\sqrt{2}=0$

3) $\sqrt{2}y-x+5=0$ 4) $\left(4\sqrt{2}+5\right)x+3y-15=0$

13. A hyperbola of eccentricity 'e' passes through (2,3) and has asymptotes $3x-4y+5=0$ and $12x+5y-40=0$. Then the equation of its transverse axis is

1) $11x-3y-145+81e^2=0$ 2) $21x-77y+135+81e^2=0$

3) $21x+77y-135-81e^2=0$ 4) $11x+3y-145+81e^2=0$

14. The locus of middle points of normal chords of the rectangular hyperbola $x^2-y^2=a^2$ is

1) $\left(x^2+y^2\right)^3+4a^2x^2y^2=0$ 2) $\left(x^2+y^2\right)^3-4a^2x^2y^2=0$

3) $\left(x^2-y^2\right)^3+4a^2x^2y^2=0$ 4) $\left(x^2-y^2\right)^2+4a^2x^2y^2=0$

15. Let A $\left(\sec\theta,\sqrt{2}\tan\theta\right)$, and $B\left(\sec\phi,\sqrt{2}\tan\phi\right)$ where $\theta+\phi=\frac{\pi}{2}$ be two points on the hyperbola $2x^2-y^2=2$. If (h,k) is the point of the intersection of the normals to the hyperbola at A and B then $(2k)^2=$

1) 36 2) 18 3) 9 4) 72

16. Consider the following statements S_1,S_2,S_3 for the hyperbola $S\equiv xy+3x-4y+13=0$

S_1 : The equation of the conjugate hyperbola $\left(S'\right)$ of $S=0$ is $(x-4)(y+3)=25$

S_2 : Length of principal axis of $S^1=0$ is $10\sqrt{2}$ units

S_3 : The equation of auxiliary circle of $S^1=0$ is $(x-4)^2+(y+3)^2=50$

Then which of the statements are true about $S'=0$

1) All S_1,S_2,S_3 are true

2) S_1,S_2 are true but S_3 is false

3) S_1 is false, S_2,S_3 are true

4) S_1,S_2 are false S_3 is true

17. Match the following

Let the circle $(x-1)^2+(y-2)^2=25$ cuts a rectangular hyperbola with transverse axis along $y=x$ line , and its centre at 0(0,0) at four points A,B,C,D having co-ordinates $(x_i,y_i), i=1,2,3,4$ respectively. O being the centre of the hyperbola. Now match the entries from the following two Columns

	Column-I		Column-II
A)	$x_1+x_2+x_3+x_4=$	p)	2
B)	$x_1^2+x_2^2+x_3^2+x_4^2=$	q)	4
C)	$OA^2+OB^2+OC^2+OD^2=$	r)	44
D)	${y_1}^2+{y_2}^2+{y_3}^2+{y_4}^2=$	s)	56
		t)	100

. 1) $A-p,B-r,C-t,D-q$ 2) $A-p,B-r,C-q,D-t$

3) $A-p,B-r,C-t,D-s$ 4) $A-r,B-p,C-t,D-s$

18. Let $H_1:\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and $H_2:\frac{-x^2}{A^2}+\frac{y^2}{B^2}=1$ be two hyperbolas having length of latusrectum $15\sqrt{2}$ and $12\sqrt{5}$ respectively . Let their eccentricities be $e_1=\sqrt{\frac{5}{2}}$ for H_1 and e_2 for H_2. Then the product of the length of their transverse axis is $100\sqrt{10}$, then $50e_2^2=$

1) 55 2) 110 3) 220 4) 1

19. Let the focii and length of the latus rectum of the ellipse $\frac{x^2}{\alpha^2}+\frac{y^2}{\beta^2}=1(\alpha>\beta)$ be $(\pm5,0)$ and $\sqrt{50}$ respectively If e_1 is eccentricity of the hyperbola $\frac{x^2}{\beta^2}-\frac{y^2}{\alpha^2\beta^2}=1$ then $2e_1^2=$

1) 51 2) 102 3) 153 4) 204

20. The locus of the point of intersection of two tangents to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ which make an angle 30^0 with one another is

1) $\left(x^2+y^2-a^2+b^2\right)^2=12\left(a^2b^2-b^2x^2+a^2y^2\right)$

2) $\left(x^2+y^2-a^2+b^2\right)^2=4\left(a^2y^2-b^2x^2+a^2b^2\right)$

3) $3\left(x^2+y^2-a^2+b^2\right)^2=4\left(a^2y^2-b^2x^2+a^2b^2\right)$

4) $x^2+y^2=a^2-b^2$

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 the four normal's at four points (x_i,y_i) where $i=1,2,3,4$ on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ are concurrent then $\left(\sum_{i=1}^{4}x_i\right)\left(\sum_{i=1}^{4}\frac{1}{x_i}\right)+2022$ _____

22. Let $\overline{PQ}$ and $\overline{RS}$ be two perpendicular chords of the rectangular hyperbola $xy=9$. If C is centre of the rectangular hyperbola, then the value of the product of the slopes of $\overline{CP},\overline{CQ},\overline{CR}$ and $\overline{CS}$ is

23. The area of the triangle formed by the tangent at any point on the hyperbola $\frac{x^2}{4}-\frac{y^2}{1}=1$ and the asymptotes is

24. If the normal at $\left(ct_1,\frac{c}{t_1}\right)(t_1\neq 0)$ on the hyperbola $xy=c^2$ cuts the hyperbola again at $\left(ct_2,\frac{c}{t_2}\right)(t_2\neq 0)$ then $\left|t_1^3t_2\right|=$

25. Let the latusrectum of the hyperbola $\frac{x^2}{9}-\frac{y^2}{b^2}=1$ subtend an angle if $\frac{\pi}{3}$ at the centre of the hyperbola. If b^2 is equal to $\frac{\ell}{m}\left(1+\sqrt{n}\right)$ where l,m are co-prime numbers, then $l^2+m^2+n^2$ is

PHYSICS **Max Marks: 100**

SECTION-I (SINGLE CORRECT ANSWER TYPE)

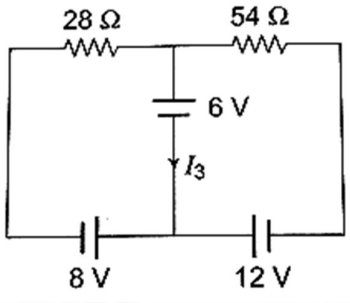
This section contains **20 Multiple Choice Questions.** Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

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

26. A battery of 24 cells each of emf 1.5V and internal resistance 2Ω is to be connected in order to send the maximum current through a 12Ω resistor. The correct arrangement of cells will be

1) 2 rows of 12 cells connected in parallel 2) 3 rows of 8 cells connected in parallel
3) 4 rows of 6 cells connected in parallel 4) All of these

27. Consider the circuit shown in figure. Current I_3 is equal to

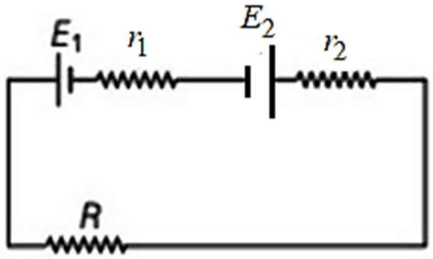


1) 5A 2) 3A 3) $-3A$ 4) $-\frac{5}{6}A$

28. Two cells of equal emf and of internal resistance r_1 and r_2 $(r_1 > r_2)$ are connected in series. On connecting this combination to an external resistance R it is observed that the potential difference across the first cell becomes zero the value of R will be

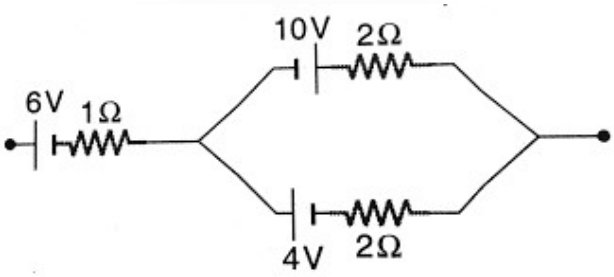
1) $r_1 + r_2$ 2) $r_1 - r_2$ 3) $\frac{r_1 + r_2}{2}$ 4) $\frac{r_1 - r_2}{2}$

29. In the circuit shown in figure $E_1 = 10V, E_2 = 4V$ $r_1 = r_2 = 1\Omega$ and $R = 2\Omega$. The potential difference across battery 1 and battery 2 respectively are



1) 11.5 V, 2.5 V 2) 12.5 V, 6 V 3) 8.5 V, 5.5 V 4) 12 V, 6 V

30. The emf and internal resistance of a single battery which is equivalent to a combination of three batteries shown in figure.



1) $9\,V, 2\Omega$ 2) $12\,V, 1\,\Omega$ 3) $3\,V, 2\,\Omega$ 4) $6\,V, 4\,\Omega$

31. What shunt resistance is required to make 1 mA 20Ω galvanometer into an ammeter with a range of 0 to $50\,mA$

1) 0.8Ω 2) 0.4Ω 3) 1.2Ω 4) 2Ω

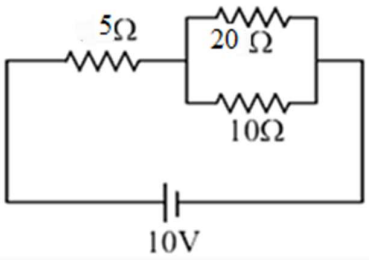
32. **Assertion :** If two bulbs of different rated powers burn with equal brightness when connected in series with a source, then must have been rated at different voltages
Reason: Bulbs of equal resistance will have the same power rating if rated at the same voltage
1) Assertion is true, Reason is true and Reason is correct explanation of Assertion
2) Assertion is true, reason is false
3) Assertion is false, reason is true
4) Assertion and Reason are true, Reason is not the correct explanation of Assertion

33. **Assertion:** Two non-ideal batteries are connected in parallel with same polarities on same side. The equivalent emf is smaller than either of two emfs
Reason: Two non-ideal batteries are connected in parallel, the equivalent internal resistance is smaller than either of the two internal resistances
1) Assertion is true, Reason is true and Reason is correct explanation of Assertion
2) Assertion is true, reason is false 3) Assertion is false, reason is true
4) Assertion and Reason are true, Reason is not the correct explanation of Assertion

34. A fuse wire of radius of 0.2 mm blows off with a current of 5A. The fuse wire of same material but of radius 0.3 mm will blow off with a current of

1) $5\times\frac{3}{2}A$ 2) $\frac{5\sqrt{3}}{2}A$ 3) $5\sqrt{\frac{27}{8}}A$ 4) 5A

35. The ratio of heat dissipated per second through the resistance 20Ω and 10Ω in the circuit given below is



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

36. By what percentage will the illumination of the lamp decrease if the current drops by 40%

1) 46% 2) 26% 3) 64% 4) 56%

37. Temperature coefficient of 'resistance' 'α' and resistivity 'ρ' of a potentiometer wire must be

1) high and low 2) low and high 3) low and low 4) high and high

38. Given below are two statements.

Statement I: If the number of turns in the coil of a moving coil galvanometer is doubled then current sensitivity becomes double

Statement II: Increasing current sensitivity of a moving coil galvanometer by only increasing the number of turns in the coil will also increase its voltage sensitivity in the same ratio

1) Statement I is false, Statement II is true
2) Both Statement I and II are true
3) Both statement I and II are false
4) Statement I is true, Statement II is false

39. A 45Ω galvanometer is shunted by a resistance of 5Ω. The percentage of total current which passes through the galvanometer is

1) 0.1% 2) 10% 3) 25% 4) 0.25%

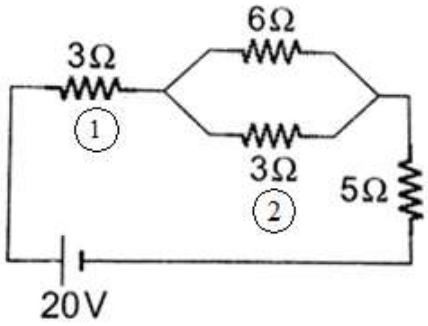
40. Read the following statements.

Statement I: Higher the range, greater is the resistance of ammeter

Statement II: To increases the range of ammeter, additional shunt needs to be used across it

1) Both Statement I and II are true
2) Both statement I and II are false
3) Statement I is true, Statement II is false
4) Statement I is false, Statement II is true

41. For the given circuit, match the heat developed across each resistance in 2s



	Column I		Column II
a	Heat developed in 3Ω [Marked (1) in figure]	p	$\frac{16}{3}J$
b	Heat developed in 6Ω	q	$\frac{32}{3}J$
c	Heat developed in 3Ω [Marked (2) in figure]	r	$40J$
d	Heat developed in 5Ω	s	$24J$

1) $a \to p, b \to q, c \to r, d \to s$ 2) $a \to q, b \to p, c \to s, d \to r$

3) $a \to s, b \to p, c \to q, d \to r$ 4) $a \to r, b \to s, c \to p, d \to q$

42. Two wires A and B of same material and mass have their lengths in the ration $1:2$ on connecting them to the same source, the rate of heat dissipation in B is found to be 5W. The rate of heat dissipation in A is

1) 10 W 2) 5 W 3) 20 W 4) 30 W

43. A lamp of 600W – 240V is connected to 220V mains. Its resistance is

1) 96Ω 2) 84Ω 3) 90Ω 4) $64\ \Omega$

44. In a meter bridge, the gaps are closed by resistance 2 and 3 ohms. The value of shunt to be added to $3\ \Omega$ resistor to shift the balancing point by 22.5 cm is

1) $1\ \Omega$ 2) $2\ \Omega$ 3) $2.5\ \Omega$ 4) $5\ \Omega$

45. When 6 identical cells of no internal resistance are connected in series in the secondary circuit of a potentiometer, the balancing length is 'ℓ', balancing length becomes $\frac{\ell}{3}$ when some cells are wrongly connected. The number of cells wrongly connected are

1) 1 2) 3 3) 2 4) 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

46. The energy dissipated by a resistor is 10 mJ in 2 sec when an electric current of 1 mA flows through it. The resistance is ___ Ω (Round off to nearest integer)

47. In a building there are 15 bulbs of 45W, 15 bulbs of 100W, 15 small fans of 10 W and 2 heaters of 1 kW. The voltage of electric main is 220 V. The minimum fuse capacity of the building will be ____A

48. The number of turns of the coil of a moving coil galvanometer is increased in order to increase current sensitivity by 25% the percentage change in voltage sensitivity of galvanometer will be ____.

49. A 100W – 220V bulb is connected to 110V source. The power consumed by the bulb is ____W.

50. A voltmeter with resistance $500\ \Omega$ is used to measure the emf of a cell of internal resistance $4\ \Omega$. The percentage error in the reading of voltmeter will be ___%.

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. Consider a binary solution of two volatile liquid components 1 and 2. X_1 and Y_1 are the mole fractions of component 1 in liquid and vapour phases respectively. The intercept and slop of the linear plot of $\frac{1}{X_1} Vs \frac{1}{Y_1}$ are given respectively as _____

(P_1^0 and P_2^0 are vapour pressure of pure liquid components 1 and 2 respectively)

1) $\frac{P_2^0 - P_1^0}{P_2^0}, \frac{P_1^0}{P_2^0}$ 2) $\frac{P_1^0 - P_2^0}{P_2^0}, \frac{P_1^0}{P_2^0}$ 3) $\frac{P_1^0 - P_2^0}{P_2^0}, \frac{P_2^0}{P_1^0}$ 4) $\frac{P_2^0 - P_1^0}{P_2^0}, \frac{P_2^0}{P_1^0}$

52. The molarity of 9%$\left(\frac{w}{w}\right)$ aqueous $HC\ell$ solution is _____ (density of solution is 1.11 $kg\,L^{-1}$)

1) 2.50 M 2) 3.25M 3) 2.73M 4) 1.52M

53. Which of the following are correct for an ideal solution

a) $\Delta V_{mix} = 0$ b) $\Delta H_{mix} = 0$ c) $\Delta V_{mix} > 0$ d) $\Delta H_{mix} < 0$

e) Inter molecular forces between A-A and B-B are nearly equal to those between A-B (A and B are components of solution)

1) a, d and e 2) c and d 3) a, b and e 4) a and b only

54. The units of the quantity of the factor $\frac{\Delta T_b}{K_b}$ is_____

($\Delta T_b \rightarrow$ elevation of boiling point, $k_b \rightarrow$ Ebullioscopic constant)

1) Equivalents/kg 2) Equivalents/Lit 3) Moles/Lit 4) Moles/Kg

55. The values of Henry's law constant for some selected gases in water at 293k are given below.

GASES	He	N_2	H_2	O_2
$k_H[K\,bar]$	144.97	76.48	69.16	34.86

Which of the following is incorrect statements

1) He is least soluble gas in the given list at 293 K

2) O_2 is most soluble gas in the given list at 293 K

3) Solubility of different gases in water at a given temperature depends on their partial pressure but not on their K_H values

4) K_H value depended on temperature

56. Based on data given below.

$E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33\,V, E^0_{C\ell_2/C\ell^-} = 1.36\,V$

$E^0_{MnO_4^-/Mn^{+2}} = 1.51\,V, E^0_{Cr^{+3}/Cr} = -0.74\,V$

The strongest oxidizing agent and strongest reducing agent respectively

1) $Cr_2O_7^{-2}, C\ell^-$ 2) MnO_4^-, Cr^{+3} 3) $Cr_2O_7^{-2}, Cr$ 4) MnO_4^-, Cr

57. For a Galvanic cell $Zn / Zn^{+2}_{(aq)} \,//\, Ag^+_{(aq)} / Ag$ the correct Nernst equation is:

1) $E_{cell} = E^0_{Cell} + \frac{RT}{2F}\ell n\frac{[Ag^+]}{[Zn^{+2}]}$ 2) $E_{cell} = E^0_{Cell} + \frac{RT}{2F}\ell n\frac{[Ag^+]^2}{[Zn^{+2}]}$

3) $E_{cell} = E^0_{Cell} - \frac{RT}{2F}\ell n\frac{[Ag^+]^2}{[Zn^{+2}]}$ 4) $E_{cell} = E^0_{Cell} - \frac{RT}{F}\ell n\frac{[Zn^{+2}]}{[Ag^+]^2}$

58. The correct order of standard reduction potentials of the following pairs is

A) $C\ell_2 / C\ell^-$ B) Co^{+3} / Co^{+2} C) Ag^+ / Ag D) Na^+ / Na

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

59. For the cell $Zn(s) / Zn^{+2}_{(aq)} / / M^{x+}_{(aq)} / M_{(s)}$, different half cells and their standard electrode potentials are given below:

$M^{x+}_{(aq)}/M(s)$	$Au^{+3}_{(aq)} / Au_{(s)}$	$Ag^+_{(aq)} / Ag_{(s)}$	$Fe^{+3}_{(aq)} / Fe_{(s)}$	$Fe^{+2}_{(aq)} / Fe_{(s)}$
$E^0_{M^{+x}/M(s)}$	1.40	0.80	0.77	–0.44

If $E^0_{Zn^{+2}/Zn} = -0.76V$, which of the following cathode will give a maximum value of E^0_{cell}

1) $Fe^{+3}_{(aq)} / Fe_{(s)}$ 2) $Ag^+_{(aq)} / Ag_{(s)}$ 3) $Fe^{+2}_{(aq)} / Fe_{(s)}$ 4) $Au^{+3}_{(aq)} / Au_{(s)}$

60. **Assertion (A) :** Pressure does not have any significant effect on solubility of solids in liquids

Reason (R) : Solids and liquids are highly incompressible and practically remain unaffected by change in pressure

In the light of above A and R, choose the correct option.

1) A and R are true and R is the correct explanation of A
2) A and R are true but R is incorrect explanation of A
3) A is true but R is false
4) A is false but R is true

61. Given below are two statements

Statement-I: A galvanic cell is an electro chemical cell that converts chemical energy of a non spontaneous redox reaction in to electrical energy

Statement-II: In case of Daniell cell the Gibbs energy of the spontaneous redox reaction is converted into electrical work which may be used for running a motor.

In the light of above statements, choose the correct option

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

62. Given below are two statements

Statement-I: A potential difference develops between the electrode and the electrolyte which is called electrode potential.

Statement-II: According to IUPAC convention, standard reduction potentials are now called standard electrode potentials.

In the light of above statements, choose the correct option.

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

63. Calculate the mole fraction of ethylene glycol $\left(C_2H_6O_2\right)$ in an aqueous solution containing 20% of $C_2H_6O_2$ by mass

1) 0.68 2) 0.068 3) 0.007 4) 0.0068

64. To avoid bends, as well as, the toxic effects of high concentrations of nitrogen in the blood, the tanks used by scuba divers are filled with air diluted with helium in which x% helium, y% nitrogen and Z% oxygen are present. Find the correct order given below

1) $x > y > z$ 2) $y > x > z$ 3) $z > y > x$ 4) $y > z > x$

65. Assertion(A): Fluorine gas (F_2) is strongest oxidizing agent and fluoride ion is the weakest reducing agent.
Reason(R): Fluorine gas (F_2) has the maximum tendency to get reduced to fluoride ions.
In the light of above statements, choose the most appropriate answer from the option given below
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (R) is true but (A) is false

66. Concentrated nitric acid is labeled as 75% by mass. 32 ml of this solution contains x gram of water. If density of nitric acid solution is 1.25g/ml, what is the value of x.
1) 10 2) 30 3) 32 4) 75

67. Arrange the following solutions in the order of their increasing boiling points
i) $10^{-4}M$ $NaCl$ ii) $10^{-4}M$ glucose iii) $10^{-3}M$ $NaCl$ iv) $10^{-2}M$ $urea$
1) $i<ii<iii<iv$ 2) $iv<iii<ii<i$ 3) $ii<i<iii<iv$ 4) $iv<ii<i<iii$

68. Molarity of 2.76 molal aqueous solution of $NaC\ell$ is 3 Molar. The density of the solution is close to ____
1) $1.75g/ml$ 2) $1.25g/ml$ 3) $1.10g/ml$ 4) $0.95g/ml$

69. Which of the following concentration term is not a temperature independent concentration term
1) Normality 2) Mole fraction 3) Molality 4) Percentage by mass $\left(\frac{w}{W}\%\right)$

70. Find the correct match between List-I and List-II

LIST-I		LIST-II	
A)	Measurement of osmotic pressure	i)	Synthetic semi permeable membrane
B)	Isotonic solutions are separated by semi permeable membrane	ii)	Osmosis occurs
C)	Pig's bladder	iii)	Naturally occuring semipermeable membrane
D)	Cellophane	iv)	No osmosis occurs
		v)	Widely used to determine molar masses of proteins

1) $A-iv, B-ii, C-i, D-v$ 2) $A-iii, B-iv, C-i, D-v$
3) $A-v, B-iv, C-iii, D-i$ 4) $A-v, B-ii, C-i, D-iii$

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. $CrCl_3.xNH_3$ can exist as a complex, 0.1 molal aqueous solution of this complex shows a depression in freezing point of 0.558^0C. Assuming 100% ionization of this complex and coordination number of Cr is 6. The complex represented as $\left[Cr\left(NH_3\right)_x C\ell_y\right]C\ell_z$ the value of x is _____. $\left(K_f = 1.86\ k.kgmol^{-1}\right)$

72. When a sample of glucose is added to the pure water, the vapour pressure of the pure water decreases by 10mm of Hg and the mole ratio of glucose and water is $\frac{1}{4}$. If mole fraction of the glucose is 0.4, the decrease in vapour pressure is x mm of Hg. Value of 'x' is

73. Number of mixtures in the given list show positive deviation from Raoult's law
    a) Ethanol and acetone b) Phenol and Aniline
    c) Chloroform and Acetone d) Ethanol and water
    e) Carbondisulphide and acetone

74. Number of true statements from the given list _____
    a) The potential of individual half-cell cannot be measured
    b) Standard hydrogen electrode Pt(s) $/H_2(g)$ / $H^{\oplus}_{(aq)}$ is assigned a zero potential at all temperatures corresponding to the reaction $H^+_{(aq)} + e^- \rightarrow \frac{1}{2}H_{2(g)}$
    c) Electrochemical cells are extensively used for determining the P^H of solution
    d) Electro chemical cells are extensively used for determining the solubility product.

75. Concentrated nitric acid is labeled as x% by mass. The volume of the solution which contain 10gram of water is 32ml. If density of the solution is $1.25kgL^{-1}$, what is the value of x___

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