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A

PG-EE-June, 2023
SUBJECT : Chemistry

SET-X

10837

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

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

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3. 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.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately 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.
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PG-EE-June, 2023/(Chemistry)(SET-X)/(A)

SEAL

- The atomic term symbol for the Helium atom in its ground state is :
(1) 3S_1 (2) 3P_2 (3) 3S_0 (4) 1S_0
- Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$ and $H_4P_2O_7$ are respectively :
(1) +3, +5 and +4 (2) +5, +3 and +4
(3) +5, +4 and +3 (4) +3, +4 and +5
- The basicity of the hydroxides of the following alkali metals is of the order :
(1) $Li > Na > Rb > Cs$ (2) $Na > Li > Rb > Cs$
(3) $Cs > Rb > Na > Li$ (4) $Rb > Cs > Na > Li$
- The geometry around the central atom in ClF_4^+ :
(1) square planar (2) square pyramidal
(3) octahedral (4) trigonal bipyramidal
- The number of anti-bonding electron in NO and CO according to MO theory are respectively :
(1) 1, 0 (2) 2, 2 (3) 3, 2 (4) 2, 3
- Semiconductors have conduction band and valence band.
(1) a lightly filled; a moderately filled
(2) an almost filled; a moderately filled
(3) an almost empty; an almost filled
(4) an almost filled; an almost empty
- Which of the following is called 'Pearl ash' ?
(1) Na_2CO_3 (2) $NaHCO_3$ (3) K_2CO_3 (4) $CaCO_3$

8. To which block of the periodic table the element with atomic number 56 belongs :
- (1) s-block (2) p-block (3) d-block (4) f-block
9. C_{60} has :
- (1) 14 pentagons and 18 hexagons
(2) 12 pentagons and 20 hexagons
(3) 10 pentagons and 20 hexagons
(4) 12 pentagons and 18 hexagons
10. The order of acidity in boron trihalides is :
- (1) $BF_3 > BCl_3 > BBr_3$
(2) $BBr_3 > BCl_3 > BF_3$
(3) $BF_3 > BBr_3 > BCl_3$
(4) $BBr_3 > BF_3 > BCl_3$
11. How many S-S bonds are there in tetrathionate ion ?
- (1) 2 (2) 3 (3) 4 (4) 5
12. P_4O_{10} has bridging O atoms.
- (1) 4 (2) 5 (3) 6 (4) 2
13. Which among the following electronic configurations represent the elements with the maximum electron affinity ?
- (1) $1s^2 2s^2 2p^6$ (2) $1s^2 2s^2 2p^5$
(3) $1s^2 2s^2 2p^6 3s^1$ (4) $1s^2 2s^2 2p^6 3s^2 3p^5$
14. The active site of enzyme nitrogenase contains :
- (1) Mo (2) Mn (3) Fe (4) Cu

15. The IUPAC nomenclature of $K_3[Co(NO_2)_6]$ is :
- (1) Potassium hexanitrocobaltate (III)
 - (2) Potassium (I) hexanitrocobaltate (III)
 - (3) Potassium hexanitrocobalt (0)
 - (4) Potassium (I) hexanitrocobaltate (II)
16. Coordination number and geometry of $[Ce(NO_3)_6]^{2-}$:
- (1) 6, octahedral
 - (2) 12, octahedral
 - (3) 8, octahedral
 - (4) 12, icosahedral
17. The spin only magnetic moment (in B.M.) value of $[FeF_6]^{3-}$ and $[Co(CN)_5(H_2O)]^{3-}$ respectively are :
- (1) 0 and 1.73
 - (2) 5.92 and 1.73
 - (3) 4.47 and 1.73
 - (4) 5.92 and 3.87
18. The number of microstates in term 1G is :
- (1) 9
 - (2) 6
 - (3) 7
 - (4) 15
19. The total number of isomers of $[Co(en)_2Cl_2]$, (en = ethylenediamine) is :
- (1) 4
 - (2) 3
 - (3) 6
 - (4) 5
20. The nephelauxetic parameter (β) is highest for :
- (1) Br^-
 - (2) Cl^-
 - (3) CN^-
 - (4) F^-
21. The complex with maximum CFSE is :
- (1) $[CoCl_4]^{2-}$
 - (2) $[Co(H_2O)_6]^{3+}$
 - (3) $[CoF_3(H_2O)_3]$
 - (4) $[CoF_6]^{3+}$

22. When is the Intramolecular hydrogen bond formed ?
- (1) When a hydrogen atom is in between the two highly electropositive atoms
 - (2) When a oxygen atom is in between the two highly electronegative atoms
 - (3) When a hydrogen atom is in between the two highly electronegative atoms
 - (4) When a oxygen atom is in between the two highly electropositive atoms
23. The number of metal-metal bonds in $Ir_4(CO)_{12}$ is :
- (1) 4
 - (2) 6
 - (3) 10
 - (4) 12
24. Identify the strongest Bronsted acid :
- (1) H_2SO_4
 - (2) CH_3COOH
 - (3) HNO_3
 - (4) H_3PO_4
25. Which of the following represents a set of hard acid and soft base respectively ?
- (1) Fe^{3+} and F^-
 - (2) Fe^{3+} and S^{2-}
 - (3) Ag^+ and S^{2-}
 - (4) Ag^+ and F^-
26. The substance present in a lesser amount in solution is :
- (1) solute
 - (2) solvent
 - (3) aqueous solvent
 - (4) None
27. Which one of the following conductometric titration will show a linear increase of the conductance with volume of titrant added upto the break point and almost constant conductance afterwards ?
- (1) A strong acid with a strong base
 - (2) A strong acid with a weak base
 - (3) A weak acid with a strong base
 - (4) A weak acid with a weak base

28. The oxidation state of iron in met-hemoglobin is :
- (1) Three (2) Two (3) Four (4) Zero
29. $BaTi[Si_3O_9]$ is a class of :
- (1) ortho silicate (2) cyclic silicate
(3) chain silicate (4) sheet silicate
30. The electronic configuration of chromium is $4s^1 3d^5$. The element tungsten (W) belongs to the same group and has atomic number = 74. The configuration of its valence shell is :
- (1) $5s^1 4d^1$ (2) $6s^1 5d^5$
(3) $6s^2 5d^4$ (4) $6s^0 5d^6$
31. Which one of the following is most easily reduced ?
- (1) $V(CO)_6$ (2) $Cr(CO)_6$
(3) $Fe(CO)_5$ (4) $Ni(CO)_4$
32. Which of the following pair of 4f elements can exhibit +4 oxidation state ?
- (1) *La* and *Lu* (2) *Ce* and *Pr*
(3) *Eu* and *Yb* (4) *Sm* and *Tm*
33. A 1s orbital refers to :
- (1) A circular track in an atom in which an electron travels
(2) A one electron wave function
(3) An observable property of the system
(4) A Hermitian operator

34. For the reaction $H^+(aq) + OH^-(aq) \rightarrow H_2O(l); \Delta H = -13.7$ kcal. The heat change when 100 ml of 0.1 M is mixed with 100 ml of 0.2 M H_2SO_4 is :
- (1) -0.137 kcal (2) -0.274 kcal
(3) -1.37 kcal (4) -0.548 kcal
35. When red light is absorbed in a malachite green solution, which of the following is correct ?
- (1) wave length of light decreases
(2) number of photons in a light beam decreases
(3) a part of red light changes to green radiation
(4) None of these
36. Equivalent conductance of $AgNO_3$ solution at infinite dilution is 130 $ohm^{-1}cm^2equiv^{-1}$. The transport number of Ag^+ ion in v-dilution is 0.4. The equivalent conductance of NO_3^- ion is :
- (1) 69 $ohm^{-1}cm^2equiv^{-1}$
(2) 52 $ohm^{-1}cm^2equiv^{-1}$
(3) 78 $ohm^{-1}cm^2equiv^{-1}$
(4) 39 $ohm^{-1}cm^2equiv^{-1}$
37. 50 ml of 0.1 $NaOH$ is added to 49 ml of 0.1 M HCl . The pH of the resulting solution is :
- (1) 9 (2) 12 (3) 10 (4) 11
38. A solid acts as an adsorbent because it has :
- (1) unsaturated valencies
(2) small pores in it
(3) high lattice energy
(4) a definite shape

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39. According to Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure :
- (1) goes on increasing with pressure
 - (2) goes on decreasing with pressure
 - (3) increases first and decreases later with pressure
 - (4) reaches a constant limiting value
40. Which of the following is an irreversible cell ?
- (1) $Zn | Zn^{2+} | AgCl | Ag$
 - (2) $Zn | H_2SO_4 | Ag$
 - (3) $Zn | Zn^{2+} || Cd^{2+} | Cd$
 - (4) $Cd | Cd^{2+} || KCl, Hg_2Cl_2 | Hg$
41. $\psi_{2l(-1)}$ represents :
- | | |
|-----------------|-----------------|
| (1) 2s orbital | (2) 2px orbital |
| (3) 2py orbital | (4) 2pz orbital |
42. An operator \hat{A} is said to be Hermitian, if :
- (1) $\int \psi_1^* \psi_2 \hat{A} d\tau = \int \psi_2 \psi_1^* \hat{A} d\tau$
 - (2) $\int \psi_2^* \psi_1 \hat{A} d\tau = \int \psi_1 \psi_2^* \hat{A} d\tau$
 - (3) $\int \psi_1^* (\hat{A} \psi_2) d\tau = \int (\hat{A} \psi_1)^* \psi_2 d\tau$
 - (4) None of these
43. The selection rules for rotational transitions are :
- | | |
|----------------------------------|---|
| (1) $\Delta J = 0, \Delta K = 0$ | (2) $\Delta J = 0, \pm 1$ |
| (3) $\Delta J = 0, \Delta K = 1$ | (4) $\Delta J = 0, \pm 1; \Delta K = 0$ |

44. Thermal conductivity of a gas is :
- (1) Independent of pressure (2) Viscosity
(3) Temperature (4) None of these
45. Number of components, number of phases and the degree of freedom in a liquid at its critical point is :
- (1) 1, 2, 1 (2) 0, 1, 2 (3) 1, 2, 0 (4) 1, 0, 2
46. The value of θ for the first order reflection from (100) face is :
- (1) 5.2° (2) 5.9° (3) 8.4° (4) 8.9°
47. Total number of vibrations in allyl bromide are :
- (1) 14 (2) 16 (3) 18 (4) 21
48. Which of the following shift leads to the decreased intensity of absorption ?
- (1) Hypochromic (2) Hypsochromic
(3) Hyperchromic (4) Bathochromic
49. Spin inversion of electrons takes place in the processes :
- (1) Absorption (2) Internal conversion
(3) Florescence (4) Phosphorescence
50. Which of the following is a limitation of Lambert-Beer's law ?
- (1) Scattering of light due to particles
(2) Florescence of sample
(3) Non-monochromatic radiation
(4) All of these

51. Parachor is related to the density of a liquid by relation :

$$(1) [P] = \frac{Mr}{d}$$

$$(2) [P] = \frac{M^{\frac{1}{4}}r}{d}$$

$$(3) [P] = \frac{Mr^{\frac{1}{4}}}{d}$$

$$(4) [P] = \frac{Md^{\frac{1}{4}}}{r}$$

52. For a particular vibrational mode to appear in the Raman spectrum, what must change ?

(1) Molecular polarizability

(2) Molecular shape

(3) Frequency of radiation

(4) Intensity of radiation

53. For an isentropic change of state :

$$(1) dE = 0$$

$$(2) dS = 0$$

$$(3) dS = 1$$

$$(4) dH = 0$$

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

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

$$(2) \hat{B} \hat{A} = 0$$

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

$$(4) \hat{A} \hat{B} \neq \hat{B} \hat{A}$$

55. In relation $S = k \ln W$, the entropies are additive while thermodynamic properties are multiplicative. What will happen to S and $\ln W$ when the energy of the system is increased ?

(1) S increases and $\ln W$ decreases

(2) S and W will increase

(3) S and W will decrease

(4) S decreases and $\ln W$ increases

56. In the lead acid base battery during charging the Cathode reaction is :

- (1) Reduction of Pb^{2+} to Pb
- (2) Formation of $PbSO_4$
- (3) Formation of PbO_2
- (4) Oxidation of Pb to Pb^{2+}

57. For one of gaseous mixture, entropy of mixing is expressed as :

- (1) $\Delta S_{mix} = -R \sum \ln x_i$
- (2) $\Delta S_{mix} = R \sum \ln x_i$
- (3) $\Delta S_{mix} = R \sum x_i \ln x_i$
- (4) $\Delta S_{mix} = -R \sum x_i \ln x_i$

58. Which one of the following is *correct* Maxwell's relation ?

- (1) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$
- (2) $\left(\frac{\partial T}{\partial P}\right)_V = \left(\frac{\partial V}{\partial S}\right)_T$
- (3) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$
- (4) $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$

59. According to first thermodynamic equation of state, for an ideal gas $\left(\frac{\partial U}{\partial V}\right)_T$ is :

- (1) Infinite (2) $\frac{P}{T}$ (3) zero (4) $\frac{T}{V}$

60. Which of the following partially miscible liquids have both upper and lower critical solution temperature ?
- (1) Water and aniline
 - (2) Water and β -picoline
 - (3) Water and diethyl amine
 - (4) Methanol and cyclohexane
61. Which of the following statement is *correct*, if :
- $$K_{sp}(\text{AgCl}) > K_{sp}(\text{AgBr}) > K_{sp}(\text{AgI})$$
- (1) *AgI* is more soluble than *AgCl* and *AgBr*
 - (2) *AgCl* is more soluble than *AgBr* and *AgI*
 - (3) *AgBr* is more soluble than *AgCl* and *AgI*
 - (4) None of these
62. Dry ice is used in fire extinguishers. It is stored in the cylinder in solid form. When sprayed on fire, dry ice quickly changes into CO_2 . The change of state is known as :
- | | |
|------------------|-----------------|
| (1) Distillation | (2) Evaporation |
| (3) Condensation | (4) Sublimation |
63. The Joule-Thomson expansion of an ideal gas is :
- (1) an isenthalpic process
 - (2) an isentropic process
 - (3) an isothermal process
 - (4) adiabatic process

64. The colloidal solutions are purified by :

- (1) Peptization (2) Dialysis
(3) Coagulation (4) Flocculation

65. The elastic scattering of photons is called as :

- (1) Atmospheric scattering
(2) Conserved scattering
(3) Rayleigh scattering
(4) Raman scattering

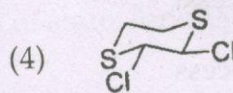
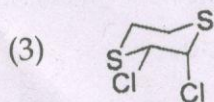
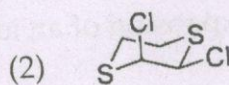
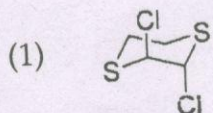
66. The solubility of a solute is three times as high in the ether as in water. What amount of the solute will be extracted from 100 ml of the aqueous solution by 100 ml of ether in one step ?

- (1) 80% (2) 75%
(3) 70% (4) 60%

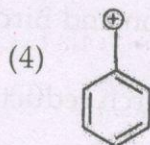
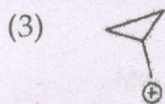
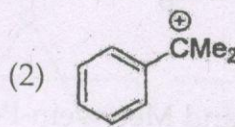
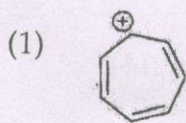
67. Choose the *correct* order of bond strength for X-F bond (X = B, C, N & O) ?

- (1) $BF_3 > CF_4 > OF_2 > NF_3$ (2) $CF_4 > BF_3 > NF_3 > OF_2$
(3) $BF_3 > CF_4 > NF_3 > OF_2$ (4) $OF_2 > NF_3 > CF_4 > BF_3$

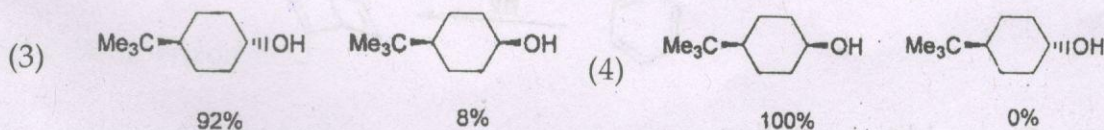
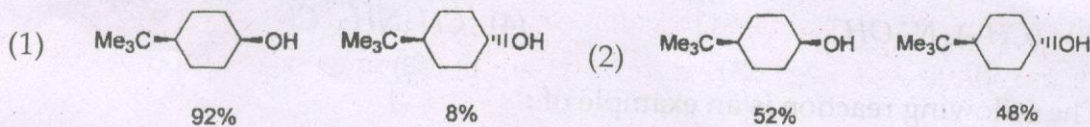
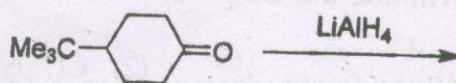
68. Which of the following conformation is *correct* ?



69. Which of the following is a non-classical carbocation ?



70. Choose the *correct* reaction product from the following transformation :



71. Which of the following is *not* a suitable reagent for nitration of aromatic compounds ?

- (1) H_2SO_4 (conc.) and HNO_3 (conc.)
- (2) HNO_3 (conc.) and acetic anhydride
- (3) Nitric acid (fuming) and H_2SO_4 (conc.)
- (4) Potassium nitrate (alcoholic)

72. Which of the following compound exist in meso form ?

- (1) Tartaric acid
- (2) Naphthyl acetic acid
- (3) Glyceraldehyde
- (4) Glucose

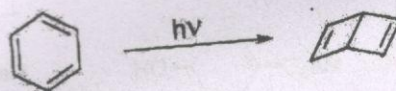
73. Which of the following reactions can be used for conversion of $PhCOPh$ into $PhCH_2Ph$?

- (1) Hydroboration and Meerwein-Ponndorf-Verley reduction
- (2) Wolf-Kishner reduction and Birch reduction
- (3) Hydroboration and Birch reduction
- (4) Clemmensen reduction and Wolf-Kishner reduction

74. Which compound will liberate CO_2 from $NaHCO_3$?

- | | |
|-----------------------|----------------------|
| (1) CH_3CONH_2 | (2) CH_3NH_2 |
| (3) $(CH_3)_4N^+OH^-$ | (4) $CH_3NH_3^+Cl^-$ |

75. The following reaction is an example of :



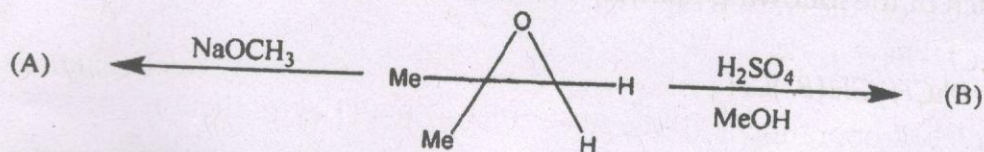
- (1) Cycloaddition reaction
- (2) Ene reaction
- (3) Sigmatropic rearrangement
- (4) Electrocyclic reaction

76. Enolate on reaction with the carbonyl carbon of an ester resulted into :

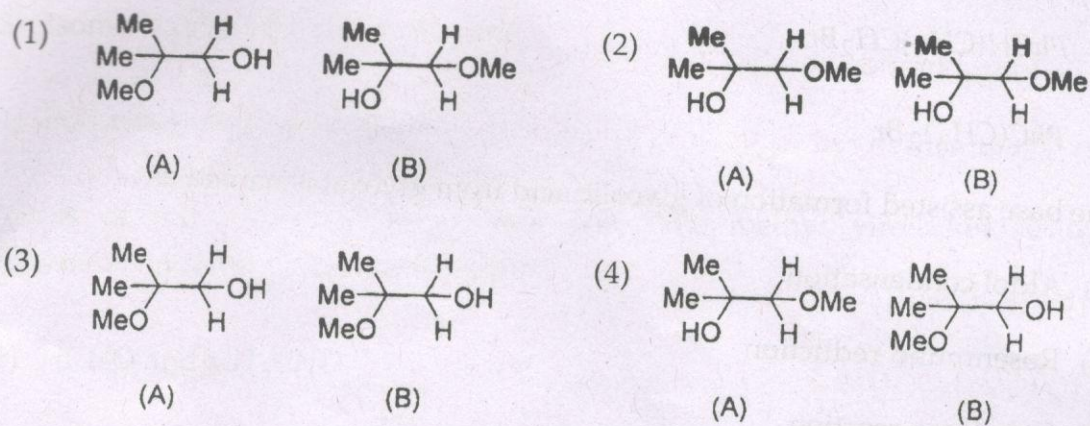
- (1) β -Ketoaldehyde
- (2) Carboxylic acid
- (3) An aldol
- (4) α, β -Unsaturated aldehyde

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77. In the following reaction :



The product A and B are, respectively :



78. Which of the following carboxylic acid is more acidic ?

- (1) *p*-nitrobenzoic acid
- (2) *p*-aminobenzoic acid
- (3) *p*-methoxybenzoic acid
- (4) *p*-fluorobenzoic acid

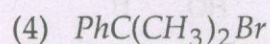
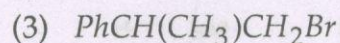
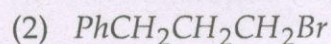
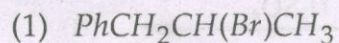
79. Nitration reaction of nitrobenzene resulted into :

- (1) *m*-dinitrobenzene
- (2) *p*-dinitrobenzene
- (3) *o*-dinitrobenzene
- (4) benzene

80. Which of the following is more basic ?

- (1) Pyrrole
- (2) Furan
- (3) Piperidine
- (4) Pyridine

81. Which of the following halides would be most reactive in an S_N2 Reaction ?



82. The base assisted formation of glycolic acid from glyoxal is named as :

(1) Aldol condensation

(2) Rosenmund reduction

(3) Cannizaro reaction

(4) Knoevenagel condensation

83. Which of the following is anionic detergent ?

(1) Sodium dodecylbenzene sulfonate

(2) Cetyltromethyl ammonium bromide

(3) Caustic soda

(4) polyethylene glycol stearate

84. The formation of toluene from p-toluidine requires :

(1) Acidification followed by hydrogenation

(2) Acidification followed by reaction with $NaBH_4$

(3) Diazotization followed by hydrogenation

(4) Diazotization followed by treatment with H_3PO_2

85. Markovnikof's addition of HCl to propene involves the :
- (1) Initial attack of a chloride ion
 - (2) Formation of isopropyl cation
 - (3) Isomerization of 1-chloropropane
 - (4) Formation of propyl cation
86. Which of the following compounds will give methyl vinyl ketone by Aldol condensation followed by dehydration ?
- (1) $HCHO$ and CH_3CHO
 - (2) $HCHO$ and CH_3COCH_3
 - (3) 2 moles of CH_3CHO
 - (4) 2 moles of CH_3COCH_3
87. Which of the following will not give positive Molisch test ?
- | | |
|------------------|-------------------------|
| (1) d -glucose | (2) d -glyceraldehyde |
| (3) d -mannose | (4) d -galactose |
88. Which of the following polymer doesn't involve cross linking ?
- | | |
|------------------|-----------------------|
| (1) Melamine | (2) Bakelite |
| (3) Polyethylene | (4) Vulcanised rubber |

89. Which of the following ring have maximum ring strain ?
- (1) Cyclopropane (2) Cyclobutane
(3) Cyclopentane (4) Cyclohexane
90. The helical structure of protein is stabilised by :
- (1) Dipeptic bond
(2) Ionic bond
(3) Hydrogen bond
(4) Peptide bond
91. Which of the following carbohydrate gives only glucose on hydrolysis :
- (1) Galactose (2) Sucrose
(3) Maltose (4) Lactose
92. The Blue shift in UV is also called as :
- (1) Hypochromic (2) Hyperchromic
(3) Bathochromic (4) Hypsochromic
93. Which of the following substituent will enhance the basicity of phenol ?
- (1) -Me (2) -NO₂
(3) -CN (4) -COOCH₃
94. Which of the following give electrophilic substitution at 3rd position ?
- (1) Pyrrole (2) Indole
(3) Furan (4) Thiophene

95. The IR stretching frequency for C=O in case of acetaldehyde appears between :

- (1) 3400-3300 cm^{-1} (2) 1300-1000 cm^{-1}
(3) 1750-1700 cm^{-1} (4) 2100-2300 cm^{-1}

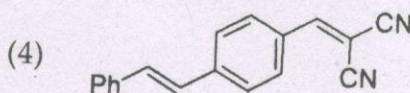
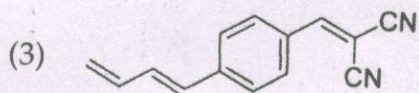
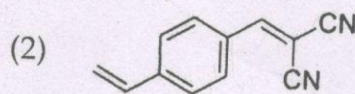
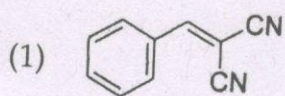
96. The IR -OH stretching frequency in which of the molecule is *not* concentration dependent :

- (1) *p*-Nitrophenol
(2) *p*- Nitroaniline
(3) *o*-Nitrophenol
(4) *m*-Nitrophenol

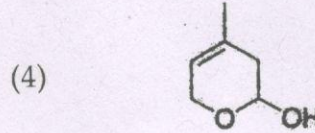
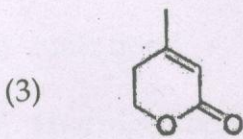
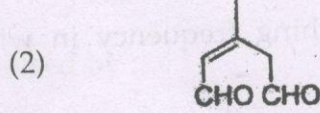
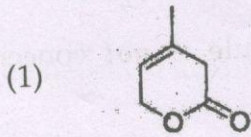
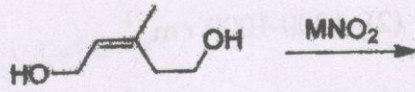
97. Which of the following compound gives 2 signal in its nmr spectrum ?

- (1) Terephthalaldehyde
(2) 4-hydroxytoluene
(3) 4-nitrobenzaldehyde
(4) 1,3-dimethylbenzene

98. Which of the following will have higher λ_{max} ?



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



100. The number of peaks observed in the ^1H NMR of CHD_2OD are :

- (1) Septet (2) Triplet (3) Pentet (4) Doublet

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

B

PG-EE-June, 2023
SUBJECT : Chemistry

SET-X

10838

Sr. No.

Time : 1½ Hours

Max. Marks : 100

Total Questions : 100

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

Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

(Signature of the Candidate)

(Signature of the Invigilator)

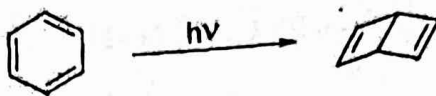
**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

- All questions are compulsory.**
- The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour 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.
- 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.
- Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately 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.
- The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
- Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
- Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.**

PG-EE-June, 2023/(Chemistry)(SET-X)/(B)

- Which of the following is *not* a suitable reagent for nitration of aromatic compounds ?
 - H_2SO_4 (conc.) and HNO_3 (conc.)
 - HNO_3 (conc.) and acetic anhydride
 - Nitric acid (fuming) and H_2SO_4 (conc.)
 - Potassium nitrate (alcoholic)
- Which of the following compound exist in meso form ?
 - Tartaric acid
 - Naphthyl acetic acid
 - Glyceraldehyde
 - Glucose
- Which of the following reactions can be used for conversion of $PhCOPh$ into $PhCH_2Ph$?
 - Hydroboration and Meerwein-Ponndorf-Verley reduction
 - Wolf-Kishner reduction and Birch reduction
 - Hydroboration and Birch reduction
 - Clemmensen reduction and Wolf-Kishner reduction
- Which compound will liberate CO_2 from $NaHCO_3$?
 - CH_3CONH_2
 - CH_3NH_2
 - $(CH_3)_4N^+OH^-$
 - $CH_3NH_3^+Cl^-$

5. The following reaction is an example of :

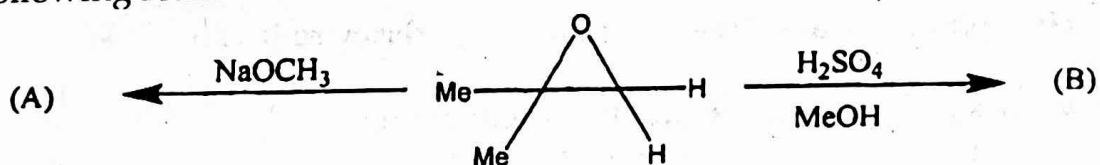


- (1) Cycloaddition reaction
- (2) Ene reaction
- (3) Sigmatropic rearrangement
- (4) Electrocyclic reaction

6. Enolate on reaction with the carbonyl carbon of an ester resulted into :

- (1) β -Ketoaldehyde
- (2) Carboxylic acid
- (3) An aldol
- (4) α, β -Unsaturated aldehyde

7. In the following reaction :



The product A and B are, respectively :

- (1)

<p>(A)</p>	<p>(B)</p>
------------	------------
- (2)

<p>(A)</p>	<p>(B)</p>
------------	------------
- (3)

<p>(A)</p>	<p>(B)</p>
------------	------------
- (4)

<p>(A)</p>	<p>(B)</p>
------------	------------

8. Which of the following carboxylic acid is more acidic ?

- (1) *p*-nitrobenzoic acid
- (2) *p*-aminobenzoic acid
- (3) *p*-methoxybenzoic acid
- (4) *p*-fluorobenzoic acid

9. Nitration reaction of nitrobenzene resulted into :

- (1) *m*-dinitrobenzene
- (2) *p*-dinitrobenzene
- (3) *o*-dinitrobenzene
- (4) benzene

10. Which of the following is more basic ?

- (1) Pyrrole
- (2) Furan
- (3) Piperidine
- (4) Pyridine

11. Parachor is related to the density of a liquid by relation :

(1) $[P] = \frac{Mr}{d}$

(2) $[P] = \frac{M^{\frac{1}{4}}r}{d}$

(3) $[P] = \frac{Mr^{\frac{1}{4}}}{d}$

(4) $[P] = \frac{Md^{\frac{1}{4}}}{r}$

12. For a particular vibrational mode to appear in the Raman spectrum, what must change ?

- (1) Molecular polarizability
- (2) Molecular shape
- (3) Frequency of radiation
- (4) Intensity of radiation

13. For an isentropic change of state :

- (1) $dE = 0$ (2) $dS = 0$ (3) $dS = 1$ (4) $dH = 0$

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

- (1) $\hat{A} \hat{B} = 0$ (2) $\hat{B} \hat{A} = 0$
 (3) $\hat{A} \hat{B} = \hat{B} \hat{A}$ (4) $\hat{A} \hat{B} \neq \hat{B} \hat{A}$

15. In relation $S = k \ln W$, the entropies are additive while thermodynamic properties are multiplicative. What will happen to S and $\ln W$ when the energy of the system is increased ?

- (1) S increases and $\ln W$ decreases
 (2) S and W will increase
 (3) S and W will decrease
 (4) S decreases and $\ln W$ increases

16. In the lead acid base battery during charging the Cathode reaction is :

- (1) Reduction of Pb^{2+} to Pb
 (2) Formation of $PbSO_4$
 (3) Formation of PbO_2
 (4) Oxidation of Pb to Pb^{2+}

17. For one of gaseous mixture, entropy of mixing is expressed as :

- (1) $\Delta S_{mix} = -R \sum \ln x_i$
 (2) $\Delta S_{mix} = R \sum \ln x_i$
 (3) $\Delta S_{mix} = R \sum x_i \ln x_i$
 (4) $\Delta S_{mix} = -R \sum x_i \ln x_i$

18. Which one of the following is *correct* Maxwell's relation ?

(1) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

(2) $\left(\frac{\partial T}{\partial P}\right)_V = \left(\frac{\partial V}{\partial S}\right)_T$

(3) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$

(4) $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$

19. According to first thermodynamic equation of state, for an ideal gas $\left(\frac{\partial U}{\partial V}\right)_T$ is :

(1) Infinite

(2) $\frac{P}{T}$

(3) zero

(4) $\frac{T}{V}$

20. Which of the following partially miscible liquids have both upper and lower critical solution temperature ?

(1) Water and aniline

(2) Water and β -picoline

(3) Water and diethyl amine

(4) Methanol and cyclohexane

21. Which one of the following is most easily reduced ?

(1) $V(CO)_6$

(2) $Cr(CO)_6$

(3) $Fe(CO)_5$

(4) $Ni(CO)_4$

22. Which of the following pair of 4f elements can exhibit +4 oxidation state ?
- (1) *La* and *Lu* (2) *Ce* and *Pr*
(3) *Eu* and *Yb* (4) *Sm* and *Tm*
23. A 1s orbital refers to :
- (1) A circular track in an atom in which an electron travels
(2) A one electron wave function
(3) An observable property of the system
(4) A Hermitian operator
24. For the reaction $H^+(aq) + OH^-(aq) \rightarrow H_2O(l); \Delta H = -13.7$ kcal. The heat change when 100 ml of 0.1 M is mixed with 100 ml of 0.2 M H_2SO_4 is :
- (1) -0.137 kcal (2) -0.274 kcal
(3) -1.37 kcal (4) -0.548 kcal
25. When red light is absorbed in a malachite green solution, which of the following is correct ?
- (1) wave length of light decreases
(2) number of photons in a light beam decreases
(3) a part of red light changes to green radiation
(4) None of these
26. Equivalent conductance of $AgNO_3$ solution at infinite dilution is $130 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$. The transport number of Ag^+ ion in v-dilution is 0.4. The equivalent conductance of NO_3^- ion is :
- (1) $69 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$ (2) $52 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
(3) $78 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$ (4) $39 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$

27. 50 ml of 0.1 NaOH is added to 49 ml of 0.1 M HCl. The pH of the resulting solution is :
(1) 9 (2) 12 (3) 10 (4) 11
28. A solid acts as an adsorbent because it has :
(1) unsaturated valencies
(2) small pores in it
(3) high lattice energy
(4) a definite shape
29. According to Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure :
(1) goes on increasing with pressure
(2) goes on decreasing with pressure
(3) increases first and decreases later with pressure
(4) reaches a constant limiting value
30. Which of the following is an irreversible cell ?
(1) $Zn | Zn^{2+} | AgCl | Ag$
(2) $Zn | H_2SO_4 | Ag$
(3) $Zn | Zn^{2+} || Cd^{2+} | Cd$
(4) $Cd | Cd^{2+} || KCl, Hg_2Cl_2 | Hg$
31. How many S-S bonds are there in tetrathionate ion ?
(1) 2 (2) 3 (3) 4 (4) 5
32. P_4O_{10} has bridging O atoms.
(1) 4 (2) 5 (3) 6 (4) 2

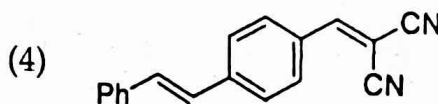
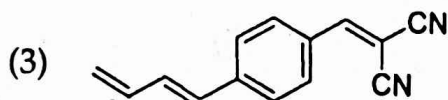
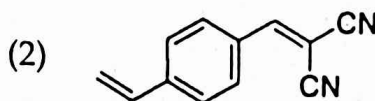
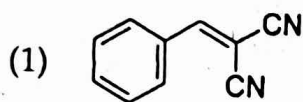
33. Which among the following electronic configurations represent the elements with the maximum electron affinity ?
- (1) $1s^2 2s^2 2p^6$ (2) $1s^2 2s^2 2p^5$
(3) $1s^2 2s^2 2p^6 3s^1$ (4) $1s^2 2s^2 2p^6 3s^2 3p^5$
34. The active site of enzyme nitrogenase contains :
- (1) *Mo* (2) *Mn* (3) *Fe* (4) *Cu*
35. The IUPAC nomenclature of $K_3[Co(NO_2)_6]$ is :
- (1) Potassium hexanitrocobaltate (III)
(2) Potassium (I) hexanitrocobaltate (III)
(3) Potassium hexanitrocobalt (0)
(4) Potassium (I) hexanitrocobaltate (II)
36. Coordination number and geometry of $[Ce(NO_3)_6]^{2-}$:
- (1) 6, octahedral (2) 12, octahedral
(3) 8, octahedral (4) 12, icosahedral
37. The spin only magnetic moment (in B.M.) value of $[FeF_6]^{3-}$ and $[Co(CN)_5(H_2O)]^{3-}$ respectively are :
- (1) 0 and 1.73 (2) 5.92 and 1.73
(3) 4.47 and 1.73 (4) 5.92 and 3.87
38. The number of microstates in term 1G is :
- (1) 9 (2) 6 (3) 7 (4) 15
39. The total number of isomers of $[Co(en)_2Cl_2]$, (*en* = ethylenediamine) is :
- (1) 4 (2) 3 (3) 6 (4) 5

40. The nephelauxetic parameter (β) is highest for :
- (1) Br^- (2) Cl^- (3) CN^- (4) I^-
41. Which of the following carbohydrate gives only glucose on hydrolysis :
- (1) Galactose (2) Sucrose
(3) Maltose (4) Lactose
42. The Blue shift in UV is also called as :
- (1) Hypochromic (2) Hyperchromic
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(3) $-CN$ (4) $-COOCH_3$
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(3) Furan (4) Thiophene
45. The IR stretching frequency for $C=O$ in case of acetaldehyde appears between :
- (1) $3400-3300\text{ cm}^{-1}$ (2) $1300-1000\text{ cm}^{-1}$
(3) $1750-1700\text{ cm}^{-1}$ (4) $2100-2300\text{ cm}^{-1}$
46. The IR $-OH$ stretching frequency in which of the molecule is *not* concentration dependent :
- (1) *p*-Nitrophenol (2) *p*-Nitroaniline
(3) *o*-Nitrophenol (4) *m*-Nitrophenol

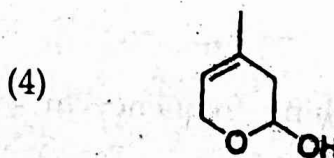
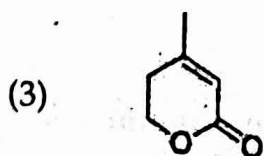
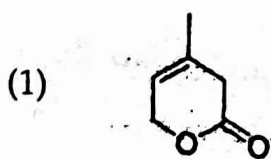
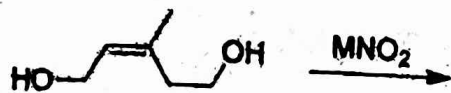
47. Which of the following compound gives 2 signal in its nmr spectrum ?

- (1) Terephthalaldehyde
- (2) 4-hydroxytoluene
- (3) 4-nitrobenzaldehyde
- (4) 1,3-dimethylbenzene

48. Which of the following will have higher λ_{\max} ?



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



50. The number of peaks observed in the ^1H NMR of CHD_2OD are:

- (1) Septet
- (2) Triplet
- (3) Pentet
- (4) Doublet

51. Which of the following statement is *correct*, if :

$$K_{sp}(\text{AgCl}) > K_{sp}(\text{AgBr}) > K_{sp}(\text{AgI})$$

- (1) *AgI* is more soluble than *AgCl* and *AgBr*
- (2) *AgCl* is more soluble than *AgBr* and *AgI*
- (3) *AgBr* is more soluble than *AgCl* and *AgI*
- (4) None of these

52. Dry ice is used in fire extinguishers. It is stored in the cylinder in solid form. When sprayed on fire, dry ice quickly changes into CO_2 . The change of state is known as :

- (1) Distillation
- (2) Evaporation
- (3) Condensation
- (4) Sublimation

53. The Joule-Thomson expansion of an ideal gas is :

- (1) an isenthalpic process
- (2) an isentropic process
- (3) an isothermal process
- (4) adiabatic process

54. The colloidal solutions are purified by :

- | | |
|-----------------|------------------|
| (1) Peptization | (2) Dialysis |
| (3) Coagulation | (4) Flocculation |

55. The elastic scattering of photons is called as :

- (1) Atmospheric scattering
- (2) Conserved scattering
- (3) Rayleigh scattering
- (4) Raman scattering

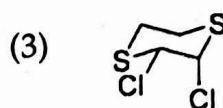
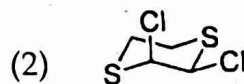
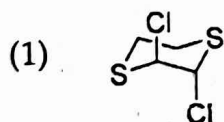
56. The solubility of a solute is three times as high in the ether as in water. What amount of the solute will be extracted from 100 ml of the aqueous solution by 100 ml of ether in one step ?

- (1) 80%
- (2) 75%
- (3) 70%
- (4) 60%

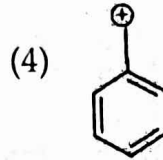
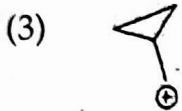
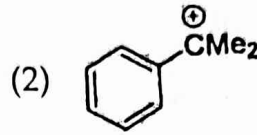
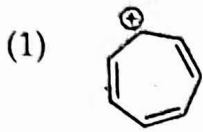
57. Choose the *correct* order of bond strength for X-F bond (X = B, C, N & O) ?

- (1) $BF_3 > CF_4 > OF_2 > NF_3$
- (2) $CF_4 > BF_3 > NF_3 > OF_2$
- (3) $BF_3 > CF_4 > NF_3 > OF_2$
- (4) $OF_2 > NF_3 > CF_4 > BF_3$

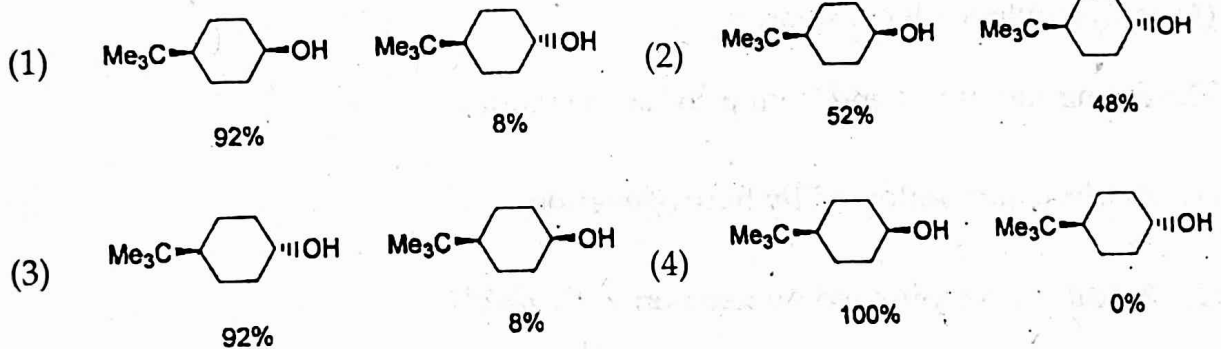
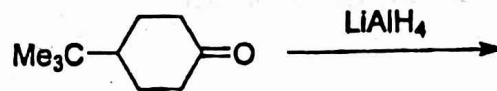
58. Which of the following conformation is *correct* ?



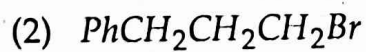
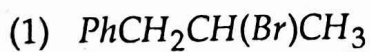
59. Which of the following is a non-classical carbocation ?



60. Choose the *correct* reaction product from the following transformation :



61. Which of the following halides would be most reactive in an S_N2 Reaction ?



62. The base assisted formation of glycolic acid from glyoxal is named as :
- (1) Aldol condensation
 - (2) Rosenmund reduction
 - (3) Cannizaro reaction
 - (4) Knoevenagel condensation
63. Which of the following is anionic detergent ?
- (1) Sodium dodecylbenzene sulfonate
 - (2) Cetyltrimethyl ammonium bromide
 - (3) Caustic soda
 - (4) polyethylene glycol stearate
64. The formation of toluene from p-toluidine requires :
- (1) Acidification followed by hydrogenation
 - (2) Acidification followed by reaction with NaBH_4
 - (3) Diazotization followed by hydrogenation
 - (4) Diazotization followed by treatment with H_3PO_2
65. Markovnikof's addition of HCl to propene involves the :
- (1) Initial attack of a chloride ion
 - (2) Formation of isopropyl cation
 - (3) Isomerization of 1-chloropropane
 - (4) Formation of propyl cation

- B**
66. Which of the following compounds will give methyl vinyl ketone by Aldol condensation followed by dehydration ?
- (1) $HCHO$ and CH_3CHO
 - (2) $HCHO$ and CH_3COCH_3
 - (3) 2 moles of CH_3CHO
 - (4) 2 moles of CH_3COCH_3
67. Which of the following will not give positive Molisch test ?
- (1) *d*-glucose
 - (2) *d*-glyceraldehyde
 - (3) *d*-mannose
 - (4) *d*-galactose
68. Which of the following polymer doesn't involve cross linking ?
- (1) Melamine
 - (2) Bakelite
 - (3) Polyethylene
 - (4) Vulcanised rubber
69. Which of the following ring have maximum ring strain ?
- (1) Cyclopropane
 - (2) Cyclobutane
 - (3) Cyclopentane
 - (4) Cyclohexane
70. The helical structure of protein is stabilised by :
- (1) Dipeptic bond
 - (2) Ionic bond
 - (3) Hydrogen bond
 - (4) Peptide bond

71. $\psi_{21(-1)}$ represents :

- (1) 2s orbital (2) 2px orbital
(3) 2py orbital (4) 2pz orbital

72. An operator \hat{A} is said to be Hermitian, if :

- (1) $\int \psi_1^* \psi_2 \hat{A} d\tau = \int \psi_2 \psi_1^* \hat{A} d\tau$
(2) $\int \psi_2^* \psi_1 \hat{A} d\tau = \int \psi_1 \psi_2^* \hat{A} d\tau$
(3) $\int \psi_1^* (\hat{A} \psi_2) d\tau = \int (\hat{A} \psi_1)^* \psi_2 d\tau$
(4) None of these

73. The selection rules for rotational transitions are :

- (1) $\Delta J = 0, \Delta K = 0$ (2) $\Delta J = 0, \pm 1$
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74. Thermal conductivity of a gas is :

- (1) Independent of pressure (2) Viscosity
(3) Temperature (4) None of these

75. Number of components, number of phases and the degree of freedom in a liquid at its critical point is :

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76. The value of θ for the first order reflection from (100) face is :

- (1) 5.2° (2) 5.9° (3) 8.4° (4) 8.9°

77. Total number of vibrations in allyl bromide are :

- (1) 14 (2) 16 (3) 18 (4) 21

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- (1) $5s^1 4d^1$ (2) $6s^1 5d^5$
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- (1) +3, +5 and +4 (2) +5, +3 and +4
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- (1) $Li > Na > Rb > Cs$ (2) $Na > Li > Rb > Cs$
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97. Which of the following is called 'Pearl ash' ?
(1) Na_2CO_3 (2) $NaHCO_3$ (3) K_2CO_3 (4) $CaCO_3$
98. To which block of the periodic table the element with atomic number 56 belongs :
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(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

C

SET-X

PG-EE-June, 2023
SUBJECT : Chemistry

10839

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

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

Name _____ Date of Birth _____

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.**

- All questions are compulsory.**
- The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair means / mis-behaviour 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.
- 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.
- Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately 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.
- The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
- Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
- Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.**

PG-EE-June, 2023/(Chemistry)(SET-X)/(C)

SEAL

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31. Which of the following carbohydrate gives only glucose on hydrolysis :
- (1) Galactose
 - (2) Sucrose
 - (3) Maltose
 - (4) Lactose

32. The Blue shift in UV is also called as :

- (1) Hypochromic
- (2) Hyperchromic
- (3) Bathochromic
- (4) Hypsochromic

33. Which of the following substituent will enhance the basicity of phenol ?

- (1) -Me
- (2) -NO₂
- (3) -CN
- (4) -COOCH₃

34. Which of the following give electrophilic substitution at 3rd position ?

- (1) Pyrrole
- (2) Indole
- (3) Furan
- (4) Thiophene

35. The IR stretching frequency for C=O in case of acetaldehyde appears between :

- (1) 3400-3300 cm⁻¹
- (2) 1300-1000 cm⁻¹
- (3) 1750-1700 cm⁻¹
- (4) 2100-2300 cm⁻¹

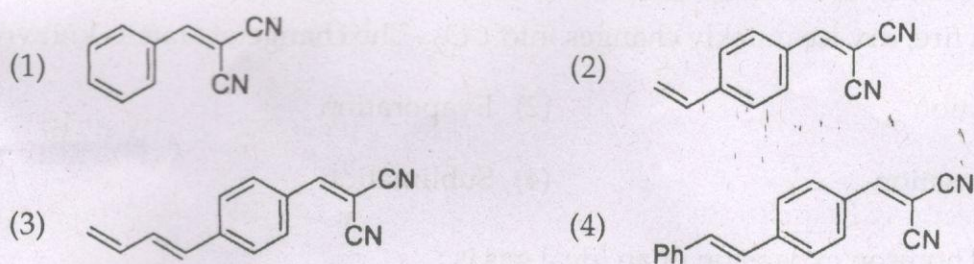
36. The IR -OH stretching frequency in which of the molecule is *not* concentration dependent :

- (1) *p*-Nitrophenol
- (2) *p*- Nitroaniline
- (3) *o*-Nitrophenol
- (4) *m*-Nitrophenol

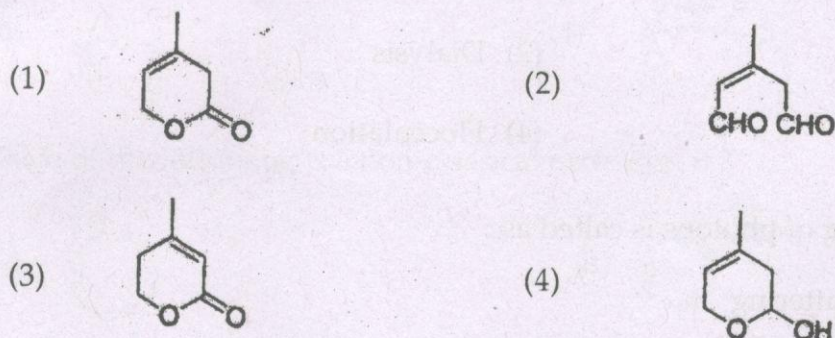
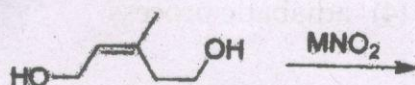
37. Which of the following compound gives 2 signal in its nmr spectrum ?

- (1) Terephthalaldehyde
- (2) 4-hydroxytoluene
- (3) 4-nitrobenzaldehyde
- (4) 1,3-dimethylbenzene

38. Which of the following will have higher λ_{\max} ?



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



40. The number of peaks observed in the ^1H NMR of CHD_2OD are :

- (1) Septet
- (2) Triplet
- (3) Pentet
- (4) Doublet

41. Which of the following statement is *correct*, if :

$$K_{sp}(\text{AgCl}) > K_{sp}(\text{AgBr}) > K_{sp}(\text{AgI})$$

- (1) *AgI* is more soluble than *AgCl* and *AgBr*
 - (2) *AgCl* is more soluble than *AgBr* and *AgI*
 - (3) *AgBr* is more soluble than *AgCl* and *AgI*
 - (4) None of these
42. Dry ice is used in fire extinguishers. It is stored in the cylinder in solid form. When sprayed on fire, dry ice quickly changes into CO_2 . The change of state is known as :
- (1) Distillation
 - (2) Evaporation
 - (3) Condensation
 - (4) Sublimation
43. The Joule-Thomson expansion of an ideal gas is :
- (1) an isenthalpic process
 - (2) an isentropic process
 - (3) an isothermal process
 - (4) adiabatic process
44. The colloidal solutions are purified by :
- (1) Peptization
 - (2) Dialysis
 - (3) Coagulation
 - (4) Flocculation
45. The elastic scattering of photons is called as :
- (1) Atmospheric scattering
 - (2) Conserved scattering
 - (3) Rayleigh scattering
 - (4) Raman scattering

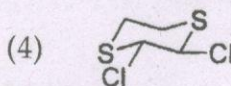
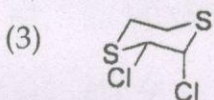
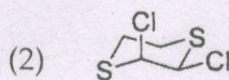
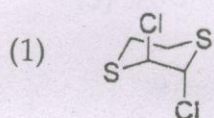
46. The solubility of a solute is three times as high in the ether as in water. What amount of the solute will be extracted from 100 ml of the aqueous solution by 100 ml of ether in one step ?

- (1) 80% (2) 75%
 (3) 70% (4) 60%

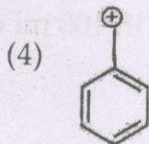
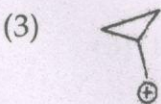
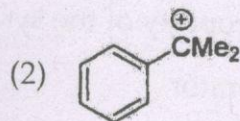
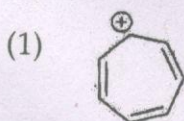
47. Choose the *correct* order of bond strength for X-F bond (X = B, C, N & O) ?

- (1) $BF_3 > CF_4 > OF_2 > NF_3$
 (2) $CF_4 > BF_3 > NF_3 > OF_2$
 (3) $BF_3 > CF_4 > NF_3 > OF_2$
 (4) $OF_2 > NF_3 > CF_4 > BF_3$

48. Which of the following conformation is *correct* ?



49. Which of the following is a non-classical carbocation ?



55. When red light is absorbed in a malachite green solution, which of the following is correct ?
- (1) wave length of light decreases
 - (2) number of photons in a light beam decreases
 - (3) a part of red light changes to green radiation
 - (4) None of these
56. Equivalent conductance of $AgNO_3$ solution at infinite dilution is $130 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$. The transport number of Ag^+ ion in v-dilution is 0.4. The equivalent conductance of NO_3^- ion is :
- (1) $69 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
 - (2) $52 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
 - (3) $78 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
 - (4) $39 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
57. 50 ml of 0.1 $NaOH$ is added to 49 ml of 0.1 M HCl . The pH of the resulting solution is :
- (1) 9 (2) 12 (3) 10 (4) 11
58. A solid acts as an adsorbent because it has :
- (1) unsaturated valencies
 - (2) small pores in it
 - (3) high lattice energy
 - (4) a definite shape

59. According to Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure :
- (1) goes on increasing with pressure
 - (2) goes on decreasing with pressure
 - (3) increases first and decreases later with pressure
 - (4) reaches a constant limiting value
60. Which of the following is an irreversible cell ?
- (1) $Zn | Zn^{2+} | AgCl | Ag$
 - (2) $Zn | H_2SO_4 | Ag$
 - (3) $Zn | Zn^{2+} || Cd^{2+} | Cd$
 - (4) $Cd | Cd^{2+} || KCl, Hg_2Cl_2 | Hg$
61. Which of the following is **not** a suitable reagent for nitration of aromatic compounds ?
- (1) H_2SO_4 (conc.) and HNO_3 (conc.)
 - (2) HNO_3 (conc.) and acetic anhydride
 - (3) Nitric acid (fuming) and H_2SO_4 (conc.)
 - (4) Potassium nitrate (alcoholic)
62. Which of the following compound exist in meso form ?
- (1) Tartaric acid
 - (2) Naphthyl acetic acid
 - (3) Glyceraldehyde
 - (4) Glucose

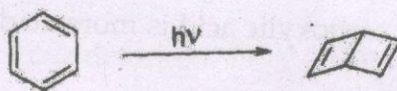
63. Which of the following reactions can be used for conversion of $PhCOPh$ into $PhCH_2Ph$?

- (1) Hydroboration and Meerwein-Ponndorf-Verley reduction
- (2) Wolf-Kishner reduction and Birch reduction
- (3) Hydroboration and Birch reduction
- (4) Clemmensen reduction and Wolf-Kishner reduction

64. Which compound will liberate CO_2 from $NaHCO_3$?

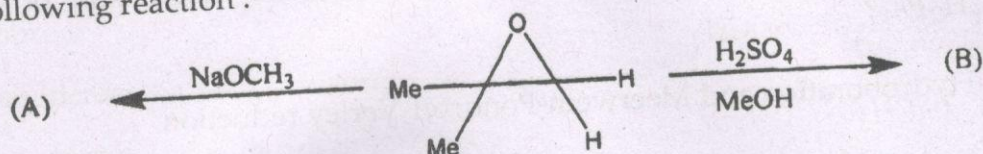
- | | |
|-----------------------|----------------------|
| (1) CH_3CONH_2 | (2) CH_3NH_2 |
| (3) $(CH_3)_4N^+OH^-$ | (4) $CH_3NH_3^+Cl^-$ |

65. The following reaction is an example of :

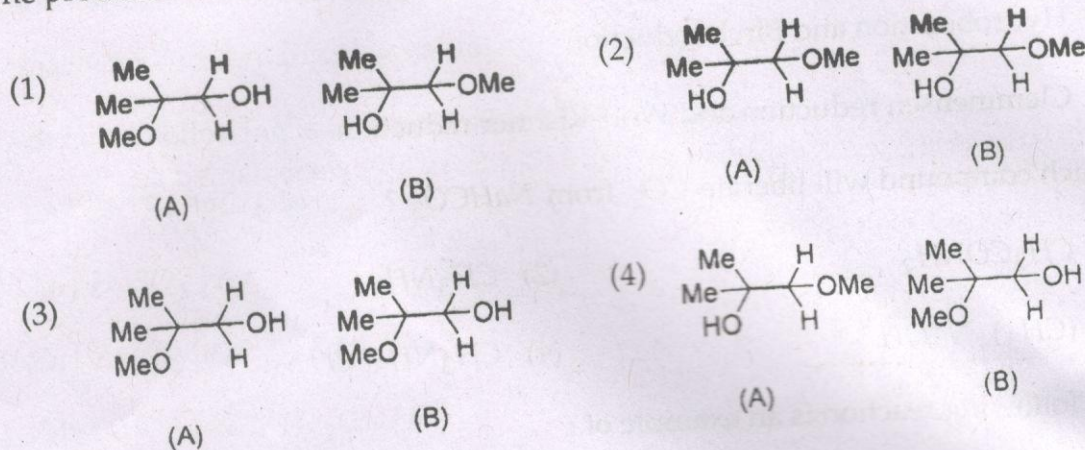


- (1) Cycloaddition reaction
 - (2) Ene reaction
 - (3) Sigmatropic rearrangement
 - (4) Electrocyclic reaction
66. Enolate on reaction with the carbonyl carbon of an ester resulted into :
- (1) β -Ketoaldehyde
 - (2) Carboxylic acid
 - (3) An aldol
 - (4) α, β -Unsaturated aldehyde

67. In the following reaction :



The product A and B are, respectively :



68. Which of the following carboxylic acid is more acidic ?

- (1) *p*-nitrobenzoic acid
- (2) *p*-aminobenzoic acid
- (3) *p*-methoxybenzoic acid
- (4) *p*-fluorobenzoic acid

69. Nitration reaction of nitrobenzene resulted into :

- (1) *m*-dinitrobenzene
- (2) *p*-dinitrobenzene
- (3) *o*-dinitrobenzene
- (4) benzene

70. Which of the following is more basic ?

- (1) Pyrrole
- (2) Furan
- (3) Piperidine
- (4) Pyridine

71. Which of the following halides would be most reactive in an S_N2 Reaction ?
- (1) $PhCH_2CH(Br)CH_3$
 - (2) $PhCH_2CH_2CH_2Br$
 - (3) $PhCH(CH_3)CH_2Br$
 - (4) $PhC(CH_3)_2Br$
72. The base assisted formation of glycolic acid from glyoxal is named as :
- (1) Aldol condensation
 - (2) Rosenmund reduction
 - (3) Cannizaro reaction
 - (4) Knoevenagel condensation
73. Which of the following is anionic detergent ?
- (1) Sodium dodecylbenzene sulfonate
 - (2) Cetyltrimethyl ammonium bromide
 - (3) Caustic soda
 - (4) polyethylene glycol stearate
74. The formation of toluene from p-toluidine requires :
- (1) Acidification followed by hydrogenation
 - (2) Acidification followed by reaction with $NaBH_4$
 - (3) Diazotization followed by hydrogenation
 - (4) Diazotization followed by treatment with H_3PO_2

75. Markovnikof's addition of HCl to propene involves the :

- (1) Initial attack of a chloride ion
- (2) Formation of isopropyl cation
- (3) Isomerization of 1-chloropropane
- (4) Formation of propyl cation

76. Which of the following compounds will give methyl vinyl ketone by Aldol condensation followed by dehydration ?

- (1) $HCHO$ and CH_3CHO
- (2) $HCHO$ and CH_3COCH_3
- (3) 2 moles of CH_3CHO
- (4) 2 moles of CH_3COCH_3

77. Which of the following will not give positive Molisch test ?

- (1) *d*-glucose
- (2) *d*-glyceraldehyde
- (3) *d*-mannose
- (4) *d*-galactose

78. Which of the following polymer doesn't involve cross linking ?

- (1) Melamine
- (2) Bakelite
- (3) Polyethylene
- (4) Vulcanised rubber

79. Which of the following ring have maximum ring strain ?
- (1) Cyclopropane (2) Cyclobutane
(3) Cyclopentane (4) Cyclohexane
80. The helical structure of protein is stabilised by :
- (1) Dipeptic bond (2) Ionic bond
(3) Hydrogen bond (4) Peptide bond
81. How many S-S bonds are there in tetrathionate ion ?
- (1) 2 (2) 3 (3) 4 (4) 5
82. P_4O_{10} has bridging O atoms.
- (1) 4 (2) 5 (3) 6 (4) 2
83. Which among the following electronic configurations represent the elements with the maximum electron affinity ?
- (1) $1s^2 2s^2 2p^6$ (2) $1s^2 2s^2 2p^5$
(3) $1s^2 2s^2 2p^6 3s^1$ (4) $1s^2 2s^2 2p^6 3s^2 3p^5$
84. The active site of enzyme nitrogenase contains :
- (1) Mo (2) Mn (3) Fe (4) Cu
85. The IUPAC nomenclature of $K_3[Co(NO_2)_6]$ is :
- (1) Potassium hexanitrocobaltate (III)
(2) Potassium (I) hexanitrocobaltate (III)
(3) Potassium hexanitrocobalt (0)
(4) Potassium (I) hexanitrocobaltate (II)

86. Coordination number and geometry of $[Ce(NO_3)_6]^{2-}$:
- (1) 6, octahedral (2) 12, octahedral
(3) 8, octahedral (4) 12, icosahedral
87. The spin only magnetic moment (in B.M.) value of $[FeF_6]^{3-}$ and $[Co(CN)_5(H_2O)]^{3-}$ respectively are :
- (1) 0 and 1.73 (2) 5.92 and 1.73
(3) 4.47 and 1.73 (4) 5.92 and 3.87
88. The number of microstates in term 1G is :
- (1) 9 (2) 6 (3) 7 (4) 15
89. The total number of isomers of $[Co(en)_2Cl_2]$, (en = ethylenediamine) is :
- (1) 4 (2) 3 (3) 6 (4) 5
90. The nephelauxetic parameter (β) is highest for :
- (1) Br^- (2) Cl^- (3) CN^- (4) F^-
91. Parachor is related to the density of a liquid by relation :
- (1) $[P] = \frac{Mr}{d}$ (2) $[P] = \frac{M^{\frac{1}{4}}r}{d}$
(3) $[P] = \frac{Mr^{\frac{1}{4}}}{d}$ (4) $[P] = \frac{Md^{\frac{1}{4}}}{r}$
92. For a particular vibrational mode to appear in the Raman spectrum, what must change ?
- (1) Molecular polarizability (2) Molecular shape
(3) Frequency of radiation (4) Intensity of radiation

93. For an isentropic change of state :

- (1) $dE = 0$ (2) $dS = 0$ (3) $dS = 1$ (4) $dH = 0$

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

- (1) $\hat{A} \hat{B} = 0$ (2) $\hat{B} \hat{A} = 0$
(3) $\hat{A} \hat{B} = \hat{B} \hat{A}$ (4) $\hat{A} \hat{B} \neq \hat{B} \hat{A}$

95. In relation $S = k \ln W$, the entropies are additive while thermodynamic properties are multiplicative. What will happen to S and $\ln W$ when the energy of the system is increased ?

- (1) S increases and $\ln W$ decreases
(2) S and W will increase
(3) S and W will decrease
(4) S decreases and $\ln W$ increases

96. In the lead acid base battery during charging the Cathode reaction is :

- (1) Reduction of Pb^{2+} to Pb
(2) Formation of $PbSO_4$
(3) Formation of PbO_2
(4) Oxidation of Pb to Pb^{2+}

97. For one of gaseous mixture, entropy of mixing is expressed as :

- (1) $\Delta S_{mix} = -R \sum \ln x_i$
(2) $\Delta S_{mix} = R \sum \ln x_i$
(3) $\Delta S_{mix} = R \sum x_i \ln x_i$
(4) $\Delta S_{mix} = -R \sum x_i \ln x_i$

98. Which one of the following is *correct* Maxwell's relation ?

(1) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

(2) $\left(\frac{\partial T}{\partial P}\right)_V = \left(\frac{\partial V}{\partial S}\right)_T$

(3) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$

(4) $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$

99. According to first thermodynamic equation of state, for an ideal gas $\left(\frac{\partial U}{\partial V}\right)_T$ is :

(1) Infinite

(2) $\frac{P}{T}$

(3) zero

(4) $\frac{T}{V}$

100. Which of the following partially miscible liquids have both upper and lower critical solution temperature ?

(1) Water and aniline

(2) Water and β -picoline

(3) Water and diethyl amine

(4) Methanol and cyclohexane

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ARE ASKED TO DO SO)

D

PG-EE-June, 2023
SUBJECT : Chemistry

SET-X

10840

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

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

Name _____ Date of Birth _____

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.**

- All questions are compulsory.**
- The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour 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.
- 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.
- Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately 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.
- The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
- Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
- Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.**

PG-EE-June, 2023/(Chemistry)(SET-X)/(D)

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10. The nephelauxetic parameter (β) is highest for :
- (1) Br^- (2) Cl^- (3) CN^- (4) F^-
11. Which of the following carbohydrate gives only glucose on hydrolysis :
- (1) Galactose (2) Sucrose
(3) Maltose (4) Lactose
12. The Blue shift in UV is also called as :
- (1) Hypochromic (2) Hyperchromic
(3) Bathochromic (4) Hypsochromic
13. Which of the following substituent will enhance the basicity of phenol ?
- (1) $-Me$ (2) $-NO_2$
(3) $-CN$ (4) $-COOCH_3$
14. Which of the following give electrophilic substitution at 3rd position ?
- (1) Pyrrole (2) Indole
(3) Furan (4) Thiophene
15. The IR stretching frequency for $C=O$ in case of acetaldehyde appears between :
- (1) $3400-3300\text{ cm}^{-1}$ (2) $1300-1000\text{ cm}^{-1}$
(3) $1750-1700\text{ cm}^{-1}$ (4) $2100-2300\text{ cm}^{-1}$

16. The IR -OH stretching frequency in which of the molecule is *not* concentration dependent :

(1) *p*-Nitrophenol

(2) *p*- Nitroaniline

(3) *o*-Nitrophenol

(4) *m*-Nitrophenol

17. Which of the following compound gives 2 signal in its nmr spectrum ?

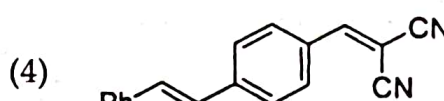
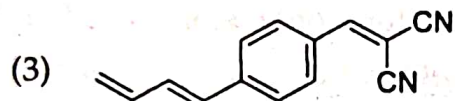
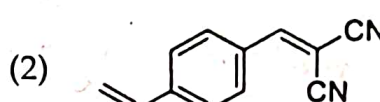
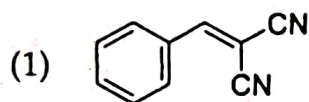
(1) Terephthalaldehyde

(2) 4-hydroxytoluene

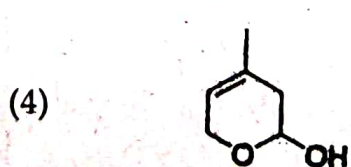
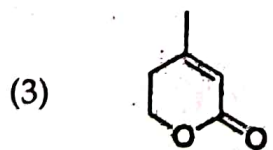
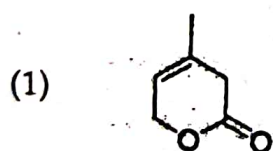
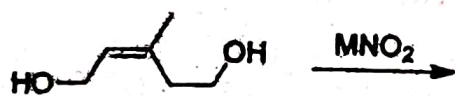
(3) 4-nitrobenzaldehyde

(4) 1,3-dimethylbenzene

18. Which of the following will have higher λ_{\max} ?

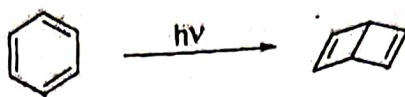


19. The major product formed in the following reaction is :



20. The number of peaks observed in the ^1H NMR of CHD_2OD are :
- (1) Septet (2) Triplet (3) Pentet (4) Doublet
21. Which of the following is *not* a suitable reagent for nitration of aromatic compounds ?
- (1) H_2SO_4 (conc.) and HNO_3 (conc.)
(2) HNO_3 (conc.) and acetic anhydride
(3) Nitric acid (fuming) and H_2SO_4 (conc.)
(4) Potassium nitrate (alcoholic)
22. Which of the following compound exist in meso form ?
- (1) Tartaric acid (2) Naphthyl acetic acid
(3) Glyceraldehyde (4) Glucose
23. Which of the following reactions can be used for conversion of PhCOPh into PhCH_2Ph ?
- (1) Hydroboration and Meerwein-Ponndorf-Verley reduction
(2) Wolf-Kishner reduction and Birch reduction
(3) Hydroboration and Birch reduction
(4) Clemmensen reduction and Wolf-Kishner reduction
24. Which compound will liberate CO_2 from NaHCO_3 ?
- (1) CH_3CONH_2 (2) CH_3NH_2
(3) $(\text{CH}_3)_4\text{N}^+\text{OH}^-$ (4) $\text{CH}_3\text{NH}_3^+\text{Cl}^-$

25. The following reaction is an example of :

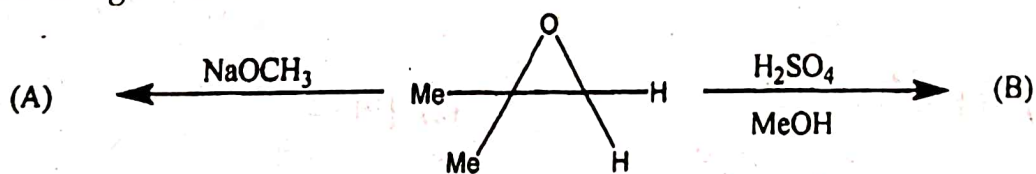


- (1) Cycloaddition reaction
- (2) Ene reaction
- (3) Sigmatropic rearrangement
- (4) Electrocyclic reaction

26. Enolate on reaction with the carbonyl carbon of an ester resulted into :

- (1) β -Ketoaldehyde
- (2) Carboxylic acid
- (3) An aldol
- (4) α, β -Unsaturated aldehyde

27. In the following reaction :



The product A and B are, respectively :

- (1)

 (A)	 (B)
---------	---------
- (2)

 (A)	 (B)
---------	---------
- (3)

 (A)	 (B)
---------	---------
- (4)

 (A)	 (B)
---------	---------

28. Which of the following carboxylic acid is more acidic ?

- (1) *p*-nitrobenzoic acid
- (2) *p*-aminobenzoic acid
- (3) *p*-methoxybenzoic acid
- (4) *p*-fluorobenzoic acid

29. Nitration reaction of nitrobenzene resulted into :

- (1) *m*-dinitrobenzene
- (2) *p*-dinitrobenzene
- (3) *o*-dinitrobenzene
- (4) benzene

30. Which of the following is more basic ?

- (1) Pyrrole
- (2) Furan
- (3) Piperidine
- (4) Pyridine

31. Parachor is related to the density of a liquid by relation :

- (1) $[P] = \frac{Mr}{d}$
- (2) $[P] = \frac{M^{\frac{1}{4}}r}{d}$
- (3) $[P] = \frac{Mr^{\frac{1}{4}}}{d}$
- (4) $[P] = \frac{Md^{\frac{1}{4}}}{r}$

32. For a particular vibrational mode to appear in the Raman spectrum, what must change ?

- (1) Molecular polarizability
- (2) Molecular shape
- (3) Frequency of radiation
- (4) Intensity of radiation

33. For an isentropic change of state :

(1) $dE = 0$

(2) $dS = 0$

(3) $dS = 1$

(4) $dH = 0$

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

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

(2) $\hat{B} \hat{A} = 0$

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

(4) $\hat{A} \hat{B} \neq \hat{B} \hat{A}$

35. In relation $S = k \ln W$, the entropies are additive while thermodynamic properties are multiplicative. What will happen to S and $\ln W$ when the energy of the system is increased ?

(1) S increases and $\ln W$ decreases

(2) S and W will increase

(3) S and W will decrease

(4) S decreases and $\ln W$ increases

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

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(3) Formation of PbO_2

(4) Oxidation of Pb to Pb^{2+}

37. For one of gaseous mixture, entropy of mixing is expressed as :

(1) $\Delta S_{mix} = -R \sum \ln x_i$

(2) $\Delta S_{mix} = R \sum \ln x_i$

(3) $\Delta S_{mix} = R \sum x_i \ln x_i$

(4) $\Delta S_{mix} = -R \sum x_i \ln x_i$

38. Which one of the following is *correct* Maxwell's relation ?

(1) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

(2) $\left(\frac{\partial T}{\partial P}\right)_V = \left(\frac{\partial V}{\partial S}\right)_T$

(3) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$

(4) $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$

39. According to first thermodynamic equation of state, for an ideal gas, $\left(\frac{\partial U}{\partial V}\right)_T$ is :

(1) Infinite

(2) $\frac{P}{T}$

(3) zero

(4) $\frac{T}{V}$

40. Which of the following partially miscible liquids have both upper and lower critical solution temperature ?

(1) Water and aniline

(2) Water and β -picoline

(3) Water and diethyl amine

(4) Methanol and cyclohexane

41. Which one of the following is most easily reduced ?
- (1) $V(CO)_6$ (2) $Cr(CO)_6$
(3) $Fe(CO)_5$ (4) $Ni(CO)_4$
42. Which of the following pair of 4f elements can exhibit +4 oxidation state ?
- (1) *La* and *Lu* (2) *Ce* and *Pr*
(3) *Eu* and *Yb* (4) *Sm* and *Tm*
43. A 1s orbital refers to :
- (1) A circular track in an atom in which an electron travels
(2) A one electron wave function
(3) An observable property of the system
(4) A Hermitian operator
44. For the reaction $H^+(aq) + OH^-(aq) \rightarrow H_2O(l); \Delta H = -13.7$ kcal. The heat change when 100 ml of 0.1 M is mixed with 100 ml of 0.2 M H_2SO_4 is :
- (1) -0.137 kcal (2) -0.274 kcal
(3) -1.37 kcal (4) -0.548 kcal
45. When red light is absorbed in a malachite green solution, which of the following is *correct* ?
- (1) wave length of light decreases
(2) number of photons in a light beam decreases
(3) a part of red light changes to green radiation
(4) None of these

46. Equivalent conductance of AgNO_3 solution at infinite dilution is $130 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$. The transport number of Ag^+ ion in v-dilution is 0.4. The equivalent conductance of NO_3^- ion is :
- (1) $69 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
 - (2) $52 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
 - (3) $78 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
 - (4) $39 \text{ ohm}^{-1}\text{cm}^2\text{equiv}^{-1}$
47. 50 ml of 0.1 NaOH is added to 49 ml of 0.1 M HCl . The pH of the resulting solution is :
- (1) 9 (2) 12 (3) 10 (4) 11
48. A solid acts as an adsorbent because it has :
- (1) unsaturated valencies
 - (2) small pores in it
 - (3) high lattice energy
 - (4) a definite shape
49. According to Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure :
- (1) goes on increasing with pressure
 - (2) goes on decreasing with pressure
 - (3) increases first and decreases later with pressure
 - (4) reaches a constant limiting value
50. Which of the following is an irreversible cell ?
- (1) $\text{Zn} | \text{Zn}^{2+} | \text{AgCl} | \text{Ag}$
 - (2) $\text{Zn} | \text{H}_2\text{SO}_4 | \text{Ag}$
 - (3) $\text{Zn} | \text{Zn}^{2+} || \text{Cd}^{2+} | \text{Cd}$
 - (4) $\text{Cd} | \text{Cd}^{2+} || \text{KCl}, \text{Hg}_2\text{Cl}_2 | \text{Hg}$

51. The complex with maximum CFSE is :
- (1) $[\text{CoCl}_4]^{2-}$ (2) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
(3) $[\text{CoF}_3(\text{H}_2\text{O})_3]$ (4) $[\text{CoF}_6]^{3+}$
52. When is the Intramolecular hydrogen bond formed ?
- (1) When a hydrogen atom is in between the two highly electropositive atoms
(2) When a oxygen atom is in between the two highly electronegative atoms
(3) When a hydrogen atom is in between the two highly electronegative atoms
(4) When a oxygen atom is in between the two highly electropositive atoms
53. The number of metal-metal bonds in $\text{Ir}_4(\text{CO})_{12}$ is : .
- (1) 4 (2) 6 (3) 10 (4) 12
54. Identify the strongest Bronsted acid :
- (1) H_2SO_4 (2) CH_3COOH
(3) HNO_3 (4) H_3PO_4
55. Which of the following represents a set of hard acid and soft base respectively ?
- (1) Fe^{3+} and F^- (2) Fe^{3+} and S^{2-}
(3) Ag^+ and S^{2-} (4) Ag^+ and F^-
56. The substance present in a lesser amount in solution is :
- (1) solute (2) solvent
(3) aqueous solvent (4) None

57. Which one of the following conductometric titration will show a linear increase of the conductance with volume of titrant added upto the break point and almost constant conductance afterwards ?
- (1) A strong acid with a strong base
 - (2) A strong acid with a weak base
 - (3) A weak acid with a strong base
 - (4) A weak acid with a weak base
58. The oxidation state of iron in met-hemoglobin is :
- (1) Three
 - (2) Two
 - (3) Four
 - (4) Zero
59. $BaTi[Si_3O_9]$ is a class of :
- (1) ortho silicate
 - (2) cyclic silicate
 - (3) chain silicate
 - (4) sheet silicate
60. The electronic configuration of chromium is $4s^1 3d^5$. The element tungsten (W) belongs to the same group and has atomic number = 74. The configuration of its valence shell is :
- (1) $5s^1 4d^1$
 - (2) $6s^1 5d^5$
 - (3) $6s^2 5d^4$
 - (4) $6s^0 5d^6$
61. $\psi_{21(-)}$ represents :
- (1) 2s orbital
 - (2) 2px orbital
 - (3) 2py orbital
 - (4) 2pz orbital

62. An operator \hat{A} is said to be Hermitian, if :

(1) $\int \psi_1^* \psi_2 \hat{A} d\tau = \int \psi_2 \psi_1^* \hat{A} d\tau$

(2) $\int \psi_2^* \psi_1 \hat{A} d\tau = \int \psi_1 \psi_2^* \hat{A} d\tau$

(3) $\int \psi_1^* (\hat{A} \psi_2) d\tau = \int (\hat{A} \psi_1)^* \psi_2 d\tau$

(4) None of these

63. The selection rules for rotational transitions are :

(1) $\Delta J = 0, \Delta K = 0$

(2) $\Delta J = 0, \pm 1$

(3) $\Delta J = 0, \Delta K = 1$

(4) $\Delta J = 0, \pm 1; \Delta K = 0$

64. Thermal conductivity of a gas is :

(1) Independent of pressure

(2) Viscosity

(3) Temperature

(4) None of these

65. Number of components, number of phases and the degree of freedom in a liquid at its critical point is :

(1) 1, 2, 1

(2) 0, 1, 2

(3) 1, 2, 0

(4) 1, 0, 2

66. The value of θ for the first order reflection from (100) face is :

(1) 5.2°

(2) 5.9°

(3) 8.4°

(4) 8.9°

67. Total number of vibrations in allyl bromide are :

(1) 14

(2) 16

(3) 18

(4) 21

68. Which of the following shift leads to the decreased intensity of absorption ?

(1) Hypochromic

(2) Hypsochromic

(3) Hyperchromic

(4) Bathochromic

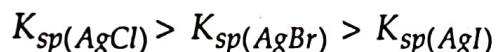
69. Spin inversion of electrons takes place in the processes :

- | | |
|-----------------|-------------------------|
| (1) Absorption | (2) Internal conversion |
| (3) Florescence | (4) Phosphorescence |

70. Which of the following is a limitation of Lambert-Beer's law ?

- (1) Scattering of light due to particles
- (2) Florescence of sample
- (3) Non-monochromatic radiation
- (4) All of these

71. Which of the following statement is *correct*, if :



- (1) AgI is more soluble than AgCl and AgBr
- (2) AgCl is more soluble than AgBr and AgI
- (3) AgBr is more soluble than AgCl and AgI
- (4) None of these

72. Dry ice is used in fire extinguishers. It is stored in the cylinder in solid form. When sprayed on fire, dry ice quickly changes into CO_2 . The change of state is known as :

- | | |
|------------------|-----------------|
| (1) Distillation | (2) Evaporation |
| (3) Condensation | (4) Sublimation |

73. The Joule-Thomson expansion of an ideal gas is :

- | | |
|----------------------------|---------------------------|
| (1) an isenthalpic process | (2) an isentropic process |
| (3) an isothermal process | (4) adiabatic process |

74. The colloidal solutions are purified by :

- (1) Peptization (2) Dialysis
(3) Coagulation (4) Flocculation

75. The elastic scattering of photons is called as :

- (1) Atmospheric scattering
(2) Conserved scattering
(3) Rayleigh scattering
(4) Raman scattering

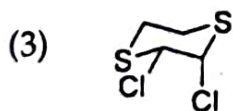
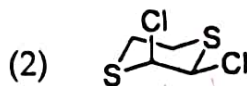
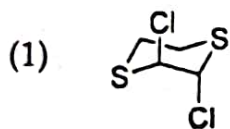
76. The solubility of a solute is three times as high in the ether as in water. What amount of the solute will be extracted from 100 ml of the aqueous solution by 100 ml of ether in one step ?

- (1) 80% (2) 75%
(3) 70% (4) 60%

77. Choose the *correct* order of bond strength for X-F bond (X = B, C, N & O) ?

- (1) $BF_3 > CF_4 > OF_2 > NF_3$ (2) $CF_4 > BF_3 > NF_3 > OF_2$
(3) $BF_3 > CF_4 > NF_3 > OF_2$ (4) $OF_2 > NF_3 > CF_4 > BF_3$

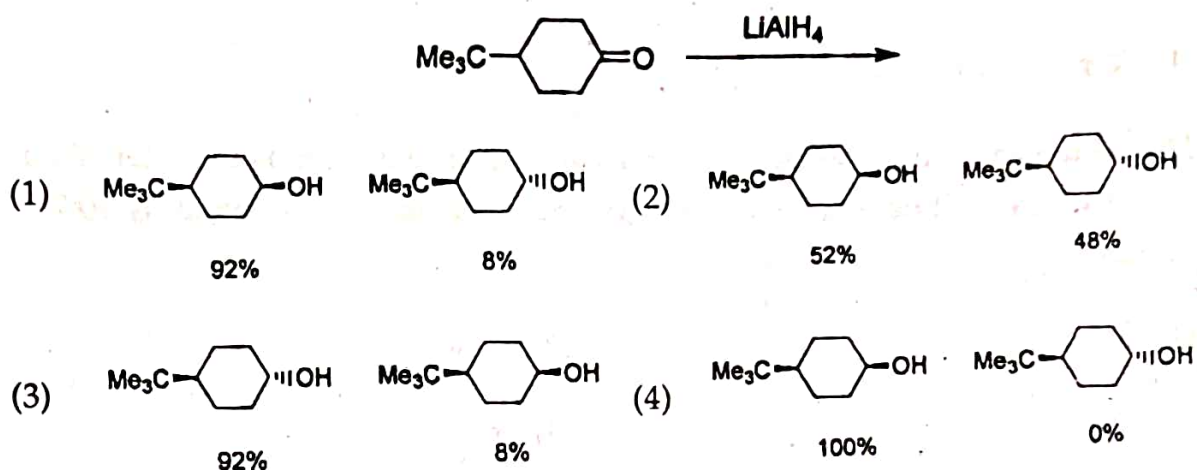
78. Which of the following conformation is *correct* ?



79. Which of the following is a non-classical carbocation ?



80. Choose the *correct* reaction product from the following transformation :



81. The atomic term symbol for the Helium atom in its ground state is :

- (1) 3S_1 (2) 3P_2 (3) 3S_0 (4) 1S_0

82. Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$ and $H_4P_2O_7$ are respectively :

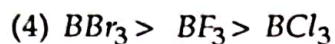
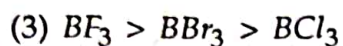
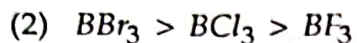
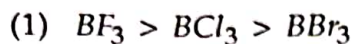
- (1) +3, +5 and +4 (2) +5, +3 and +4
 (3) +5, +4 and +3 (4) +3, +4 and +5

83. The basicity of the hydroxides of the following alkali metals is of the order :

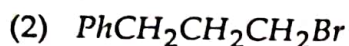
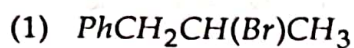
- (1) $Li > Na > Rb > Cs$ (2) $Na > Li > Rb > Cs$
 (3) $Cs > Rb > Na > Li$ (4) $Rb > Cs > Na > Li$

84. The geometry around the central atom in ClF_4^+ :
- (1) square planar (2) square pyramidal
(3) octahedral (4) trigonal bipyramidal
85. The number of anti-bonding electron in NO and CO according to MO theory are respectively :
- (1) 1, 0 (2) 2, 2 (3) 3, 2 (4) 2, 3
86. Semiconductors have conduction band and valence band.
- (1) a lightly filled; a moderately filled
(2) an almost filled; a moderately filled
(3) an almost empty; an almost filled
(4) an almost filled; an almost empty
87. Which of the following is called 'Pearl ash' ?
- (1) Na_2CO_3 (2) $NaHCO_3$ (3) K_2CO_3 (4) $CaCO_3$
88. To which block of the periodic table the element with atomic number 56 belongs :
- (1) s-block (2) p-block (3) d-block (4) f-block
89. C_{60} has :
- (1) 14 pentagons and 18 hexagons
(2) 12 pentagons and 20 hexagons
(3) 10 pentagons and 20 hexagons
(4) 12 pentagons and 18 hexagons

90. The order of acidity in boron trihalides is :



91. Which of the following halides would be most reactive in an SN_2 Reaction ?



92. The base assisted formation of glycolic acid from glyoxal is named as :

(1) Aldol condensation

(2) Rosenmund reduction

(3) Cannizaro reaction

(4) Knoevenagel condensation

93. Which of the following is anionic detergent ?

(1) Sodium dodecylbenzene sulfonate

(2) Cetyltrimethyl ammonium bromide

(3) Caustic soda

(4) polyethylene glycol stearate

94. The formation of toluene from p-toluidine requires :
- (1) Acidification followed by hydrogenation
 - (2) Acidification followed by reaction with $NaBH_4$
 - (3) Diazotization followed by hydrogenation
 - (4) Diazotization followed by treatment with H_3PO_2
95. Markovnikof's addition of HCl to propene involves the :
- (1) Initial attack of a chloride ion
 - (2) Formation of isopropyl cation
 - (3) Isomerization of 1-chloropropane
 - (4) Formation of propyl cation
96. Which of the following compounds will give methyl vinyl ketone by Aldol condensation followed by dehydration ?
- (1) $HCHO$ and CH_3CHO
 - (2) $HCHO$ and CH_3COCH_3
 - (3) 2 moles of CH_3CHO
 - (4) 2 moles of CH_3COCH_3
97. Which of the following will not give positive Molisch test ?
- | | |
|-----------------------|------------------------------|
| (1) <i>d</i> -glucose | (2) <i>d</i> -glyceraldehyde |
| (3) <i>d</i> -mannose | (4) <i>d</i> -galactose |

98. Which of the following polymer doesn't involve cross linking ?

(1) Melamine

(2) Bakelite

(3) Polyethylene

(4) Vulcanised rubber

99. Which of the following ring have maximum ring strain ?

(1) Cyclopropane

(2) Cyclobutane

(3) Cyclopentane

(4) Cyclohexane

100. The helical structure of protein is stabilised by :




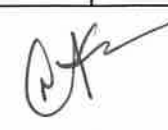
(1) Dipeptic bond

(2) Ionic bond



(3) Hydrogen bond

(4) Peptide bond

ANSWER KEYS OF M.Sc. CHEMISTRY 2 YEAR PG COURSE FOR SESSION 2023-24				
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50	4	3	3	2




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ANSWER KEYS OF M.Sc. CHEMISTRY 2 YEAR PG COURSE FOR SESSION 2023-24				
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99	3	2	3	1
100	3	2	2	3



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