

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

A

PG-EE-July, 2026

SET-X

SUBJECT : Chemistry

100013

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate)

(Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet/OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answer (1), (2), (3), (4) are given. The candidate is to choose only one answer which he/she considers the correct or best one. If the candidate darkens more than one circle or cutting/over writing/erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question booklet.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
8. The candidates must return the Question booklet as well as Original OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

PG-EE-July, 2026/(Chemistry)(SET-X)/(A)

SEAL

1. Which lanthanide is radioactive ?
(1) Lanthanum (2) Gadolinium
(3) Promethium (4) Ytterbium
2. Which actinide is known for exhibiting the highest number of stable oxidation states ?
(1) Thorium (2) Uranium
(3) Actinium (4) Lutetium
3. Which reagent is commonly used to synthesize silicones ?
(1) SiCl_4 (2) RSiCl_3
(3) $\text{R}_2\text{Si}(\text{OH})_2$ (4) R_4Si
4. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ is colored because :
(1) Charge transfer transition (2) d-d transition
(3) f-f transition (4) Ligand transition
5. In the context of the 18-electron rule, which of the following complexes is coordinatively unsaturated and highly reactive ?
(1) $[\text{Fe}(\text{CO})_5]$ (2) $[\text{Cr}(\text{CO})_6]$
(3) $[\text{CpMn}(\text{CO})_3]$ (4) $[\text{V}(\text{CO})_6]$
6. Considering HSAB theory, which reaction is thermodynamically favoured ?
(1) $\text{LiI} + \text{CsF} \rightarrow \text{LiF} + \text{CsI}$
(2) $\text{LiF} + \text{CsI} \rightarrow \text{LiI} + \text{CsF}$
(3) Both are equally favoured
(4) Neither reaction occurs
7. Which of the following is the strongest Bronsted acid ?
(1) HI (2) HBr
(3) HCl (4) HF
8. In the auto-ionization of liquid SO_2 , the thionyl cation is :
(1) SO^{2+} (2) SO_3^{2-}
(3) S^{2+} (4) O^{2-}

9. Why must oxalates be removed before cation analysis ?
- (1) They form volatile compounds.
 - (2) They cause premature precipitation of Group IV/V cations in Group III.
 - (3) They are too acidic.
 - (4) They interfere with flame tests only.
10. The nitrogenase enzyme complex contains which key metallic co-factor ?
- (1) Fe-Cu
 - (2) Fe-Mo
 - (3) Zn-Mg
 - (4) Fe-Zn
11. The energy required to break one mole of $Cl-Cl$ bonds in Cl_2 is 242 kJ mol^{-1} . The longest wavelength of light capable of breaking a single $Cl-Cl$ bond is :
- ($C = 3 \times 10^8 \text{ m/s}$ and $NA = 6.02 \times 10^{23} \text{ mol}^{-1}$)
- (1) 494 nm
 - (2) 594 nm
 - (3) 640 nm
 - (4) 700 nm
12. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is :
- (1) 13.6 eV
 - (2) 30.6 eV
 - (3) 122.4 eV
 - (4) 3.4 eV
13. The increasing order of the ionic radii of the given isoelectronic species is :
- (1) K^+ , S^{2-} , Ca^{2+} , Cl^-
 - (2) Cl^- , Ca^{2+} , K^+ , S^{2-}
 - (3) S^{2-} , Cl^- , Ca^{2+} , K^+
 - (4) Ca^{2+} , K^+ , Cl^- , S^{2-}
14. Which one of the following is an amphoteric oxide ?
- (1) Na_2O
 - (2) SO_2
 - (3) B_2O_3
 - (4) ZnO

15. The compound of Xenon with zero dipole moment is :
(1) XeO_3 (2) XeO_2
(3) XeF_4 (4) $XeOF_4$
16. Among the following the maximum covalent character is shown by the compound :
(1) $AlCl_3$ (2) $MgCl_2$
(3) $FeCl_2$ (4) $SnCl_2$
17. The hybridisation of orbitals of N atom in NO_3^- , NO_2^+ , NH_4^+ are respectively :
(1) sp^2 , sp^3 , sp (2) sp , sp^3 , sp^2
(3) sp , sp^2 , sp^3 (4) sp^2 , sp , sp^3
18. Bond distance in HF is $9.17 \times 10^{-11}m$. Dipole moment of HF is $6.104 \times 10^{-30}Cm$. The percent ionic character in HF will be : (electron charge = $1.60 \times 10^{-19}C$)
(1) 61.0% (2) 38.0%
(3) 35.5% (4) 41.6%
19. The formation of molecular complex $BF_3 - NH_3$ results in a change in the hybridisation of boron :
(1) From sp^3 to sp^3d
(2) From sp^2 to dsp^2
(3) From sp^3 to sp^2
(4) From sp^2 to sp^3
20. A metal M on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour, Y is :
(1) NH_3 (2) MgO
(3) Mg_3N_2 (4) $Mg(NO_3)_2$

21. The compound that does not produce nitrogen gas by the thermal decomposition is :
- (1) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (2) NH_4NO_3
(3) $(\text{NH}_4)_2\text{SO}_4$ (4) $\text{Ba}(\text{N}_3)_2$
22. Which one of the following depletes the ozone layer ?
- (1) NO and freons (2) SO_2
(3) CO (4) CO_2
23. Which one of the following reactions of Xenon compounds is **not** feasible ?
- (1) $2\text{XeF}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Xe} + 4\text{HF} + \text{O}_2$
(2) $\text{XeF}_6 + \text{RbF} \rightarrow \text{Rb}[\text{XeF}_7]$
(3) $\text{XeO}_3 + 6\text{HF} \rightarrow \text{XeF}_6 + 3\text{H}_2\text{O}$
(4) $3\text{XeF}_4 + 6\text{H}_2\text{O} \rightarrow 2\text{Xe} + \text{XeO}_3 + 12\text{HF} + 1.5\text{O}_2$
24. Chlorine water on standing loses its colour and forms :
- (1) HCl and HClO_2 (2) HCl only
(3) HOCl and HOCl_2 (4) HCl and HOCl
25. Boron cannot form which one of the following anions ?
- (1) $\text{B}(\text{OH})_4^-$ (2) BO_2^-
(3) BF_6^{3-} (4) BH_4^-
26. Which of the following statements regarding sulphur is **incorrect** ?
- (1) At 600° the gas mainly consists of S_2 molecules
(2) The oxidation state of sulphur is never less than +4 in its compounds
(3) S_2 molecule is paramagnetic
(4) The vapour at 200°C consists mostly of S_8 rings
27. The type of isomerism present in Pentaamminenitrochromium(III) chloride is :
- (1) Optical (2) Linkage
(3) Ionization (4) Polymerisation

28. Which of the following is *not* formed when H_2S reacts with acidic $K_2Cr_2O_7$ solution ?
(1) K_2SO_4 (2) $Cr_2(SO_4)_3$
(3) S (4) $CrSO_4$
29. The geometries of the ammonia complexes of Ni^{2+} , Pt^{2+} and Zn^{2+} , respectively, are :
(1) octahedral, square planar and tetrahedral
(2) square planar, octahedral and tetrahedral
(3) tetrahedral, square planar and octahedral
(4) octahedral, tetrahedral and square planar
30. The spin-only magnetic moment of $[Mn(H_2O)_6]^{2+}$ is closest to :
(1) 4.90 BM (2) 5.92 BM
(3) 3.87 BM (4) 6.93 BM
31. Which complex is an outer-orbital complex ?
(1) $[Co(CN)_6]^{3-}$ (2) $[Fe(CN)_6]^{4-}$
(3) $[CoF_6]^{3-}$ (4) $[Ni(CN)_4]^{2-}$
32. Which complex has the highest thermodynamic stability ?
(1) $[Ni(H_2O)_6]^{2+}$ (2) $[Ni(NH_3)_6]^{2+}$
(3) $[Ni(en)_3]^{2+}$ (4) $[NiCl_4]^{2-}$
33. Which complex is diamagnetic ?
(1) $[Fe(H_2O)_6]^{2+}$ (2) $[CoF_6]^{3-}$
(3) $[Fe(CN)_6]^{4-}$ (4) $[Mn(H_2O)_6]^{2+}$
34. The cell potential is a :
(1) Colligative property
(2) Thermodynamic property
(3) Extensive property
(4) Intensive property

35. For a Vander Waals gas, the Boyle temperature is :
(1) $T_B = Rb/a$ (2) $T_B = Ra/b$
(3) $T_B = a/Rb$ (4) $T_B = R.a.b$
36. The compressibility factor of a Vander Waals gas at the critical point is :
(1) Zero (2) 0.40
(3) 0.375 (4) 0.55
37. Which of the following crystals has the highest lattice energy ?
(1) KF (2) CsF
(3) NaF (4) RbF
38. Operators $\hat{A}$ and $\hat{B}$ are said to be commutative, if :
(1) $[\hat{A}][\hat{B}] = 0$ (2) $[\hat{A}][\hat{B}] \neq 0$
(3) $\hat{A}\hat{B} - \hat{B}\hat{A} = 0$ (4) $\hat{A}\hat{B} + \hat{B}\hat{A} = 0$
39. The Joule-Thomson expansion of an Ideal gas :
(1) Isenthalpic process (2) An isothermal process
(3) An isobaric process (4) An isentropic process
40. Eigen value :
(1) is always a positive quantity
(2) is always a negative quantity
(3) is sometimes positive and sometime negative
(4) can be zero
41. The quantum yield of photochemical gas reaction $2HI \rightleftharpoons H_2 + I_2$ at wavelength 2400 Å is about :
(1) 0.25 (2) 10^3
(3) 2 (4) 10

A

42. The probability factor in the collision theory of reaction rates should be interpreted in terms of :

- | | |
|------------------------|---------------------|
| (1) Viscosity factor | (2) Enthalpy factor |
| (3) Free energy factor | (4) Entropy factor |

43. Debye-Huckel Onsagar equation is :

(1) $\Lambda_m = \Lambda_m^0 - (A + B \Lambda_m^0) C^{1/2}$

(2) $\Lambda_m = \Lambda_m^0 + (A + B \Lambda_m^0) C^{3/2}$

(3) $\Lambda_m = \Lambda_m^0 + (A - B \Lambda_m^0) C^{1/2}$

(4) $\Lambda_m = \Lambda_m^0 - (A + B \Lambda_m^0) C^{3/2}$

44. In the lead-acid battery during charging, the Cathode reaction is :

- (1) Formation of $PbSO_4$
- (2) Formation of PbO_2
- (3) Reduction of Pb^{2+} to Pb
- (4) None of the above

45. The energy required for ionization of a certain atom is 3.44 aJ ($1 \text{ aJ} = 10^{-18} \text{ J}$). The absorption of a photon of unknown wavelength ionizes the atom and ejects an electron with velocity $1.03 \times 10^6 \text{ ms}^{-1}$. Calculate the wavelength of the incident radiation :

- | | |
|-------------|-------------|
| (1) 52.5 nm | (2) 51.8 nm |
| (3) 50.9 nm | (4) 50.6 nm |

46. The rate constant of a reaction depends on :

- | | |
|---------------------------------------|------------------------|
| (1) Initial concentration of reactant | (2) Pressure |
| (3) Temperature | (4) Extent of reaction |

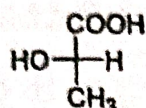
47. According to transition state theory, the specific rate constant k_2 of a bimolecular reaction is given by :
- (1) $e^2 \frac{kT}{h} e^{\Delta s^\ddagger / R} e^{-E_a / kT}$
 - (2) $e^2 \left(\frac{RT}{P_0} \right) \frac{kT}{h} e^{\Delta s_0^\ddagger / R} e^{-E_a / kT}$
 - (3) $e^2 \left(\frac{RT}{P_0} \right) \frac{RT}{N_0 h} e^{\Delta s_0^\ddagger / R} e^{-\Delta H / kT}$
 - (4) None of the above
48. A liquid of density 1.2 flows through a viscometer in 110 seconds. The same volume of water requires 60 second to pass. Calculate n . (Given $H_2O = 0.01$)
- (1) 0.012
 - (2) 0.021
 - (3) 0.022
 - (4) 0.023
49. A goldfish swims in a bowl of water at 20°C . Over a period of time, the fish transfer 120 J to the water as a result of its metabolism. What is the change in entropy of water ?
- (1) 4.10 JK^{-1}
 - (2) 0.410 JK^{-1}
 - (3) 0.426 JK^{-1}
 - (4) 14.10 JK^{-1}
50. 1 kg of water at 25°C and 1 atm is subjected to 100 atm, calculate ΔG .
- (1) 12.04 KJ
 - (2) 13.05 KJ
 - (3) 10.06 KJ
 - (4) 10.03 KJ
51. What is the differential form of the Clausius-Clapeyron equation used for phase transition ?
- (1) $\frac{dp}{dt} = \frac{L}{T(V_g - V_e)}$
 - (2) $\frac{dp}{dt} = \frac{\Delta S}{\Delta V}$
 - (3) $\frac{dp}{dt} = \frac{\Delta H}{T\Delta V}$
 - (4) All of the above

52. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$. At constant pressure of some inert gas added into the system then :
- (1) More $NH_3(g)$ is produced
 - (2) Less $NH_3(g)$ is produced
 - (3) No effect on equilibrium
 - (4) K_p of the reaction decreased
53. Calculate the minimum volume of benzene required to extract in one step 90%. If H_2S present in one litre of 0.1 M aqueous solution : [Given : $C_1/C_2 = 0.17$]
- (1) 1.53 litre
 - (2) 1.46 litre
 - (3) 1.35 litre
 - (4) 1.58 litre
54. When Benzoic acid mixed with mixture of benzene and water, undergo dimerization in benzene. Which form of distribution law is used here ?
- (1) $\sqrt{C_b} / C_w = K_D$
 - (2) $C_b / C_w^2 = K_D$
 - (3) $C_b / \sqrt{C_w} = K_D$
 - (4) $C_b^2 / C_w = K_D$
55. 1 D (debye) is :
- (1) 3.466×10^{-31} Cm
 - (2) 3.336×10^{-30} Cm
 - (3) 3.664×10^{-30} Cm
 - (4) 3.446×10^{-29} Cm
56. The Gouy balance results showed that a sample of a complex ion in a tube of $1.75 \times 10^{-5} m^2$ cross-section that was partly in a magnetic flux density of 0.4 T was pushed into the field by a force equal to 2.50×10^{-4} N. Calculate the magnetic susceptibility (χ) :
- (1) 88.76×10^{-6}
 - (2) 89.76×10^{-6}
 - (3) 89.67×10^{-7}
 - (4) 88.76×10^{-7}

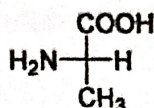
57. 10 g of a substance dissolved in 100 g water raised its boiling point by 1° . K_b for water is 0.52. Calculate the molecular weight of the solute.
- (1) 51.05 g (2) 52.00 g
(3) 52.05 g (4) 54.05 g
58. If two solutions are separated by a semipermeable membrane and solvent flows in both directions, then the solutions are :
- (1) Isotonic (2) Hypo-solution
(3) Iso-osmotic (4) Isopiestic
59. It is advantage in using molality instead of molarity as concentration because :
- (1) Pressure independent
(2) Temperature independent
(3) Volume independent
(4) Weight independent
60. The freezing point of water is lowered by increase of pressure, while that of sulphur is raised this is because :
- (1) The molar heat of fusion of ice is higher than that of sulphur.
(2) The molar volume of liquid water is lower than that of solid water but molar volume of liquid sulphur is higher than that of solid sulphur.
(3) The freezing point of water is lower than the boiling point of sulphur.
(4) None of the above
61. Determine the number of components :
 $NaCl(s)$, $KBr(s)$, $K^+(aq)$, $Na^+(aq)$, $Cl^-(aq)$, $Br^-(aq)$, $H_2O(l)$, $H_2O(g)$
- (1) 3 (2) 5
(3) 4 (4) 6

62. The unit of equivalent conductance is :
- (1) $\text{ohm}^{-1}\text{cm}^{-2}/\text{gm eq.}$
 - (2) $\text{ohm}^{-1}\text{cm}^2/\text{gm eq.}$
 - (3) $\text{ohm}^{-1}\text{cm}^{-2}/\text{gm eq.}$
 - (4) $\text{ohm}^{-1}\text{cm}^2/\text{gm eq.}$
63. Calculate the solubility product of Ag_2CrO_4 . Given that its solubility is 7×10^{-5} gm-mole/litre :
- (1) 1.372×10^{-12}
 - (2) 1.472×10^{-12}
 - (3) 1.472×10^{-11}
 - (4) 1.372×10^{-11}
64. The value of K_w for water at body temperature is 2.5×10^{-14} . What is the value of pH of neutral water at 37°C ?
- (1) 6.90
 - (2) 6.85
 - (3) 6.80
 - (4) 7.00
65. The collision theory is satisfactory for :
- (1) Zero order
 - (2) Unimolecular
 - (3) Bimolecular
 - (4) Fractional order
66. pH range of methylorange indicator is :
- (1) 2.9 – 4.0
 - (2) 4.2–6.3
 - (3) 3.1 – 4.4
 - (4) 3.8 – 5.4
67. Which of the following molecule does *not* have delocalized bonds ?
- (1) 1,3-butadiene
 - (2) vinyl chloride
 - (3) 1,3-butadiyne
 - (4) ethylene

68. The configuration of the following molecules are :



and



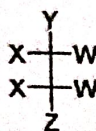
(1) R and S

(2) S and R

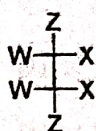
(3) S and S

(4) R and R

69. What are the prefixes for the following ?



and



(1) threo and erythro

(2) erythro and threo

(3) meso and erythro

(4) erythro and meso

70. Which of the following free-radical is relatively less stable ?

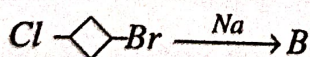
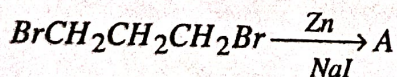
(1) *Ph.*

(2) $\text{CF}_3\cdot$

(3) $\text{CH}_2 = \text{CH}\cdot$

(4) *Me.*

71. Identify the products A and B in the following reactions :



(1) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\diamond$

(2) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\diamond$

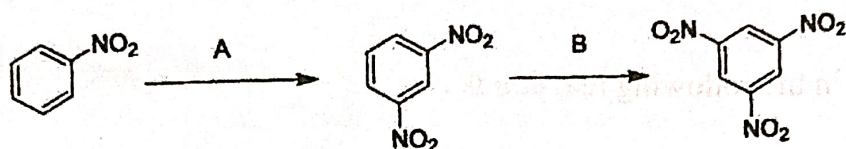
(3) $\triangle$ and $\diamond$

(4) $\triangle$ and $\diamond$

72. 2,3-Dimethyl-2-butene on ozonolysis followed by decomposition with zinc and acetic acid produces :

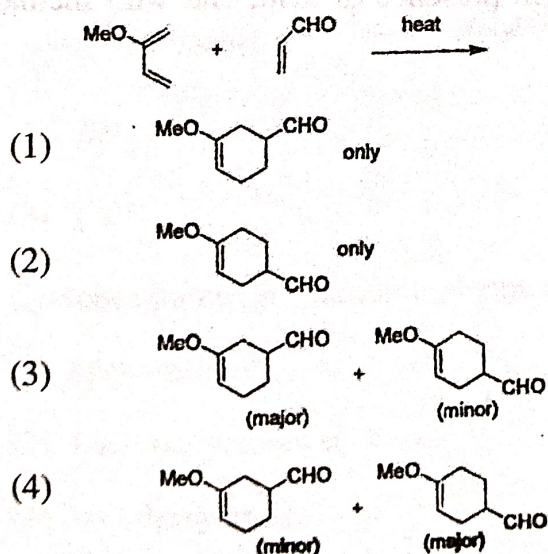
- (1) acetaldehyde and acetone (2) acetic acid
(3) acetone (4) acetone and acetic acid

73. Identify the reagents A and B for the following conversions :



- (1) HNO_3 and $HNO_3 + H_2SO_4$
(2) $HNO_3 + H_2SO_4$ and $NO_2^+ BF_4^-$
(3) HNO_3 and $NO_2^+ BF_4^-$
(4) $HNO_3 + H_2SO_4$ and $HNO_3 + H_2SO_4$

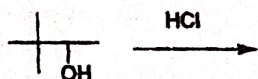
74. Identify the product(s) formed in the following Diels-Alder reaction :



75. o-Deuteriofluorobenzene on treatment with potassium amide in presence of ammonia is rapidly converted to :

- (1) fluorobenzene
- (2) aniline
- (3) o-deuterioaniline
- (4) m-deuterioaniline

76. The product obtained in the following reaction is :



- (1) $\begin{array}{c} | \\ | \\ \text{---} \text{C} \text{---} \text{Cl} \\ | \end{array}$
- (2) $\begin{array}{c} | \\ \text{Cl} \text{---} \text{C} \text{---} | \\ | \end{array}$
- (3) $\begin{array}{c} | \\ | \\ \text{---} \text{C} \text{---} \text{C} \text{---} \\ | \quad \quad | \end{array}$
- (4) $\begin{array}{c} | \\ | \\ \text{---} \text{C} \text{---} \text{C} \text{---} \\ | \quad \quad | \end{array}$

77. Isobutylene oxide on reaction with H_2^{18}O in presence of acid; and with methanol in presence of sodium methoxide produces :

- (1) $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ ^{18}\text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OMe} \end{array}$
- (2) $\begin{array}{c} \text{Me} \quad ^{18} \\ | \quad | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OMe} \end{array}$
- (3) $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ ^{18}\text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OCH}_3 \\ | \\ \text{OH} \end{array}$
- (4) $\begin{array}{c} \text{Me} \quad ^{18} \\ | \quad | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OCH}_3 \\ | \\ \text{OH} \end{array}$

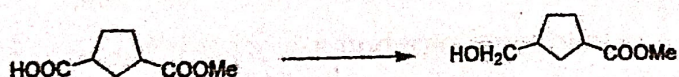
78. The major product obtained in the reaction of phenol with bromine in carbon disulfide at 0°C is :

- (1) 2-bromophenol
- (2) 4-bromophenol
- (3) 3-bromophenol
- (4) bromobenzene

79. Propionic acid on reaction with two equivalents of bromine in presence of phosphorus gives :

- (1) $BrCH_2CH_2COOH$
- (2) $BrCH_2CH(Br)COOH$
- (3) $CH_3CH(Br)COOH$
- (4) $CH_3C(Br)_2COOH$

80. Which reagent(s) is (are) preferred for carrying out the following transformation ?



- (1) BH_3
- (2) $LiAlH_4$
- (3) $LiBH_4$
- (4) Both $LiAlH_4$ and $LiBH_4$

81. Cyclohexanone on reaction with ammonia in presence of hydrogen and nickel affords :

- (1) cyclohexanol
- (2) 1-aminocyclohexan-1-ol
- (3) cyclohexylamine
- (4) cyclohexene

82. Benzene diazonium chloride on treatment with H_3PO_2 and $KI + H_2O$, respectively produces :

- | | |
|------------------------|-----------------------------|
| (1) benzene and phenol | (2) benzene and iodobenzene |
| (3) phenol and phenol | (4) phenol and iodobenzene |

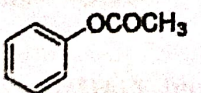
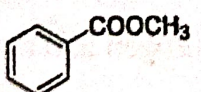
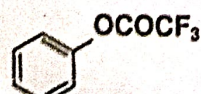
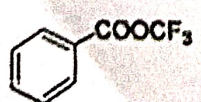
83. Nitration of trifluoromethyl benzene using $HNO_3 + H_2SO_4$ followed by reduction with $Sn + \text{conc. } HCl$ mainly affords :

- (1) 2-trifluoromethyl aniline
- (2) 3-trifluoromethyl aniline
- (3) 4-trifluoromethyl aniline
- (4) aniline

84. Which is (are) relatively better reagent(s) for conversion of acid sensitive secondary alcohol to ketone ?

- (1) PCC
- (2) Chromic acid
- (3) PDC
- (4) Both chromic acid and PDC

85. Acetophenone on treatment with per trifluoroacetic acid mainly gives :

- (1) 
- (2) 
- (3) 
- (4) 

86. Which of the following is utilized to make α , β -unsaturated carboxylic acid efficiently ?
- (1) Perkin reaction
 - (2) Knoevenagel condensation
 - (3) Mannich reaction
 - (4) Cannizaro reaction
87. Which of the following carbohydrate pair forms same osazone ?
- (1) (+)-glucose and (+)-galactose
 - (2) (+)-glucose and (+)-mannose
 - (3) (+)-galactose and (+)-mannose
 - (4) (+)-glucose and (+)-gulose
88. Choose the *correct* statement :
- (1) (+)-Sucrose is made up of D-(+)-glucose and D-(+)-Fructose.
 - (2) Starch contains 80% amylose and 20% amylopectin.
 - (3) (+)-Maltose reduces Tollen's and Fehling's reagent.
 - (4) (+)-Lactose do not undergo mutarotation.
89. Choose the *incorrect* statement :
- (1) Pyrrole on reaction with bromine at 0°C in ethanol produces 2, 3, 4, 5-tetrabromopyrrole.
 - (2) Furan on reaction with acetic anhydride in presence of zinc chloride at 0°C produces 2-acetylfuran.
 - (3) Pyridine does not undergo electrophilic substitution.
 - (4) Furan on reaction with bromine in ethanol produces 2, 3, 4, 5-tetrabromofuran.

90. Isoquinoline on nitration with $\text{HNO}_3 + \text{H}_2\text{SO}_4$ gives mainly :

- (1) 4-nitroisoquinoline
- (2) 5-nitroisoquinoline
- (3) 1-nitroisoquinoline
- (4) 8-nitroisoquinoline

91. Choose the *incorrect* statement :

- (1) Tosyl and Brosyl groups contain an aromatic ring.
- (2) Sulfonic acids are strong acids.
- (3) Sulfonates are weak bases.
- (4) Mesyl and Brosyl groups contains aliphatic groups.

92. Which of the following enolate avoids self-condensation with carbonyl compounds in aldol condensation ?

- (1) sodium enolate
- (2) potassium enolate
- (3) lithium enolate
- (4) sodium enolate and potassium enolate

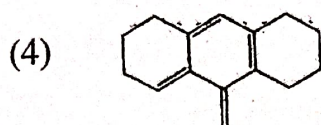
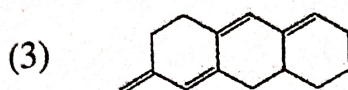
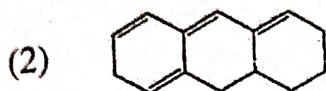
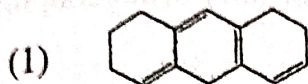
93. Glyptal is an example of :

- (1) polyamide
- (2) polyester
- (3) UF resin
- (4) PF resin

94. Which of the following amino acid is *not* chiral ?

- (1) valine
- (2) proline
- (3) cysteine
- (4) glycine

95. Which of the following will show higher $\lambda_{\max}$ in UV spectroscopy ?



96. The higher $\lambda_{\max}$ observed in the UV spectrum of acetone is due to :

(1) $n - \sigma^*$ transition

(2) $\pi - \pi^*$ transition

(3) $n - \pi^*$ transition

(4) $\sigma - \sigma^*$ transition

97. Which of the following bond in a molecule will have relatively LOWER stretching frequency in IR spectrum ?

(1) C-C

(2) C-N

(3) C-O

(4) C-H

98. Which of the following will show C=O stretching band at higher frequency ?

(1) lactam

(2) amide

(3) lactone

(4) ester

99. How many signals will be observed in the ^1H NMR spectrum of methyl proppionate and ethyl acetate, respectively ?

(1) 3 and 2

(2) 2 and 2

(3) 3 and 3

(4) 2 and 3

100. The number of aromatic ring signals and multiplicity (consider only ortho couplings) in the ^1H NMR spectrum of m-nitroacetophenone are :

- (1) one and multiplet
- (2) two and both doublets
- (3) three and two doublets, one triplet
- (4) four and one singlet, one triplet, two doublets

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

B

SET-X

PG-EE-July, 2026
SUBJECT : Chemistry

100026

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate)

(Signature of the Invigilator)

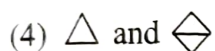
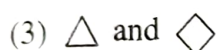
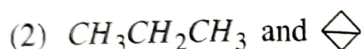
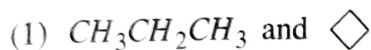
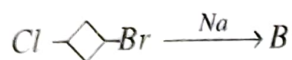
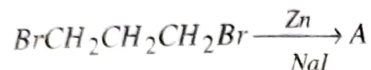
**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet/OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answer (1), (2), (3), (4) are given. The candidate is to choose only one answer which he/she considers the correct or best one. If the candidate darkens more than one circle or cutting/over writing/erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question booklet.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
8. The candidates must return the Question booklet as well as Original OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

PG-EE-July, 2026/(Chemistry)(SET-X)/(B)

SEAL

1. Identify the products A and B in the following reactions :



2. 2,3-Dimethyl-2-butene on ozonolysis followed by decomposition with zinc and acetic acid produces :

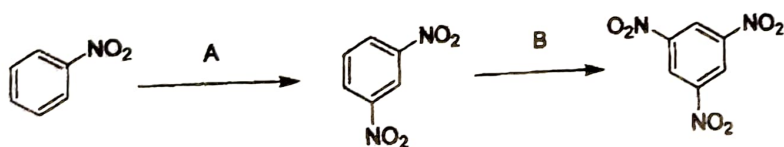
(1) acetaldehyde and acetone

(2) acetic acid

(3) acetone

(4) acetone and acetic acid

3. Identify the reagents A and B for the following conversions :



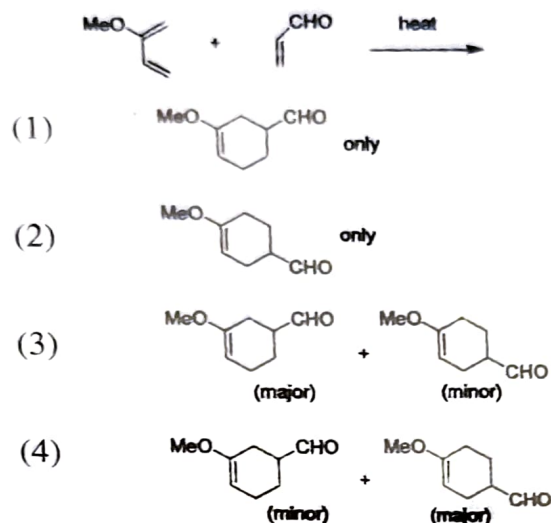
(1) HNO_3 and $\text{HNO}_3 + \text{H}_2\text{SO}_4$

(2) $\text{HNO}_3 + \text{H}_2\text{SO}_4$ and $\text{NO}_2^+ \text{BF}_4^-$

(3) HNO_3 and $\text{NO}_2^+ \text{BF}_4^-$

(4) $\text{HNO}_3 + \text{H}_2\text{SO}_4$ and $\text{HNO}_3 + \text{H}_2\text{SO}_4$

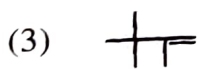
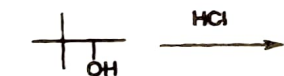
4. Identify the product(s) formed in the following Diels-Alder reaction :



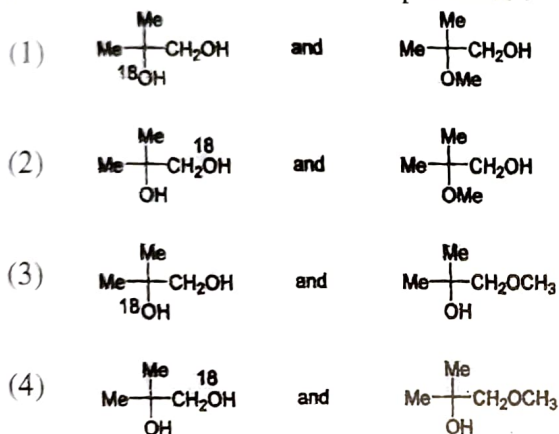
5. o-Deuteriofluorobenzene on treatment with potassium amide in presence of ammonia is rapidly converted to :

- (1) fluorobenzene
- (2) aniline
- (3) o-deuterioaniline
- (4) m-deuterioaniline

6. The product obtained in the following reaction is :



7. Isobutylene oxide on reaction with $H_2^{18}O$ in presence of acid; and with methanol in presence of sodium methoxide produces :



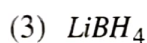
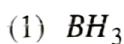
8. The major product obtained in the reaction of phenol with bromine in carbon disulfide at 0°C is :

- (1) 2-bromophenol
 (2) 4-bromophenol
 (3) 3-bromophenol
 (4) bromobenzene

9. Propionic acid on reaction with two equivalents of bromine in presence of phosphorus gives :

- (1) $\text{BrCH}_2\text{CH}_2\text{COOH}$
 (2) $\text{BrCH}_2\text{CH}(\text{Br})\text{COOH}$
 (3) $\text{CH}_3\text{CH}(\text{Br})\text{COOH}$
 (4) $\text{CH}_3\text{C}(\text{Br})_2\text{COOH}$

10. Which reagent(s) is (are) preferred for carrying out the following transformation ?



11. What is the differential form of the Clausius-Clapeyron equation used for phase transition ?

(1) $\frac{dp}{dt} = \frac{L}{T(V_g - V_e)}$

(2) $\frac{dp}{dt} = \frac{\Delta S}{\Delta V}$

(3) $\frac{dp}{dt} = \frac{\Delta H}{T\Delta V}$

(4) All of the above

12. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$. At constant pressure of some inert gas added into the system then :

(1) More $NH_3(g)$ is produced

(2) Less $NH_3(g)$ is produced

(3) No effect on equilibrium

(4) K_p of the reaction decreased

13. Calculate the minimum volume of benzene required to extract in one step 90%. If H_2S present in one litre of 0.1 M aqueous solution : [Given : $C_1/C_2 = 0.17$]

(1) 1.53 litre

(2) 1.46 litre

(3) 1.35 litre

(4) 1.58 litre

14. When Benzoic acid mixed with mixture of benzene and water, undergo dimerization in benzene. Which form of distribution law is used here ?

(1) $\sqrt{C_b} / C_w = K_D$

(2) $C_b / C_w^2 = K_D$

(3) $C_b / \sqrt{C_w} = K_D$

(4) $C_b^2 / C_w = K_D$

15. 1 D (debye) is :

- (1) 3.466×10^{-31} Cm (2) 3.336×10^{-30} Cm
(3) 3.664×10^{-30} Cm (4) 3.446×10^{-29} Cm

16. The Gouy balance results showed that a sample of a complex ion in a tube of $1.75 \times 10^{-5} \text{ m}^2$ cross-section that was partly in a magnetic flux density of 0.4 T was pushed into the field by a force equal to 2.50×10^{-4} N. Calculate the magnetic susceptibility (χ) :

- (1) 88.76×10^{-6} (2) 89.76×10^{-6}
(3) 89.67×10^{-7} (4) 88.76×10^{-7}

17. 10 g of a substance dissolved in 100 g water raised its boiling point by 1° . K_b for water is 0.52. Calculate the molecular weight of the solute.

- (1) 51.05 g (2) 52.00 g
(3) 52.05 g (4) 54.05 g

18. If two solutions are separated by a semipermeable membrane and solvent flows in both directions, then the solutions are :

- (1) Isotonic (2) Hypo-solution
(3) Iso-osmotic (4) Isopiestic

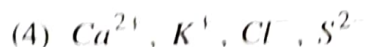
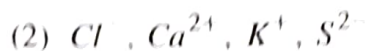
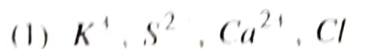
19. It is advantage in using molality instead of molarity as concentration because :

- (1) Pressure independent
(2) Temperature independent
(3) Volume independent
(4) Weight independent

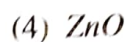
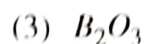
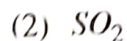
20. The freezing point of water is lowered by increase of pressure, while that of sulphur is raised this is because :
- (1) The molar heat of fusion of ice is higher than that of sulphur.
 - (2) The molar volume of liquid water is lower than that of solid water but molar volume of liquid sulphur is higher than that of solid sulphur.
 - (3) The freezing point of water is lower than the boiling point of sulphur.
 - (4) None of the above
21. Which complex is an outer-orbital complex ?
- (1) $[Co(CN)_6]^{3-}$
 - (2) $[Fe(CN)_6]^{4-}$
 - (3) $[CoF_6]^{3-}$
 - (4) $[Ni(CN)_4]^{2-}$
22. Which complex has the highest thermodynamic stability ?
- (1) $[Ni(H_2O)_6]^{2+}$
 - (2) $[Ni(NH_3)_6]^{2+}$
 - (3) $[Ni(en)_3]^{2+}$
 - (4) $[NiCl_4]^{2-}$
23. Which complex is diamagnetic ?
- (1) $[Fe(H_2O)_6]^{2+}$
 - (2) $[CoF_6]^{3-}$
 - (3) $[Fe(CN)_6]^{4-}$
 - (4) $[Mn(H_2O)_6]^{2+}$
24. The cell potential is a :
- (1) Colligative property
 - (2) Thermodynamic property
 - (3) Extensive property
 - (4) Intensive property
25. For a Vander Waals gas, the Boyle temperature is :
- (1) $T_B = Rb/a$
 - (2) $T_B = Ra/b$
 - (3) $T_B = a/Rb$
 - (4) $T_B = R.a.b$

26. The compressibility factor of a Vander Waals gas at the critical point is :
(1) Zero (2) 0.40
(3) 0.375 (4) 0.55
27. Which of the following crystals has the highest lattice energy ?
(1) KF (2) CsF
(3) NaF (4) RbF
28. Operators $\hat{A}$ and $\hat{B}$ are said to be commutative, if :
(1) $[\hat{A}][\hat{B}] = 0$ (2) $[\hat{A}][\hat{B}] \neq 0$
(3) $\hat{A}\hat{B} - \hat{B}\hat{A} = 0$ (4) $\hat{A}\hat{B} + \hat{B}\hat{A} = 0$
29. The Joule-Thomson expansion of an Ideal gas :
(1) Isenthalpic process (2) An isothermal process
(3) An isobaric process (4) An isentropic process
30. Eigen value :
(1) is always a positive quantity
(2) is always a negative quantity
(3) is sometimes positive and sometime negative
(4) can be zero
31. The energy required to break one mole of $Cl-Cl$ bonds in Cl_2 is 242 kJ mol^{-1} . The longest wavelength of light capable of breaking a single $Cl-Cl$ bond is :
($C = 3 \times 10^8 \text{ m/s}$ and $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)
(1) 494 nm (2) 594 nm
(3) 640 nm (4) 700 nm
32. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is :
(1) 13.6 eV (2) 30.6 eV
(3) 122.4 eV (4) 3.4 eV

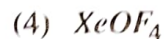
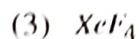
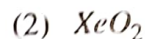
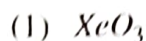
33. The increasing order of the ionic radii of the given isoelectronic species is :



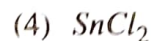
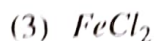
34. Which one of the following is an amphoteric oxide ?



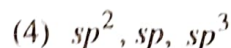
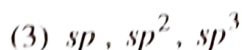
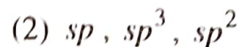
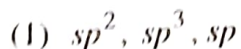
35. The compound of Xenon with zero dipole moment is :



36. Among the following the maximum covalent character is shown by the compound :



37. The hybridisation of orbitals of N atom in NO_3^- , NO_2^+ , NH_4^+ are respectively :



38. Bond distance in HF is 9.17×10^{-11} m. Dipole moment of HF is 6.104×10^{-30} Cm. The percent ionic character in HF will be : (electron charge = 1.60×10^{-19} C)

(1) 61.0%

(2) 38.0%

(3) 35.5%

(4) 41.6%

39. The formation of molecular complex $BF_3 - NH_3$ results in a change in the hybridisation of boron :
- (1) From sp^3 to sp^3d
 - (2) From sp^2 to dsp^2
 - (3) From sp^3 to sp^2
 - (4) From sp^2 to sp^3
40. A metal M on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour, Y is :
- (1) NH_3
 - (2) MgO
 - (3) Mg_3N_2
 - (4) $Mg(NO_3)_2$
41. Choose the *incorrect* statement :
- (1) Tosyl and Brosyl groups contain an aromatic ring.
 - (2) Sulfonic acids are strong acids.
 - (3) Sulfonates are weak bases.
 - (4) Mesyl and Brosyl groups contains aliphatic groups.
42. Which of the following enolate avoids self-condensation with carbonyl compounds in aldol condensation ?
- (1) sodium enolate
 - (2) potassium enolate
 - (3) lithium enolate
 - (4) sodium enolate and potassium enolate

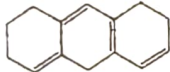
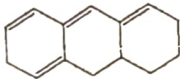
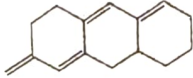
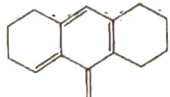
43. Glyptal is an example of :

- | | |
|---------------|---------------|
| (1) polyamide | (2) polyester |
| (3) UF resin | (4) PF resin |

44. Which of the following amino acid is *not* chiral ?

- | | |
|--------------|-------------|
| (1) valine | (2) proline |
| (3) cysteine | (4) glycine |

45. Which of the following will show higher $\lambda_{\max}$ in UV spectroscopy ?

- (1) 
- (2) 
- (3) 
- (4) 

46. The higher $\lambda_{\max}$ observed in the UV spectrum of acetone is due to :

- | | |
|-------------------------------|------------------------------------|
| (1) $n - \sigma^*$ transition | (2) $\pi - \pi^*$ transition |
| (3) $n - \pi^*$ transition | (4) $\sigma - \sigma^*$ transition |

47. Which of the following bond in a molecule will have relatively LOWER stretching frequency in IR spectrum ?

- | | |
|---------|---------|
| (1) C-C | (2) C-N |
| (3) C-O | (4) C-H |

48. Which of the following will show C=O stretching band at higher frequency ?
- (1) lactam (2) amide
(3) lactone (4) ester
49. How many signals will be observed in the 1H NMR spectrum of methyl proppionate and ethyl acetate, respectively ?
- (1) 3 and 2 (2) 2 and 2
(3) 3 and 3 (4) 2 and 3
50. The number of aromatic ring signals and multiplicity (consider only ortho couplings) in the 1H NMR spectrum of m-nitroacetophenone are :
- (1) one and multiplet
(2) two and both doublets
(3) three and two doublets, one triplet
(4) four and one singlet, one triplet, two doublets
51. Determine the number of components :
 $NaCl(s), KBr(s), K^+(aq), Na^+(aq), Cl^-(aq), Br^-(aq), H_2O(l), H_2O(g)$
- (1) 3 (2) 5
(3) 4 (4) 6
52. The unit of equivalent conductance is :
- (1) $ohm^{-1}cm^2/gm\ eq.$
(2) $ohm^{-1}cm^2/gm\ eq.$
(3) $ohm^{-1}cm^2/gm\ eq.$
(4) $ohm^{-1}cm^2/gm\ eq.$

53. Calculate the solubility product of Ag_2CrO_4 . Given that its solubility is 7×10^{-5} gm-mole/litre :

- (1) 1.372×10^{-12} (2) 1.472×10^{-12}
(3) 1.472×10^{-11} (4) 1.372×10^{-11}

54. The value of K_w for water at body temperature is 2.5×10^{-14} . What is the value of pH of neutral water at $37^\circ C$?

- (1) 6.90 (2) 6.85
(3) 6.80 (4) 7.00

55. The collision theory is satisfactory for :

- (1) Zero order (2) Unimolecular
(3) Bimolecular (4) Fractional order

56. pH range of methylorange indicator is :

- (1) 2.9 – 4.0 (2) 4.2–6.3
(3) 3.1 – 4.4 (4) 3.8 – 5.4

57. Which of the following molecule does **not** have delocalized bonds ?

- (1) 1,3-butadiene (2) vinyl chloride
(3) 1,3-butadiyne (4) ethylene

58. The configuration of the following molecules are :



- (1) R and S (2) S and R
(3) S and S (4) R and R

59. What are the prefixes for the following ?



- (1) threo and erythro
 - (2) erythro and threo
 - (3) meso and erythro
 - (4) erythro and meso
60. Which of the following free-radical is relatively less stable ?
- (1) *Ph.*
 - (2) $CF_3.$
 - (3) $CH_2 = CH.$
 - (4) *Me.*
61. Cyclohexanone on reaction with ammonia in presence of hydrogen and nickel affords :
- (1) cyclohexanol
 - (2) 1-aminocyclohexan-1-ol
 - (3) cyclohexylamine
 - (4) cyclohexene
62. Benzene diazonium chloride on treatment with H_3PO_2 and $KI + H_2O$, respectively produces :
- (1) benzene and phenol
 - (2) benzene and iodobenzene
 - (3) phenol and phenol
 - (4) phenol and iodobenzene

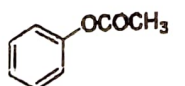
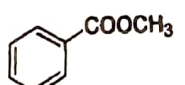
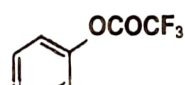
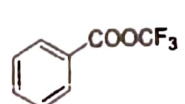
63. Nitration of trifluoromethyl benzene using $HNO_3 + H_2SO_4$ followed by reduction with $Sn + \text{conc. } HCl$ mainly affords :

- (1) 2-trifluoromethyl aniline
- (2) 3-trifluoromethyl aniline
- (3) 4-trifluoromethyl aniline
- (4) aniline

64. Which is (are) relatively better reagent(s) for conversion of acid sensitive secondary alcohol to ketone ?

- (1) PCC
- (2) Chromic acid
- (3) PDC
- (4) Both chromic acid and PDC

65. Acetophenone on treatment with per trifluoroacetic acid mainly gives :

- (1) 
- (2) 
- (3) 
- (4) 

66. Which of the following is utilized to make α , β -unsaturated carboxylic acid efficiently ?
- (1) Perkin reaction
 - (2) Knoevenagel condensation
 - (3) Mannich reaction
 - (4) Cannizaro reaction
67. Which of the following carbohydrate pair forms same osazone ?
- (1) (+)-glucose and (+)-galactose
 - (2) (+)-glucose and (+)-mannose
 - (3) (+)-galactose and (+)-mannose
 - (4) (+)-glucose and (+)-gulose
68. Choose the *correct* statement :
- (1) (+)-Sucrose is made up of D-(+)-glucose and D-(+)-Fructose.
 - (2) Starch contains 80% amylose and 20% amylopectin.
 - (3) (+)-Maltose reduces Tollen' and Fehling's reagent.
 - (4) (+)-Lactose do not undergo mutarotation.
69. Choose the *incorrect* statement :
- (1) Pyrrole on reaction with bromine at 0°C in ethanol produces 2, 3, 4, 5-tetrabromopyrrole.
 - (2) Furan on reaction with acetic anhydride in presence of zinc chloride at 0°C produces 2-acetylfuran.
 - (3) Pyridine does not undergo electrophilic substitution.
 - (4) Furan on reaction with bromine in ethanol produces 2, 3, 4, 5-tetrabromofuran.

70. Isoquinoline on nitration with $HNO_3 + H_2SO_4$ gives mainly :
- (1) 4-nitroisoquinoline
 - (2) 5-nitroisoquinoline
 - (3) 1-nitroisoquinoline
 - (4) 8-nitroisoquinoline
71. The quantum yield of photochemical gas reaction $2HI \rightleftharpoons H_2 + I_2$ at wavelength $2400 \text{ \AA}$ is about :
- (1) 0.25
 - (2) 10^3
 - (3) 2
 - (4) 10
72. The probability factor in the collision theory of reaction rates should be interpreted in terms of :
- (1) Viscosity factor
 - (2) Enthalpy factor
 - (3) Free energy factor
 - (4) Entropy factor
73. Debye-Huckel Onsagar equation is :
- (1) $\wedge_m = \wedge_m^0 - (A + B \wedge_m^0) C^{1/2}$
 - (2) $\wedge_m = \wedge_m^0 + (A + B \wedge_m^0) C^{3/2}$
 - (3) $\wedge_m = \wedge_m^0 + (A - B \wedge_m^0) C^{1/2}$
 - (4) $\wedge_m = \wedge_m^0 - (A + B \wedge_m^0) C^{3/2}$
74. In the lead-acid battery during charging, the Cathode reaction is :
- (1) Formation of $PbSO_4$
 - (2) Formation of PbO_2
 - (3) Reduction of Pb^{2+} to Pb
 - (4) None of the above
75. The energy required for ionization of a certain atom is 3.44 aJ ($1 \text{ aJ} = 10^{-18} \text{ J}$). The absorption of a photon of unknown wavelength ionizes the atom and ejects an electron with velocity $1.03 \times 10^6 \text{ ms}^{-1}$. Calculate the wavelength of the incident radiation :
- (1) 52.5 nm
 - (2) 51.8 nm
 - (3) 50.9 nm
 - (4) 50.6 nm

76. The rate constant of a reaction depends on :

- (1) Initial concentration of reactant (2) Pressure
(3) Temperature (4) Extent of reaction

77. According to transition state theory, the specific rate constant k_2 of a bimolecular reaction is given by :

- (1) $e^2 \frac{kT}{h} e^{\Delta s^\ddagger / R} e^{-E_a / kT}$ (2) $e^2 \left(\frac{RT}{P_0} \right) \frac{kT}{h} e^{\Delta s_0^\ddagger / R} e^{-E_a / kT}$
(3) $e^2 \left(\frac{RT}{P_0} \right) \frac{RT}{N_0 h} e^{\Delta s_0^\ddagger / R} e^{-\Delta H / kT}$ (4) None of the above

78. A liquid of density 1.2 flows through a viscometer in 110 seconds. The same volume of water requires 60 second to pass. Calculate n . (Given $H_2O = 0.01$)

- (1) 0.012 (2) 0.021
(3) 0.022 (4) 0.023

79. A goldfish swims in a bowl of water at 20°C. Over a period of time, the fish transfer 120 J to the water as a result of its metabolism. What is the change in entropy of water ?

- (1) 4.10 JK^{-1} (2) 0.410 JK^{-1}
(3) 0.426 JK^{-1} (4) 14.10 JK^{-1}

80. 1 kg of water at 25°C and 1 atm is subjected to 100 atm, calculate ΔG .

- (1) 12.04 KJ (2) 13.05 KJ
(3) 10.06 KJ (4) 10.03 KJ

81. The compound that does not produce nitrogen gas by the thermal decomposition is :

- (1) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (2) NH_4NO_3
(3) $(\text{NH}_4)_2\text{SO}_4$ (4) $\text{Ba}(\text{N}_3)_2$

82. Which one of the following depletes the ozone layer ?
(1) NO and freons (2) SO_2
(3) CO (4) CO_2
83. Which one of the following reactions of Xenon compounds is *not* feasible ?
(1) $2XeF_2 + 2H_2O \rightarrow 2Xe + 4HF + O_2$
(2) $XeF_6 + RbF \rightarrow Rb[XeF_7]$
(3) $XeO_3 + 6HF \rightarrow XeF_6 + 3H_2O$
(4) $3XeF_4 + 6H_2O \rightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$
84. Chlorine water on standing loses its colour and forms :
(1) HCl and $HClO_2$ (2) HCl only
(3) $HOCl$ and $HOCl_2$ (4) HCl and $HOCl$
85. Boron cannot form which one of the following anions ?
(1) $B(OH)_4^-$ (2) BO_2^-
(3) BF_6^{3-} (4) BH_4^-
86. Which of the following statements regarding sulphur is *incorrect* ?
(1) At 600° the gas mainly consists of S_2 molecules
(2) The oxidation state of sulphur is never less than +4 in its compounds
(3) S_2 molecule is paramagnetic
(4) The vapour at $200^\circ C$ consists mostly of S_8 rings
87. The type of isomerism present in Pentaamminenitrochromium(III) chloride is :
(1) Optical (2) Linkage
(3) Ionization (4) Polymerisation
88. Which of the following is *not* formed when H_2S reacts with acidic $K_2Cr_2O_7$ solution ?
(1) K_2SO_4 (2) $Cr_2(SO_4)_3$
(3) S (4) $CrSO_4$

89. The geometries of the ammonia complexes of Ni^{2+} , Pt^{2+} and Zn^{2+} , respectively, are :
- (1) octahedral, square planar and tetrahedral
 - (2) square planar, octahedral and tetrahedral
 - (3) tetrahedral, square planar and octahedral
 - (4) octahedral, tetrahedral and square planar
90. The spin-only magnetic moment of $[Mn(H_2O)_6]^{2+}$ is closest to :
- (1) 4.90 BM
 - (2) 5.92 BM
 - (3) 3.87 BM
 - (4) 6.93 BM
91. Which lanthanide is radioactive ?
- (1) Lanthanum
 - (2) Gadolinium
 - (3) Promethium
 - (4) Ytterbium
92. Which actinide is known for exhibiting the highest number of stable oxidation states ?
- (1) Thorium
 - (2) Uranium
 - (3) Actinium
 - (4) Lutetium
93. Which reagent is commonly used to synthesize silicones ?
- (1) $SiCl_4$
 - (2) $RSiCl_3$
 - (3) $R_2Si(OH)_2$
 - (4) R_4Si
94. $[Ti(H_2O)_6]^{3+}$ is colored because :
- (1) Charge transfer transition
 - (2) d-d transition
 - (3) f-f transition
 - (4) Ligand transition
95. In the context of the 18-electron rule, which of the following complexes is coordinatively unsaturated and highly reactive ?
- (1) $[Fe(CO)_5]$
 - (2) $[Cr(CO)_6]$
 - (3) $[CpMn(CO)_3]$
 - (4) $[V(CO)_6]$

96. Considering HSAB theory, which reaction is thermodynamically favoured ?
- (1) $\text{LiI} + \text{CsF} \rightarrow \text{LiF} + \text{CsI}$
 - (2) $\text{LiF} + \text{CsI} \rightarrow \text{LiI} + \text{CsF}$
 - (3) Both are equally favoured
 - (4) Neither reaction occurs
97. Which of the following is the strongest Bronsted acid ?
- (1) HI
 - (2) HBr
 - (3) HCl
 - (4) HF
98. In the auto-ionization of liquid SO_2 , the thionyl cation is :
- (1) SO^{2+}
 - (2) SO_3^{2-}
 - (3) S^{2+}
 - (4) O^{2-}
99. Why must oxalates be removed before cation analysis ?
- (1) They form volatile compounds.
 - (2) They cause premature precipitation of Group IV/V cations in Group III.
 - (3) They are too acidic.
 - (4) They interfere with flame tests only.
100. The nitrogenase enzyme complex contains which key metallic co-factor ?
- (1) Fe-Cu
 - (2) Fe-Mo
 - (3) Zn-Mg
 - (4) Fe-Zn

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

C

PG-EE-July, 2026
SUBJECT : Chemistry

SET-X

100007

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate)

(Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet/OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answer (1), (2), (3), (4) are given. The candidate is to choose only one answer which he/she considers the correct or best one. If the candidate darkens more than one circle or cutting/over writing/erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question booklet.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
8. The candidates must return the Question booklet as well as Original OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

PG-EE-July, 2026/(Chemistry)(SET-X)/(C)

SEAL

1. The energy required to break one mole of $Cl-Cl$ bonds in Cl_2 is 242 kJ mol^{-1} . The longest wavelength of light capable of breaking a single $Cl-Cl$ bond is :
($C = 3 \times 10^8 \text{ m/s}$ and $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)
- (1) 494 nm (2) 594 nm
(3) 640 nm (4) 700 nm
2. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is :
- (1) 13.6 eV (2) 30.6 eV
(3) 122.4 eV (4) 3.4 eV
3. The increasing order of the ionic radii of the given isoelectronic species is :
- (1) $K^+, S^{2-}, Ca^{2+}, Cl^-$
(2) $Cl^-, Ca^{2+}, K^+, S^{2-}$
(3) $S^{2-}, Cl^-, Ca^{2+}, K^+$
(4) $Ca^{2+}, K^+, Cl^-, S^{2-}$
4. Which one of the following is an amphoteric oxide ?
- (1) Na_2O (2) SO_2
(3) B_2O_3 (4) ZnO
5. The compound of Xenon with zero dipole moment is :
- (1) XeO_3 (2) XeO_2
(3) XeF_4 (4) $XeOF_4$
6. Among the following the maximum covalent character is shown by the compound :
- (1) $AlCl_3$ (2) $MgCl_2$
(3) $FeCl_2$ (4) $SnCl_2$

7. The hybridisation of orbitals of N atom in NO_3^- , NO_2^+ , NH_4^+ are respectively :
- (1) sp^2 , sp^3 , sp (2) sp , sp^3 , sp^2
(3) sp , sp^2 , sp^3 (4) sp^2 , sp , sp^3
8. Bond distance in HF is 9.17×10^{-11} m. Dipole moment of HF is 6.104×10^{-30} Cm. The percent ionic character in HF will be : (electron charge = 1.60×10^{-19} C)
- (1) 61.0% (2) 38.0%
(3) 35.5% (4) 41.6%
9. The formation of molecular complex $\text{BF}_3 - \text{NH}_3$ results in a change in the hybridisation of boron :
- (1) From sp^3 to sp^3d
(2) From sp^2 to dsp^2
(3) From sp^3 to sp^2
(4) From sp^2 to sp^3
10. A metal M on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through CuSO_4 solution gives a blue colour, Y is :
- (1) NH_3 (2) MgO
(3) Mg_3N_2 (4) $\text{Mg}(\text{NO}_3)_2$
11. Choose the *incorrect* statement :
- (1) Tosyl and Brosyl groups contain an aromatic ring.
(2) Sulfonic acids are strong acids.
(3) Sulfonates are weak bases.
(4) Mesyl and Brosyl groups contains aliphatic groups.

12. Which of the following enolate avoids self-condensation with carbonyl compounds in aldol condensation ?

- (1) sodium enolate
- (2) potassium enolate
- (3) lithium enolate
- (4) sodium enolate and potassium enolate

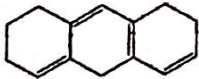
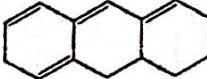
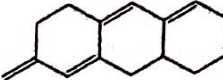
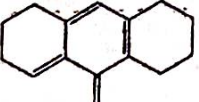
13. Glyptal is an example of :

- (1) polyamide
- (2) polyester
- (3) UF resin
- (4) PF resin

14. Which of the following amino acid is *not* chiral ?

- (1) valine
- (2) proline
- (3) cysteine
- (4) glycine

15. Which of the following will show higher $\lambda_{\max}$ in UV spectroscopy ?

- (1) 
- (2) 
- (3) 
- (4) 

16. The higher $\lambda_{\max}$ observed in the UV spectrum of acetone is due to :

- (1) $n - \sigma^*$ transition
- (2) $\pi - \pi^*$ transition
- (3) $n - \pi^*$ transition
- (4) $\sigma - \sigma^*$ transition

17. Which of the following bond in a molecule will have relatively LOWER stretching frequency in IR spectrum ?

- (1) C-C (2) C-N
(3) C-O (4) C-H

18. Which of the following will show C=O stretching band at higher frequency ?

- (1) lactam (2) amide
(3) lactone (4) ester

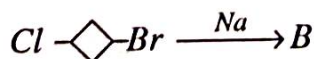
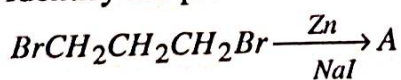
19. How many signals will be observed in the ^1H NMR spectrum of methyl proppionate and ethyl acetate, respectively ?

- (1) 3 and 2 (2) 2 and 2
(3) 3 and 3 (4) 2 and 3

20. The number of aromatic ring signals and multiplicity (consider only ortho couplings) in the ^1H NMR spectrum of m-nitroacetophenone are :

- (1) one and multiplet
(2) two and both doublets
(3) three and two doublets, one triplet
(4) four and one singlet, one triplet, two doublets

21. Identify the products A and B in the following reactions :



(1) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\diamond$

(2) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\diamond$

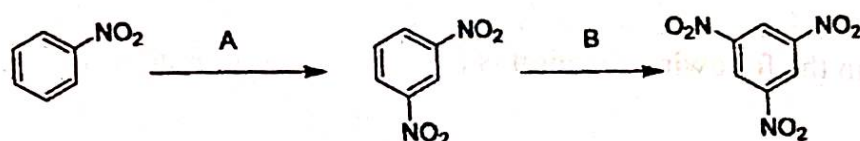
(3) $\triangle$ and $\diamond$

(4) $\triangle$ and $\diamond$

22. 2,3-Dimethyl-2-butene on ozonolysis followed by decomposition with zinc and acetic acid produces :

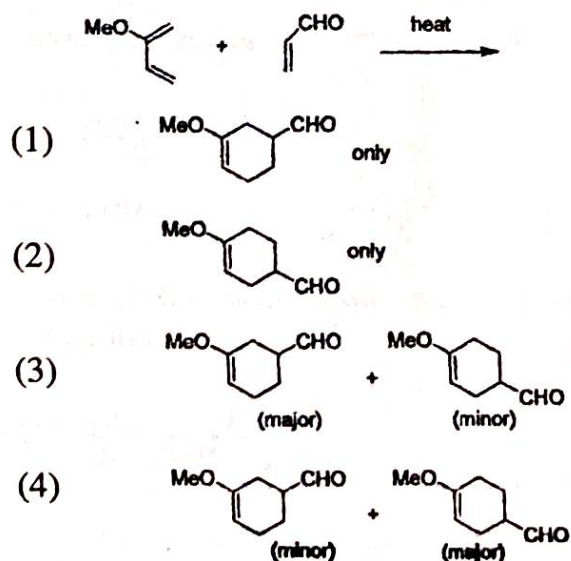
- (1) acetaldehyde and acetone (2) acetic acid
(3) acetone (4) acetone and acetic acid

23. Identify the reagents A and B for the following conversions :



- (1) HNO_3 and $HNO_3 + H_2SO_4$
(2) $HNO_3 + H_2SO_4$ and $NO_2^+BF_4^-$
(3) HNO_3 and $NO_2^+BF_4^-$
(4) $HNO_3 + H_2SO_4$ and $HNO_3 + H_2SO_4$

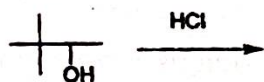
24. Identify the product(s) formed in the following Diels-Alder reaction :



25. o-Deuteriofluorobenzene on treatment with potassium amide in presence of ammonia is rapidly converted to :

- (1) fluorobenzene
- (2) aniline
- (3) o-deuterioaniline
- (4) m-deuterioaniline

26. The product obtained in the following reaction is :



- (1) $\begin{array}{c} | \\ | \\ \text{---} \text{C} \text{---} \text{Cl} \\ | \end{array}$
- (2) $\begin{array}{c} | \\ \text{Cl} \text{---} \text{C} \text{---} | \\ | \end{array}$
- (3) $\begin{array}{c} | \\ | \\ \text{---} \text{C} \text{---} \text{C} \text{---} \\ | \quad || \end{array}$
- (4) $\begin{array}{c} | \\ | \\ \text{---} \text{C} \text{---} \text{C} \text{---} \\ | \quad | \end{array}$

27. Isobutylene oxide on reaction with H_2^{18}O in presence of acid; and with methanol in presence of sodium methoxide produces :

- (1) $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ ^{18}\text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OMe} \end{array}$
- (2) $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OMe} \end{array}$
- (3) $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ ^{18}\text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OCH}_3 \\ | \\ \text{OH} \end{array}$
- (4) $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OH} \\ | \\ \text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me} \text{---} \text{C} \text{---} \text{CH}_2\text{OCH}_3 \\ | \\ \text{OH} \end{array}$

28. The major product obtained in the reaction of phenol with bromine in carbon disulfide at 0°C is :
- (1) 2-bromophenol
 - (2) 4-bromophenol
 - (3) 3-bromophenol
 - (4) bromobenzene
29. Propionic acid on reaction with two equivalents of bromine in presence of phosphorus gives :
- (1) $\text{BrCH}_2\text{CH}_2\text{COOH}$
 - (2) $\text{BrCH}_2\text{CH}(\text{Br})\text{COOH}$
 - (3) $\text{CH}_3\text{CH}(\text{Br})\text{COOH}$
 - (4) $\text{CH}_3\text{C}(\text{Br})_2\text{COOH}$
30. Which reagent(s) is (are) preferred for carrying out the following transformation ?



- (1) BH_3
 - (2) LiAlH_4
 - (3) LiBH_4
 - (4) Both LiAlH_4 and LiBH_4
31. What is the differential form of the Clausius-Clapeyron equation used for phase transition ?

$$(1) \frac{dp}{dt} = \frac{L}{T(V_g - V_e)}$$

$$(2) \frac{dp}{dt} = \frac{\Delta S}{\Delta V}$$

$$(3) \frac{dp}{dt} = \frac{\Delta H}{T\Delta V}$$

$$(4) \text{ All of the above}$$

32. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$. At constant pressure of some inert gas added into the system then :
- (1) More $NH_3(g)$ is produced
 - (2) Less $NH_3(g)$ is produced
 - (3) No effect on equilibrium
 - (4) K_p of the reaction decreased
33. Calculate the minimum volume of benzene required to extract in one step 90%. If H_2S present in one litre of 0.1 M aqueous solution : [Given : $C_1/C_2 = 0.17$]
- (1) 1.53 litre
 - (2) 1.46 litre
 - (3) 1.35 litre
 - (4) 1.58 litre
34. When Benzoic acid mixed with mixture of benzene and water, undergo dimerization in benzene. Which form of distribution law is used here ?
- (1) $\sqrt{C_b}/C_w = K_D$
 - (2) $C_b/C_w^2 = K_D$
 - (3) $C_b/\sqrt{C_w} = K_D$
 - (4) $C_b^2/C_w = K_D$
35. 1 D (debye) is :
- (1) 3.466×10^{-31} Cm
 - (2) 3.336×10^{-30} Cm
 - (3) 3.664×10^{-30} Cm
 - (4) 3.446×10^{-29} Cm
36. The Gouy balance results showed that a sample of a complex ion in a tube of $1.75 \times 10^{-5} m^2$ cross-section that was partly in a magnetic flux density of 0.4 T was pushed into the field by a force equal to 2.50×10^{-4} N. Calculate the magnetic susceptibility (χ) :
- (1) 88.76×10^{-6}
 - (2) 89.76×10^{-6}
 - (3) 89.67×10^{-7}
 - (4) 88.76×10^{-7}

37. 10 g of a substance dissolved in 100 g water raised its boiling point by 1° . K_b for water is 0.52. Calculate the molecular weight of the solute.
- (1) 51.05 g (2) 52.00 g
(3) 52.05 g (4) 54.05 g
38. If two solutions are separated by a semipermeable membrane and solvent flows in both directions, then the solutions are :
- (1) Isotonic (2) Hypo-solution
(3) Iso-osmotic (4) Isopiestic
39. It is advantage in using molality instead of molarity as concentration because :
- (1) Pressure independent
(2) Temperature independent
(3) Volume independent
(4) Weight independent
40. The freezing point of water is lowered by increase of pressure, while that of sulphur is raised this is because :
- (1) The molar heat of fusion of ice is higher than that of sulphur.
(2) The molar volume of liquid water is lower than that of solid water but molar volume of liquid sulphur is higher than that of solid sulphur.
(3) The freezing point of water is lower than the boiling point of sulphur.
(4) None of the above
41. Which complex is an outer-orbital complex ?
- (1) $[Co(CN)_6]^{3-}$ (2) $[Fe(CN)_6]^{4-}$
(3) $[CoF_6]^{3-}$ (4) $[Ni(CN)_4]^{2-}$

42. Which complex has the highest thermodynamic stability ?
- (1) $[Ni(H_2O)_6]^{2+}$ (2) $[Ni(NH_3)_6]^{2+}$
(3) $[Ni(en)_3]^{2+}$ (4) $[NiCl_4]^{2-}$
43. Which complex is diamagnetic ?
- (1) $[Fe(H_2O)_6]^{2+}$ (2) $[CoF_6]^{3-}$
(3) $[Fe(CN)_6]^{4-}$ (4) $[Mn(H_2O)_6]^{2+}$
44. The cell potential is a :
- (1) Colligative property
(2) Thermodynamic property
(3) Extensive property
(4) Intensive property
45. For a Vander Waals gas, the Boyle temperature is :
- (1) $T_B = Rb/a$ (2) $T_B = Ra/b$
(3) $T_B = a/Rb$ (4) $T_B = R.a.b$
46. The compressibility factor of a Vander Waals gas at the critical point is :
- (1) Zero (2) 0.40
(3) 0.375 (4) 0.55
47. Which of the following crystals has the highest lattice energy ?
- (1) KF (2) CsF
(3) NaF (4) RbF
48. Operators $\hat{A}$ and $\hat{B}$ are said to be commutative, if :
- (1) $[\hat{A}][\hat{B}] = 0$ (2) $[\hat{A}][\hat{B}] \neq 0$
(3) $\hat{A}\hat{B} - \hat{B}\hat{A} = 0$ (4) $\hat{A}\hat{B} + \hat{B}\hat{A} = 0$

49. The Joule-Thomson expansion of an Ideal gas :
- (1) Isenthalpic process
 - (2) An isothermal process
 - (3) An isobaric process
 - (4) An isentropic process
50. Eigen value :
- (1) is always a positive quantity
 - (2) is always a negative quantity
 - (3) is sometimes positive and sometime negative
 - (4) can be zero
51. The compound that does not produce nitrogen gas by the thermal decomposition is :
- (1) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
 - (2) NH_4NO_3
 - (3) $(\text{NH}_4)_2\text{SO}_4$
 - (4) $\text{Ba}(\text{N}_3)_2$
52. Which one of the following depletes the ozone layer ?
- (1) NO and freons
 - (2) SO_2
 - (3) CO
 - (4) CO_2
53. Which one of the following reactions of Xenon compounds is *not* feasible ?
- (1) $2\text{XeF}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Xe} + 4\text{HF} + \text{O}_2$
 - (2) $\text{XeF}_6 + \text{RbF} \rightarrow \text{Rb}[\text{XeF}_7]$
 - (3) $\text{XeO}_3 + 6\text{HF} \rightarrow \text{XeF}_6 + 3\text{H}_2\text{O}$
 - (4) $3\text{XeF}_4 + 6\text{H}_2\text{O} \rightarrow 2\text{Xe} + \text{XeO}_3 + 12\text{HF} + 1.5\text{O}_2$
54. Chlorine water on standing loses its colour and forms :
- (1) HCl and HClO_2
 - (2) HCl only
 - (3) HOCl and HOCl_2
 - (4) HCl and HOCl

55. Boron cannot form which one of the following anions ?
(1) $B(OH)_4^-$ (2) BO_2^-
(3) BF_6^{3-} (4) BH_4^-
56. Which of the following statements regarding sulphur is *incorrect* ?
(1) At 600° the gas mainly consists of S_2 molecules
(2) The oxidation state of sulphur is never less than +4 in its compounds
(3) S_2 molecule is paramagnetic
(4) The vapour at 200° C consists mostly of S_8 rings
57. The type of isomerism present in Pentaamminenitrochromium(III) chloride is :
(1) Optical (2) Linkage
(3) Ionization (4) Polymerisation
58. Which of the following is *not* formed when H_2S reacts with acidic $K_2Cr_2O_7$ solution ?
(1) K_2SO_4 (2) $Cr_2(SO_4)_3$
(3) S (4) $CrSO_4$
59. The geometries of the ammonia complexes of Ni^{2+} , Pt^{2+} and Zn^{2+} , respectively, are :
(1) octahedral, square planar and tetrahedral
(2) square planar, octahedral and tetrahedral
(3) tetrahedral, square planar and octahedral
(4) octahedral, tetrahedral and square planar
60. The spin-only magnetic moment of $[Mn(H_2O)_6]^{2+}$ is closest to :
(1) 4.90 BM (2) 5.92 BM
(3) 3.87 BM (4) 6.93 BM
61. The quantum yield of photochemical gas reaction $2HI \rightleftharpoons H_2 + I_2$ at wavelength $2400 \text{ \AA}$ is about :
(1) 0.25 (2) 10^3
(3) 2 (4) 10

62. The probability factor in the collision theory of reaction rates should be interpreted in terms of :

- (1) Viscosity factor
- (2) Enthalpy factor
- (3) Free energy factor
- (4) Entropy factor

63. Debye-Huckel Onsagar equation is :

(1) $\Lambda_m = \Lambda_m^0 - (A + B \Lambda_m^0) C^{1/2}$

(2) $\Lambda_m = \Lambda_m^0 + (A + B \Lambda_m^0) C^{3/2}$

(3) $\Lambda_m = \Lambda_m^0 + (A - B \Lambda_m^0) C^{1/2}$

(4) $\Lambda_m = \Lambda_m^0 - (A + B \Lambda_m^0) C^{3/2}$

64. In the lead-acid battery during charging, the Cathode reaction is :

(1) Formation of $PbSO_4$

(2) Formation of PbO_2

(3) Reduction of Pb^{2+} to Pb

(4) None of the above

65. The energy required for ionization of a certain atom is 3.44 aJ ($1 \text{ aJ} = 10^{-18} \text{ J}$). The absorption of a photon of unknown wavelength ionizes the atom and ejects an electron with velocity $1.03 \times 10^6 \text{ ms}^{-1}$. Calculate the wavelength of the incident radiation :

(1) 52.5 nm

(2) 51.8 nm

(3) 50.9 nm

(4) 50.6 nm

66. The rate constant of a reaction depends on :

(1) Initial concentration of reactant

(2) Pressure

(3) Temperature

(4) Extent of reaction

67. According to transition state theory, the specific rate constant k_2 of a bimolecular reaction is given by :

(1) $e^2 \frac{kT}{h} e^{\Delta s^\ddagger / R} e^{-E_a / kT}$

(2) $e^2 \left(\frac{RT}{P_0} \right) \frac{kT}{h} e^{\Delta s_0^\ddagger / R} e^{-E_a / kT}$

(3) $e^2 \left(\frac{RT}{P_0} \right) \frac{RT}{N_0 h} e^{\Delta s_0^\ddagger / R} e^{-\Delta H / kT}$

(4) None of the above

68. A liquid of density 1.2 flows through a viscometer in 110 seconds. The same volume of water requires 60 second to pass. Calculate n . (Given $H_2O = 0.01$)

(1) 0.012

(2) 0.021

(3) 0.022

(4) 0.023

69. A goldfish swims in a bowl of water at 20°C . Over a period of time, the fish transfer 120 J to the water as a result of its metabolism. What is the change in entropy of water ?

(1) 4.10 JK^{-1}

(2) 0.410 JK^{-1}

(3) 0.426 JK^{-1}

(4) 14.10 JK^{-1}

70. 1 kg of water at 25°C and 1 atm is subjected to 100 atm, calculate ΔG .

(1) 12.04 KJ

(2) 13.05 KJ

(3) 10.06 KJ

(4) 10.03 KJ

71. Determine the number of components :

$\text{NaCl}(s), \text{KBr}(s), \text{K}^+(aq), \text{Na}^+(aq), \text{Cl}^-(aq), \text{Br}^-(aq), \text{H}_2\text{O}(l), \text{H}_2\text{O}(g)$

(1) 3

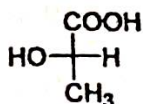
(2) 5

(3) 4

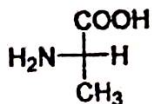
(4) 6

72. The unit of equivalent conductance is :
- (1) $\text{ohm}^{-1}\text{cm}^{-2}/\text{gm eq.}$
 - (2) $\text{ohm}^{-1}\text{cm}^2/\text{gm eq.}$
 - (3) $\text{ohm}^{-1}\text{cm}^{-2}/\text{gm eq.}$
 - (4) $\text{ohm}^{-1}\text{cm}^2/\text{gm eq.}$
73. Calculate the solubility product of Ag_2CrO_4 . Given that its solubility is 7×10^{-5} gm-mole/litre :
- (1) 1.372×10^{-12}
 - (2) 1.472×10^{-12}
 - (3) 1.472×10^{-11}
 - (4) 1.372×10^{-11}
74. The value of K_w for water at body temperature is 2.5×10^{-14} . What is the value of pH of neutral water at 37°C ?
- (1) 6.90
 - (2) 6.85
 - (3) 6.80
 - (4) 7.00
75. The collision theory is satisfactory for :
- (1) Zero order
 - (2) Unimolecular
 - (3) Bimolecular
 - (4) Fractional order
76. pH range of methylorange indicator is :
- (1) 2.9 – 4.0
 - (2) 4.2 – 6.3
 - (3) 3.1 – 4.4
 - (4) 3.8 – 5.4
77. Which of the following molecule does *not* have delocalized bonds ?
- (1) 1,3-butadiene
 - (2) vinyl chloride
 - (3) 1,3-butadiyne
 - (4) ethylene

78. The configuration of the following molecules are :



and



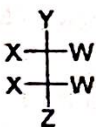
(1) R and S

(2) S and R

(3) S and S

(4) R and R

79. What are the prefixes for the following ?



and



(1) threo and erythro

(2) erythro and threo

(3) meso and erythro

(4) erythro and meso

80. Which of the following free-radical is relatively less stable ?

(1) *Ph.*

(2) $\text{CF}_3.$

(3) $\text{CH}_2 = \text{CH.}$

(4) *Me.*

81. Which lanthanide is radioactive ?

(1) Lanthanum

(2) Gadolinium

(3) Promethium

(4) Ytterbium

82. Which actinide is known for exhibiting the highest number of stable oxidation states ?

(1) Thorium

(2) Uranium

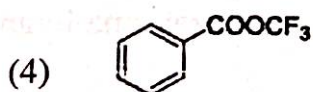
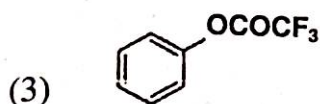
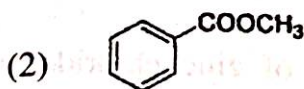
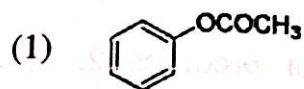
(3) Actinium

(4) Lutetium

83. Which reagent is commonly used to synthesize silicones ?
(1) $SiCl_4$ (2) $RSiCl_3$
(3) $R_2Si(OH)_2$ (4) R_4Si
84. $[Ti(H_2O)_6]^{3+}$ is colored because :
(1) Charge transfer transition (2) d-d transition
(3) f-f transition (4) Ligand transition
85. In the context of the 18-electron rule, which of the following complexes is coordinatively unsaturated and highly reactive ?
(1) $[Fe(CO)_5]$ (2) $[Cr(CO)_6]$
(3) $[CpMn(CO)_3]$ (4) $[V(CO)_6]$
86. Considering HSAB theory, which reaction is thermodynamically favoured ?
(1) $LiI + CsF \rightarrow LiF + CsI$
(2) $LiF + CsI \rightarrow LiI + CsF$
(3) Both are equally favoured
(4) Neither reaction occurs
87. Which of the following is the strongest Bronsted acid ?
(1) HI (2) HBr
(3) HCl (4) HF
88. In the auto-ionization of liquid SO_2 , the thionyl cation is :
(1) SO^{2+} (2) SO_3^{2-}
(3) S^{2+} (4) O^{2-}
89. Why must oxalates be removed before cation analysis ?
(1) They form volatile compounds.
(2) They cause premature precipitation of Group IV/V cations in Group III.
(3) They are too acidic.
(4) They interfere with flame tests only.

90. The nitrogenase enzyme complex contains which key metallic co-factor ?
(1) Fe-Cu (2) Fe-Mo
(3) Zn-Mg (4) Fe-Zn
91. Cyclohexanone on reaction with ammonia in presence of hydrogen and nickel affords :
(1) cyclohexanol
(2) 1-aminocyclohexan-1-ol
(3) cyclohexylamine
(4) cyclohexene
92. Benzene diazonium chloride on treatment with H_3PO_2 and $KI + H_2O$, respectively produces :
(1) benzene and phenol (2) benzene and iodobenzene
(3) phenol and phenol (4) phenol and iodobenzene
93. Nitration of trifluoromethyl benzene using $HNO_3 + H_2SO_4$ followed by reduction with $Sn + conc. HCl$ mainly affords :
(1) 2-trifluoromethyl aniline
(2) 3-trifluoromethyl aniline
(3) 4-trifluoromethyl aniline
(4) aniline
94. Which is (are) relatively better reagent(s) for conversion of acid sensitive secondary alcohol to ketone ?
(1) PCC
(2) Chromic acid
(3) PDC
(4) Both chromic acid and PDC

95. Acetophenone on treatment with per trifluoroacetic acid mainly gives :



96. Which of the following is utilized to make α , β -unsaturated carboxylic acid efficiently ?

- (1) Perkin reaction
- (2) Knoevenagel condensation
- (3) Mannich reaction
- (4) Cannizaro reaction

97. Which of the following carbohydrate pair forms same osazone ?

- (1) (+)-glucose and (+)-galactose
- (2) (+)-glucose and (+)-mannose
- (3) (+)-galactose and (+)-mannose
- (4) (+)-glucose and (+)-gulose

98. Choose the **correct** statement :

- (1) (+)-Sucrose is made up of D-(+)-glucose and D-(+)-Fructose.
- (2) Starch contains 80% amylose and 20% amylopectin.
- (3) (+)-Maltose reduces Tollen' and Fehling's reagent.
- (4) (+)-Lactose do not undergo mutarotation.

99. Choose the *incorrect* statement :

- (1) Pyrrole on reaction with bromine at 0°C in ethanol produces 2, 3, 4, 5-tetrabromopyrrole.
- (2) Furan on reaction with acetic anhydride in presence of zinc chloride at 0°C produces 2-acetylfuran.
- (3) Pyridine does not undergo electrophilic substitution.
- (4) Furan on reaction with bromine in ethanol produces 2, 3, 4, 5-tetrabromofuran.

100. Isoquinoline on nitration with $\text{HNO}_3 + \text{H}_2\text{SO}_4$ gives mainly :

- (1) 4-nitroisoquinoline
- (2) 5-nitroisoquinoline
- (3) 1-nitroisoquinoline
- (4) 8-nitroisoquinoline

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

D

PG-EE-July, 2026

SET-X

SUBJECT : Chemistry

100012

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate)

(Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

1. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Discrepancy, if any, should be immediately reported to the invigilator and should ask for replacement of Question booklet/OMR Answer Sheet. **Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after start of the examination.**
2. All questions are compulsory. There will be no negative marking. Each correct answer will be awarded one full mark.
3. For each question, four suggested answer (1), (2), (3), (4) are given. The candidate is to choose only one answer which he/she considers the correct or best one. If the candidate darkens more than one circle or cutting/over writing/erasing, then such answer(s) shall not be evaluated.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the space provided in the end of question booklet. Answers **MUST NOT** be ticked in the Question booklet.
5. Use only Black or Blue **BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
7. Question Booklet(s) along with answer key(s) of all the A, B, C & D codes will be got uploaded on the university website after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
8. The candidates must return the Question booklet as well as Original OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

PG-EE-July, 2026/(Chemistry)(SET-X)/(D)

1. The quantum yield of photochemical gas reaction $2HI \rightleftharpoons H_2 + I_2$ at wavelength 2400 Å is about :

(1) 0.25

(2) 10^3

(3) 2

(4) 10

2. The probability factor in the collision theory of reaction rates should be interpreted in terms of :

(1) Viscosity factor

(2) Enthalpy factor

(3) Free energy factor

(4) Entropy factor

3. Debye-Huckel Onsagar equation is :

(1) $\wedge_m = \wedge_m^0 - (A + B \wedge_m^0) C^{1/2}$

(2) $\wedge_m = \wedge_m^0 + (A + B \wedge_m^0) C^{3/2}$

(3) $\wedge_m = \wedge_m^0 + (A - B \wedge_m^0) C^{1/2}$

(4) $\wedge_m = \wedge_m^0 - (A + B \wedge_m^0) C^{3/2}$

4. In the lead-acid battery during charging, the Cathode reaction is :

(1) Formation of $PbSO_4$

(2) Formation of PbO_2

(3) Reduction of Pb^{2+} to Pb

(4) None of the above

5. The energy required for ionization of a certain atom is 3.44 aJ ($1 \text{ aJ} = 10^{-18} \text{ J}$). The absorption of a photon of unknown wavelength ionizes the atom and ejects an electron with velocity $1.03 \times 10^6 \text{ ms}^{-1}$. Calculate the wavelength of the incident radiation :

(1) 52.5 nm

(2) 51.8 nm

(3) 50.9 nm

(4) 50.6 nm

6. The rate constant of a reaction depends on :

- (1) Initial concentration of reactant (2) Pressure
(3) Temperature (4) Extent of reaction

7. According to transition state theory, the specific rate constant k_2 of a bimolecular reaction is given by :

- (1) $e^2 \frac{kT}{h} e^{\Delta s^\ddagger / R} e^{-E_a / kT}$
(2) $e^2 \left(\frac{RT}{P_0} \right) \frac{kT}{h} e^{\Delta s_0^\ddagger / R} e^{-E_a / kT}$
(3) $e^2 \left(\frac{RT}{P_0} \right) \frac{RT}{Noh} e^{\Delta s_0^\ddagger / R} e^{-\Delta H / kT}$
(4) None of the above

8. A liquid of density 1.2 flows through a viscometer in 110 seconds. The same volume of water requires 60 second to pass. Calculate n .
(Given $H_2O = 0.01$)

- (1) 0.012 (2) 0.021
(3) 0.022 (4) 0.023

9. A goldfish swims in a bowl of water at 20°C. Over a period of time, the fish transfer 120 J to the water as a result of its metabolism. What is the change in entropy of water ?

- (1) $4.10 JK^{-1}$ (2) $0.410 JK^{-1}$
(3) $0.426 JK^{-1}$ (4) $14.10 JK^{-1}$

10. 1 kg of water at 25°C and 1 atm is subjected to 100 atm, calculate ΔG .

- (1) 12.04 KJ (2) 13.05 KJ
(3) 10.06 KJ (4) 10.03 KJ

11. The compound that does not produce nitrogen gas by the thermal decomposition is :
- (1) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (2) NH_4NO_3
(3) $(\text{NH}_4)_2\text{SO}_4$ (4) $\text{Ba}(\text{N}_3)_2$
12. Which one of the following depletes the ozone layer ?
- (1) NO and freons (2) SO_2
(3) CO (4) CO_2
13. Which one of the following reactions of Xenon compounds is **not** feasible ?
- (1) $2\text{XeF}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Xe} + 4\text{HF} + \text{O}_2$
(2) $\text{XeF}_6 + \text{RbF} \rightarrow \text{Rb}[\text{XeF}_7]$
(3) $\text{XeO}_3 + 6\text{HF} \rightarrow \text{XeF}_6 + 3\text{H}_2\text{O}$
(4) $3\text{XeF}_4 + 6\text{H}_2\text{O} \rightarrow 2\text{Xe} + \text{XeO}_3 + 12\text{HF} + 1.5\text{O}_2$
14. Chlorine water on standing loses its colour and forms :
- (1) HCl and HClO_2 (2) HCl only
(3) HOCl and HOCl_2 (4) HCl and HOCl
15. Boron cannot form which one of the following anions ?
- (1) $\text{B}(\text{OH})_4^-$ (2) BO_2^-
(3) BF_6^{3-} (4) BH_4^-
16. Which of the following statements regarding sulphur is **incorrect** ?
- (1) At 600° the gas mainly consists of S_2 molecules
(2) The oxidation state of sulphur is never less than +4 in its compounds
(3) S_2 molecule is paramagnetic
(4) The vapour at 200°C consists mostly of S_8 rings
17. The type of isomerism present in Pentaamminenitrochromium(III) chloride is :
- (1) Optical (2) Linkage
(3) Ionization (4) Polymerisation

18. Which of the following is **not** formed when H_2S reacts with acidic $K_2Cr_2O_7$ solution ?
(1) K_2SO_4 (2) $Cr_2(SO_4)_3$
(3) S (4) $CrSO_4$
19. The geometries of the ammonia complexes of Ni^{2+} , Pt^{2+} and Zn^{2+} , respectively, are :
(1) octahedral, square planar and tetrahedral
(2) square planar, octahedral and tetrahedral
(3) tetrahedral, square planar and octahedral
(4) octahedral, tetrahedral and square planar
20. The spin-only magnetic moment of $[Mn(H_2O)_6]^{2+}$ is closest to :
(1) 4.90 BM (2) 5.92 BM
(3) 3.87 BM (4) 6.93 BM
21. Which lanthanide is radioactive ?
(1) Lanthanum (2) Gadolinium
(3) Promethium (4) Ytterbium
22. Which actinide is known for exhibiting the highest number of stable oxidation states ?
(1) Thorium (2) Uranium
(3) Actinium (4) Lutetium
23. Which reagent is commonly used to synthesize silicones ?
(1) $SiCl_4$ (2) $RSiCl_3$
(3) $R_2Si(OH)_2$ (4) R_4Si
24. $[Ti(H_2O)_6]^{3+}$ is colored because :
(1) Charge transfer transition (2) d-d transition
(3) f-f transition (4) Ligand transition
25. In the context of the 18-electron rule, which of the following complexes is coordinatively unsaturated and highly reactive ?
(1) $[Fe(CO)_5]$ (2) $[Cr(CO)_6]$
(3) $[CpMn(CO)_3]$ (4) $[V(CO)_6]$

26. Considering HSAB theory, which reaction is thermodynamically favoured ?
(1) $\text{LiI} + \text{CsF} \rightarrow \text{LiF} + \text{CsI}$
(2) $\text{LiF} + \text{CsI} \rightarrow \text{LiI} + \text{CsF}$
(3) Both are equally favoured
(4) Neither reaction occurs
27. Which of the following is the strongest Bronsted acid ?
(1) HI
(2) HBr
(3) HCl
(4) HF
28. In the auto-ionization of liquid SO_2 , the thionyl cation is :
(1) SO^{2+}
(2) SO_3^{2-}
(3) S^{2+}
(4) O^{2-}
29. Why must oxalates be removed before cation analysis ?
(1) They form volatile compounds.
(2) They cause premature precipitation of Group IV/V cations in Group III.
(3) They are too acidic.
(4) They interfere with flame tests only.
30. The nitrogenase enzyme complex contains which key metallic co-factor ?
(1) Fe-Cu
(2) Fe-Mo
(3) Zn-Mg
(4) Fe-Zn
31. Choose the **incorrect** statement :
(1) Tosyl and Brosyl groups contain an aromatic ring.
(2) Sulfonic acids are strong acids.
(3) Sulfonates are weak bases.
(4) Mesyl and Brosyl groups contains aliphatic groups.

32. Which of the following enolate avoids self-condensation with carbonyl compounds in aldol condensation ?

- (1) sodium enolate
- (2) potassium enolate
- (3) lithium enolate
- (4) sodium enolate and potassium enolate

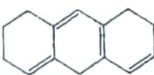
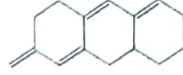
33. Glyptal is an example of :

- (1) polyamide
- (2) polyester
- (3) UF resin
- (4) PF resin

34. Which of the following amino acid is *not* chiral ?

- (1) valine
- (2) proline
- (3) cysteine
- (4) glycine

35. Which of the following will show higher $\lambda_{\max}$ in UV spectroscopy ?

- (1) 
- (2) 
- (3) 
- (4) 

36. The higher $\lambda_{\max}$ observed in the UV spectrum of acetone is due to :

- (1) $n - \sigma^*$ transition
- (2) $\pi - \pi^*$ transition
- (3) $n - \pi^*$ transition
- (4) $\sigma - \sigma^*$ transition

37. Which of the following bond in a molecule will have relatively LOWER stretching frequency in IR spectrum ?
- (1) C-C (2) C-N
(3) C-O (4) C-H
38. Which of the following will show C=O stretching band at higher frequency ?
- (1) lactam (2) amide
(3) lactone (4) ester
39. How many signals will be observed in the ^1H NMR spectrum of methyl proppionate and ethyl acetate, respectively ?
- (1) 3 and 2 (2) 2 and 2
(3) 3 and 3 (4) 2 and 3
40. The number of aromatic ring signals and multiplicity (consider only ortho couplings) in the ^1H NMR spectrum of m-nitroacetophenone are :
- (1) one and multiplet
(2) two and both doublets
(3) three and two doublets, one triplet
(4) four and one singlet, one triplet, two doublets
41. Determine the number of components :
- $\text{NaCl}(s), \text{KBr}(s), \text{K}^+(aq), \text{Na}^+(aq), \text{Cl}^-(aq), \text{Br}^-(aq), \text{H}_2\text{O}(l), \text{H}_2\text{O}(g)$
- (1) 3 (2) 5
(3) 4 (4) 6

42. The unit of equivalent conductance is :

(1) $\text{ohm}^{-1}\text{cm}^{-2}/\text{gm eq.}$

(2) $\text{ohm}^{-1}\text{cm}^2/\text{gm eq.}$

(3) $\text{ohm}^{-1}\text{cm}^{-2}/\text{gm eq.}$

(4) $\text{ohm}^{-1}\text{cm}^2/\text{gm eq.}$

43. Calculate the solubility product of Ag_2CrO_4 . Given that its solubility is 7×10^{-5} gm-mole/litre :

(1) 1.372×10^{-12}

(2) 1.472×10^{-12}

(3) 1.472×10^{-11}

(4) 1.372×10^{-11}

44. The value of K_w for water at body temperature is 2.5×10^{-14} . What is the value of pH of neutral water at 37°C ?

(1) 6.90

(2) 6.85

(3) 6.80

(4) 7.00

45. The collision theory is satisfactory for :

(1) Zero order

(2) Unimolecular

(3) Bimolecular

(4) Fractional order

46. pH range of methylorange indicator is :

(1) 2.9 – 4.0

(2) 4.2–6.3

(3) 3.1 – 4.4

(4) 3.8 – 5.4

47. Which of the following molecule does **not** have delocalized bonds ?

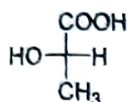
(1) 1,3-butadiene

(2) vinyl chloride

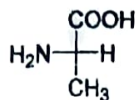
(3) 1,3-butadiyne

(4) ethylene

48. The configuration of the following molecules are :



and



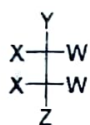
(1) R and S

(2) S and R

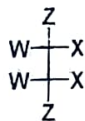
(3) S and S

(4) R and R

49. What are the prefixes for the following ?



and



(1) threo and erythro

(2) erythro and threo

(3) meso and erythro

(4) erythro and meso

50. Which of the following free-radical is relatively less stable ?

(1) *Ph.*

(2) $\text{CF}_3\cdot$

(3) $\text{CH}_2 = \text{CH}\cdot$

(4) *Me.*

51. Which complex is an outer-orbital complex ?

(1) $[\text{Co}(\text{CN})_6]^{3-}$

(2) $[\text{Fe}(\text{CN})_6]^{4-}$

(3) $[\text{CoF}_6]^{3-}$

(4) $[\text{Ni}(\text{CN})_4]^{2-}$

52. Which complex has the highest thermodynamic stability ?

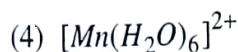
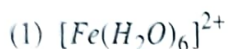
(1) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$

(2) $[\text{Ni}(\text{NH}_3)_6]^{2+}$

(3) $[\text{Ni}(\text{en})_3]^{2+}$

(4) $[\text{NiCl}_4]^{2-}$

53. Which complex is diamagnetic ?



54. The cell potential is a :

(1) Colligative property

(2) Thermodynamic property

(3) Extensive property

(4) Intensive property

55. For a Vander Waals gas, the Boyle temperature is :

(1) $T_B = Rb/a$

(2) $T_B = Ra/b$

(3) $T_B = a/Rb$

(4) $T_B = R.a.b$

56. The compressibility factor of a Vander Waals gas at the critical point is :

(1) Zero

(2) 0.40

(3) 0.375

(4) 0.55

57. Which of the following crystals has the highest lattice energy ?

(1) KF

(2) CsF

(3) NaF

(4) RbF

58. Operators $\hat{A}$ and $\hat{B}$ are said to be commutative, if :

(1) $[\hat{A}][\hat{B}] = 0$

(2) $[\hat{A}][\hat{B}] \neq 0$

(3) $\hat{A}\hat{B} - \hat{B}\hat{A} = 0$

(4) $\hat{A}\hat{B} + \hat{B}\hat{A} = 0$

59. The Joule-Thomson expansion of an Ideal gas :

(1) Isenthalpic process

(2) An isothermal process

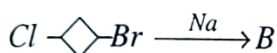
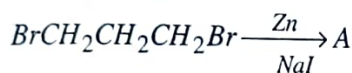
(3) An isobaric process

(4) An isentropic process

60. Eigen value :

- (1) is always a positive quantity
- (2) is always a negative quantity
- (3) is sometimes positive and sometime negative
- (4) can be zero

61. Identify the products *A* and *B* in the following reactions :

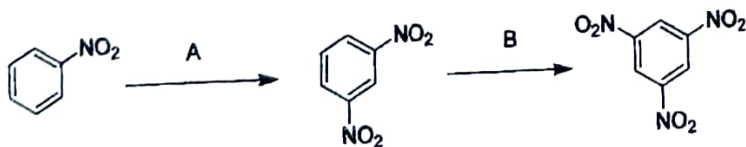


- (1) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\diamond$
- (2) $\text{CH}_3\text{CH}_2\text{CH}_3$ and $\diamond$
- (3) $\triangle$ and $\diamond$
- (4) $\triangle$ and $\diamond$

62. 2,3-Dimethyl-2-butene on ozonolysis followed by decomposition with zinc and acetic acid produces :

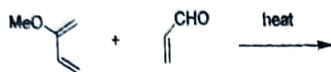
- (1) acetaldehyde and acetone
- (2) acetic acid
- (3) acetone
- (4) acetone and acetic acid

63. Identify the reagents *A* and *B* for the following conversions :



- (1) HNO_3 and $\text{HNO}_3 + \text{H}_2\text{SO}_4$
- (2) $\text{HNO}_3 + \text{H}_2\text{SO}_4$ and $\text{NO}_2^+ \text{BF}_4^-$
- (3) HNO_3 and $\text{NO}_2^+ \text{BF}_4^-$
- (4) $\text{HNO}_3 + \text{H}_2\text{SO}_4$ and $\text{HNO}_3 + \text{H}_2\text{SO}_4$

64. Identify the product(s) formed in the following Diels-Alder reaction :

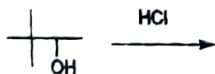


- (1) only
- (2) only
- (3) + (major) (minor)
- (4) + (minor) (major)

65. o-Deuteriofluorobenzene on treatment with potassium amide in presence of ammonia is rapidly converted to :

- (1) fluorobenzene
- (2) aniline
- (3) o-deuterioaniline
- (4) m-deuterioaniline

66. The product obtained in the following reaction is :



- (1)
- (2)
- (3)
- (4)

67. Isobutylene oxide on reaction with $H_2^{18}O$ in presence of acid; and with methanol in presence of sodium methoxide produces :

- (1) $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OH} \\ | \\ {}^{18}\text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OH} \\ | \\ \text{OMe} \end{array}$
- (2) $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OH} \\ | \\ \text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OH} \\ | \\ \text{OMe} \end{array}$
- (3) $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OH} \\ | \\ {}^{18}\text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OCH}_3 \\ | \\ \text{OH} \end{array}$
- (4) $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OH} \\ | \\ \text{OH} \end{array}$ and $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CH}_2\text{OCH}_3 \\ | \\ \text{OH} \end{array}$

68. The major product obtained in the reaction of phenol with bromine in carbon disulfide at 0°C is :

- (1) 2-bromophenol
 (2) 4-bromophenol
 (3) 3-bromophenol
 (4) bromobenzene

69. Propionic acid on reaction with two equivalents of bromine in presence of phosphorus gives :

- (1) $\text{BrCH}_2\text{CH}_2\text{COOH}$
 (2) $\text{BrCH}_2\text{CH}(\text{Br})\text{COOH}$
 (3) $\text{CH}_3\text{CH}(\text{Br})\text{COOH}$
 (4) $\text{CH}_3\text{C}(\text{Br})_2\text{COOH}$

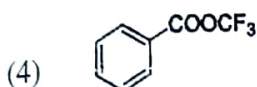
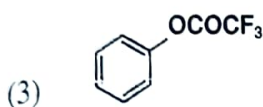
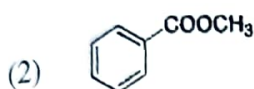
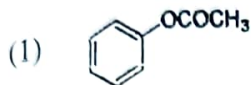
70. Which reagent(s) is (are) preferred for carrying out the following transformation ?



- (1) BH_3 (2) $LiAlH_4$
 (3) $LiBH_4$ (4) Both $LiAlH_4$ and $LiBH_4$
71. Cyclohexanone on reaction with ammonia in presence of hydrogen and nickel affords :
 (1) cyclohexanol
 (2) 1-aminocyclohexan-1-ol
 (3) cyclohexylamine
 (4) cyclohexene
72. Benzene diazonium chloride on treatment with H_3PO_2 and $KI + H_2O$, respectively produces :
 (1) benzene and phenol (2) benzene and iodobenzene
 (3) phenol and phenol (4) phenol and iodobenzene
73. Nitration of trifluoromethyl benzene using $HNO_3 + H_2SO_4$ followed by reduction with $Sn + \text{conc. } HCl$ mainly affords :
 (1) 2-trifluoromethyl aniline
 (2) 3-trifluoromethyl aniline
 (3) 4-trifluoromethyl aniline
 (4) aniline
74. Which is (are) relatively better reagent(s) for conversion of acid sensitive secondary alcohol to ketone ?
 (1) PCC (2) Chromic acid
 (3) PDC (4) Both chromic acid and PDC

D

75. Acetophenone on treatment with per trifluoroacetic acid mainly gives :



76. Which of the following is utilized to make α , β -unsaturated carboxylic acid efficiently ?

- (1) Perkin reaction
- (2) Knoevenagel condensation
- (3) Mannich reaction
- (4) Cannizaro reaction

77. Which of the following carbohydrate pair forms same osazone ?

- (1) (+)-glucose and (+)-galactose
- (2) (+)-glucose and (+)-mannose
- (3) (+)-galactose and (+)-mannose
- (4) (+)-glucose and (+)-gulose

78. Choose the **correct** statement :

- (1) (+)-Sucrose is made up of D-(+)-glucose and D-(+)-Fructose.
- (2) Starch contains 80% amylose and 20% amylopectin.
- (3) (+)-Maltose reduces Tollen' and Fehling's reagent.
- (4) (+)-Lactose do not undergo mutarotation.

79. Choose the *incorrect* statement :

- (1) Pyrrole on reaction with bromine at 0°C in ethanol produces 2, 3, 4, 5-tetrabromopyrrole.
- (2) Furan on reaction with acetic anhydride in presence of zinc chloride at 0°C produces 2-acetylfuran.
- (3) Pyridine does not undergo electrophilic substitution.
- (4) Furan on reaction with bromine in ethanol produces 2, 3, 4, 5-tetrabromofuran.

80. Isoquinoline on nitration with $\text{HNO}_3 + \text{H}_2\text{SO}_4$ gives mainly :

- (1) 4-nitroisoquinoline
- (2) 5-nitroisoquinoline
- (3) 1-nitroisoquinoline
- (4) 8-nitroisoquinoline

81. The energy required to break one mole of $\text{Cl}-\text{Cl}$ bonds in Cl_2 is 242 kJ mol^{-1} . The longest wavelength of light capable of breaking a single $\text{Cl}-\text{Cl}$ bond is :

$$(C = 3 \times 10^8 \text{ m/s and } N_A = 6.02 \times 10^{23} \text{ mol}^{-1})$$

- | | |
|------------|------------|
| (1) 494 nm | (2) 594 nm |
| (3) 640 nm | (4) 700 nm |

82. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is :

- | | |
|--------------|-------------|
| (1) 13.6 eV | (2) 30.6 eV |
| (3) 122.4 eV | (4) 3.4 eV |

D

83. The increasing order of the ionic radii of the given isoelectronic species is :
- (1) K^+ , S^{2-} , Ca^{2+} , Cl^-
 - (2) Cl^- , Ca^{2+} , K^+ , S^{2-}
 - (3) S^{2-} , Cl^- , Ca^{2+} , K^+
 - (4) Ca^{2+} , K^+ , Cl^- , S^{2-}
84. Which one of the following is an amphoteric oxide ?
- (1) Na_2O
 - (2) SO_2
 - (3) B_2O_3
 - (4) ZnO
85. The compound of Xenon with zero dipole moment is :
- (1) XeO_3
 - (2) XeO_2
 - (3) XeF_4
 - (4) $XeOF_4$
86. Among the following the maximum covalent character is shown by the compound :
- (1) $AlCl_3$
 - (2) $MgCl_2$
 - (3) $FeCl_2$
 - (4) $SnCl_2$
87. The hybridisation of orbitals of N atom in NO_3^- , NO_2^+ , NH_4^+ are respectively :
- (1) sp^2 , sp^3 , sp
 - (2) sp , sp^3 , sp^2
 - (3) sp , sp^2 , sp^3
 - (4) sp^2 , sp , sp^3
88. Bond distance in HF is 9.17×10^{-11} m. Dipole moment of HF is 6.104×10^{-30} Cm. The percent ionic character in HF will be : (electron charge = 1.60×10^{-19} C)
- (1) 61.0%
 - (2) 38.0%
 - (3) 35.5%
 - (4) 41.6%

89. The formation of molecular complex $BF_3 - NH_3$ results in a change in the hybridisation of boron :

(1) From sp^3 to sp^3d

(2) From sp^2 to dsp^2

(3) From sp^3 to sp^2

(4) From sp^2 to sp^3

90. A metal M on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour, Y is :

(1) NH_3

(2) MgO

(3) Mg_3N_2

(4) $Mg(NO_3)_2$

91. What is the differential form of the Clausius-Clapeyron equation used for phase transition ?

(1) $\frac{dp}{dt} = \frac{L}{T(V_g - V_c)}$

(2) $\frac{dp}{dt} = \frac{\Delta S}{\Delta V}$

(3) $\frac{dp}{dt} = \frac{\Delta H}{T\Delta V}$

(4) All of the above

92. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$. At constant pressure of some inert gas added into the system then :

(1) More $NH_3(g)$ is produced

(2) Less $NH_3(g)$ is produced

(3) No effect on equilibrium

(4) K_p of the reaction decreased

D

93. Calculate the minimum volume of benzene required to extract in one step 90%. If H_2S present in one litre of 0.1 M aqueous solution : [Given : $C_1/C_2 = 0.17$]

- (1) 1.53 litre (2) 1.46 litre
(3) 1.35 litre (4) 1.58 litre

94. When Benzoic acid mixed with mixture of benzene and water, undergo dimerization in benzene. Which form of distribution law is used here ?

- (1) $\sqrt{C_b}/C_w = K_D$
(2) $C_b/C_w^2 = K_D$
(3) $C_b/\sqrt{C_w} = K_D$
(4) $C_b^2/C_w = K_D$

95. 1 D (debye) is :

- (1) 3.466×10^{-31} Cm (2) 3.336×10^{-30} Cm
(3) 3.664×10^{-30} Cm (4) 3.446×10^{-29} Cm

96. The Gouy balance results showed that a sample of a complex ion in a tube of $1.75 \times 10^{-5} \text{ m}^2$ cross-section that was partly in a magnetic flux density of 0.4 T was pushed into the field by a force equal to 2.50×10^{-4} N. Calculate the magnetic susceptibility (χ) :

- (1) 88.76×10^{-6} (2) 89.76×10^{-6}
(3) 89.67×10^{-7} (4) 88.76×10^{-7}

97. 10 g of a substance dissolved in 100 g water raised its boiling point by 1° . K_b for water is 0.52. Calculate the molecular weight of the solute.

- (1) 51.05 g (2) 52.00 g
(3) 52.05 g (4) 54.05 g

98. If two solutions are separated by a semipermeable membrane and solvent flows in both directions, then the solutions are :
- | | |
|-----------------|-------------------|
| (1) Isotonic | (2) Hypo-solution |
| (3) Iso-osmotic | (4) Isopiestic |
99. It is advantage in using molality instead of molarity as concentration because :
- (1) Pressure independent
 - (2) Temperature independent
 - (3) Volume independent
 - (4) Weight independent
100. The freezing point of water is lowered by increase of pressure, while that of sulphur is raised this is because :
- (1) The molar heat of fusion of ice is higher than that of sulphur.
 - (2) The molar volume of liquid water is lower than that of solid water but molar volume of liquid sulphur is higher than that of solid sulphur.
 - (3) The freezing point of water is lower than the boiling point of sulphur.
 - (4) None of the above

Answer keys of M.Sc. (Chemistry) entrance exam dated 14.07.2026

Q. NO.	A	B	C	D
1	3	4	1	3
2	2	3	2	4
3	3	2	4	1
4	2	4	4	3
5	4	1	3	4
6	1	2	1	3
7	1	3	4	2
8	1	2	4	3
9	2	4	4	2
10	2	1	3	4
11	1	4	4	3
12	2	2	3	1
13	4	1	2	3
14	4	1	4	4
15	3	2	1	3
16	1	2	3	2
17	4	2	1	2
18	4	3	3	4
19	4	2	3	1
20	3	2	4	2
21	3	3	4	3
22	1	3	3	2
23	3	3	2	3
24	4	4	4	2
25	3	3	1	4
26	2	3	2	1
27	2	3	3	1
28	4	3	2	1
29	1	1	4	2
30	2	1	1	2
31	3	1	4	4
32	3	2	2	3
33	3	4	1	2
34	4	4	1	4
35	3	3	2	1
36	3	1	2	3
37	3	4	2	1
38	3	4	3	3
39	1	4	2	3
40	1	3	2	4
41	3	4	3	3
42	4	3	3	2
43	1	2	3	1
44	3	4	4	3
45	4	1	3	3
46	3	3	3	3
47	2	1	3	4
48	3	3	3	3
49	2	3	1	4
50	4	4	1	1

OK 14/7/26

Ravi 14/7/26

Ch 14/07/26

14/7/26
Page 1 of 2

Sadhna 14/7/26

14/07/26

Answer keys of M.Sc. (Chemistry) entrance exam dated 14.07.2026

Q. NO.	A	B	C	D
51	4	3	3	3
52	2	2	1	3
53	1	1	3	3
54	1	3	4	4
55	2	3	3	3
56	2	3	2	3
57	2	4	2	3
58	3	3	4	3
59	2	4	1	1
60	2	1	2	1
61	3	2	3	4
62	2	2	4	3
63	1	2	1	2
64	3	1	3	4
65	3	1	4	1
66	3	1	3	2
67	4	2	2	3
68	3	3	3	2
69	4	4	2	4
70	1	2	4	1
71	4	3	3	2
72	3	4	2	2
73	2	1	1	2
74	4	3	3	1
75	1	4	3	1
76	2	3	3	1
77	3	2	4	2
78	2	3	3	3
79	4	2	4	4
80	1	4	1	2
81	2	3	3	1
82	2	1	2	2
83	2	3	3	4
84	1	4	2	4
85	1	3	4	3
86	1	2	1	1
87	2	2	1	4
88	3	4	1	4
89	4	1	2	4
90	2	2	2	3
91	4	3	2	4
92	3	2	2	2
93	2	3	2	1
94	4	2	1	1
95	1	4	1	2
96	3	1	1	2
97	1	1	2	2
98	3	1	3	3
99	3	2	4	2
100	4	2	2	2

PK 14.7.2026

Rajy 14/7/26

Ch 14/07/26

14/7/26

Banbu 14/7/26

Dangre 14/07/26