Paper	: **II**
Subject	: **CHEMICAL SCIENCES**
Subject Code	: **27**

Roll No. [ ][ ][ ][ ][ ][ ][ ][ ]

(Figures as per admission card)

OMR Sheet No. : _____

Name & Signature of Invigilator/s

Signature : _____

Name : _____

Time : 2 Hours   Maximum Marks : 200

Number of Pages in this Booklet : **16**   Number of Questions in this Booklet : **100**

ಅಭ್ಯರ್ಥಿಗಳಿಗೆ ಸೂಚನೆಗಳು

1. ಈ ಪುಟದ ಮೇಲ್ತುದಿಯಲ್ಲಿ ಒದಗಿಸಿದ ಸ್ಥಳದಲ್ಲಿ ನಿಮ್ಮ ರೋಲ್ ನಂಬರನ್ನು ಬರೆಯಿರಿ.
2. ಈ ಪತ್ರಿಕೆಯ ಬಹು ಆಯ್ಕೆ ವಿಧದ ನೂರು (100) ಪ್ರಶ್ನೆಗಳನ್ನು ಒಳಗೊಂಡಿದೆ.
3. ಪರೀಕ್ಷೆಯ ಪ್ರಾರಂಭದಲ್ಲಿ, ಪ್ರಶ್ನೆ ಪುಸ್ತಿಕೆಯನ್ನು ನಿಮಗೆ ನೀಡಲಾಗುವುದು. ಮೊದಲ 5 ನಿಮಿಷಗಳಲ್ಲಿ ನೀವು ಪುಸ್ತಿಕೆಯನ್ನು ತೆರೆಯಲು ಮತ್ತು ಕೆಳಗಿನಂತೆ ಕಡ್ಡಾಯವಾಗಿ ಪರೀಕ್ಷಿಸಲು ಕೋರಲಾಗಿದೆ.
   (i) ಪ್ರಶ್ನೆಪುಸ್ತಿಕೆಗೆ ಪ್ರವೇಶಾವಕಾಶ ಪಡೆಯಲು, ಈ ಹೊದಿಕೆ ಪುಟದ ಅಂಚಿನ ಮೇಲಿರುವ ಪೇಪರ್ ಸೀಲನ್ನು ಹರಿಯಿರಿ. ಸ್ಟಿಕ್ಕರ್ ಸೀಲ್ ಇಲ್ಲದ ಅಥವಾ ತೆರೆದ ಪುಸ್ತಿಕೆಯನ್ನು ಸ್ವೀಕರಿಸಬೇಡಿ.
   (ii) **ಪುಸ್ತಿಕೆಯಲ್ಲಿನ ಪ್ರಶ್ನೆಗಳ ಸಂಖ್ಯೆ ಮತ್ತು ಪುಟಗಳ ಸಂಖ್ಯೆಯನ್ನು ಮುಖಪುಟದ ಮೇಲೆ ಮುದ್ರಿಸಿದ ಮಾಹಿತಿಯೊಂದಿಗೆ ತಾಳೆ ನೋಡಿರಿ. ಪುಟಗಳು/ಪ್ರಶ್ನೆಗಳು ಕಾಣೆಯಾದ ಅಥವಾ ದ್ವಿಪ್ರತಿ ಅಥವಾ ಅನುಕ್ರಮವಾಗಿಲ್ಲದ ಅಥವಾ ಇತರ ಯಾವುದೇ ವ್ಯತ್ಯಾಸದ ದೋಷಪೂರಿತ ಪುಸ್ತಿಕೆಯನ್ನು ಕೂಡಲೆ 5 ನಿಮಿಷದ ಅವಧಿ ಒಳಗೆ, ಸಂವೀಕ್ಷಕರಿಂದ ಸರಿ ಇರುವ ಪುಸ್ತಿಕೆಗೆ ಬದಲಾಯಿಸಿಕೊಳ್ಳಬೇಕು. ಆ ಬಳಿಕ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನು ಬದಲಾಯಿಸಲಾಗುವುದಿಲ್ಲ, ಯಾವುದೇ ಹೆಚ್ಚು ಸಮಯವನ್ನೂ ಕೊಡಲಾಗುವುದಿಲ್ಲ.**
4. ಪ್ರತಿಯೊಂದು ಪ್ರಶ್ನೆಗೂ (A), (B), (C) ಮತ್ತು (D) ಎಂದು ಗುರುತಿಸಿದ ನಾಲ್ಕು ಪರ್ಯಾಯ ಉತ್ತರಗಳಿವೆ. ನೀವು ಪ್ರಶ್ನೆಯ ಎದುರು ಸರಿಯಾದ ಉತ್ತರದ ಮೇಲೆ, ಕೆಳಗೆ ಕಾಣಿಸಿದಂತೆ ಅಂಡಾಕೃತಿಯನ್ನು ಕಪ್ಪಾಗಿಸಬೇಕು.

   ಉದಾಹರಣೆ : (A) (B) ● (D)

   (C) ಸರಿಯಾದ ಉತ್ತರವಾಗಿದ್ದಾಗ.
5. ಈ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಜೊತೆಯಲ್ಲಿ **ಕೊಟ್ಟಿರುವ OMR ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ನಿಮ್ಮ ಉತ್ತರಗಳನ್ನು ಸೂಚಿಸತಕ್ಕದ್ದು.** OMR ಹಾಳೆಯಲ್ಲಿ ಅಂಡಾಕೃತಿಯಲ್ಲದ ಬೇರೆ ಯಾವುದೇ ಸ್ಥಳದಲ್ಲಿ ಉತ್ತರವನ್ನು ಗುರುತಿಸಿದರೆ, ಅದರ ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುವುದಿಲ್ಲ.
6. OMR ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ಕೊಟ್ಟ ಸೂಚನೆಗಳನ್ನು ಜಾಗರೂಕತೆಯಿಂದ ಓದಿರಿ.
7. ಎಲ್ಲಾ ಕರಡು ಕೆಲಸವನ್ನು ಪುಸ್ತಿಕೆಯ ಕೊನೆಯಲ್ಲಿ ಮಾಡತಕ್ಕದ್ದು.
8. ನಿಮ್ಮ ಗುರುತನ್ನು ಬಹಿರಂಗಪಡಿಸಬಹುದಾದ ನಿಮ್ಮ ಹೆಸರು ಅಥವಾ ಯಾವುದೇ ಚಿಹ್ನೆಯನ್ನು, ಸಂಗತವಾದ ಸ್ಥಳ ಹೊರತು ಪಡಿಸಿ, OMR ಉತ್ತರ ಹಾಳೆಯ ಯಾವುದೇ ಭಾಗದಲ್ಲಿ ಬರೆದರೆ, ನೀವು ಅನರ್ಹತೆಗೆ ಬಾಧ್ಯರಾಗುತ್ತೀರಿ.
9. ಪರೀಕ್ಷೆಯು ಮುಗಿದನಂತರ, ಕಡ್ಡಾಯವಾಗಿ OMR ಉತ್ತರ ಹಾಳೆಯನ್ನು ಸಂವೀಕ್ಷಕರಿಗೆ ನೀವು ಹಿಂತಿರುಗಿಸಬೇಕು ಮತ್ತು ಪರೀಕ್ಷಾ ಕೊಠಡಿಯ ಹೊರಗೆ OMRನ್ನು ನಿಮ್ಮೊಂದಿಗೆ ಕೊಂಡೊಯ್ಯಕೂಡದು.
10. ಪರೀಕ್ಷೆಯ ನಂತರ, ಪರೀಕ್ಷಾ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನು ಮತ್ತು ನಕಲು OMR ಉತ್ತರ ಹಾಳೆಯನ್ನು ನಿಮ್ಮೊಂದಿಗೆ ತೆಗೆದುಕೊಂಡು ಹೋಗಬಹುದು.
11. **ನೀಲಿ/ಕಪ್ಪು ಬಾಲ್‌ಪಾಯಿಂಟ್ ಪೆನ್ ಮಾತ್ರವೇ ಉಪಯೋಗಿಸಿರಿ.**
12. **ಕ್ಯಾಲ್ಕುಲೇಟರ್, ವಿದ್ಯುನ್ಮಾನ ಉಪಕರಣ ಅಥವಾ ಲಾಗ್ ಟೇಬಲ್ ಇತ್ಯಾದಿಯ ಉಪಯೋಗವನ್ನು ನಿಷೇಧಿಸಲಾಗಿದೆ.**
13. ಸರಿ ಅಲ್ಲದ ಉತ್ತರಗಳಿಗೆ ಋಣ ಅಂಕ ಇರುವುದಿಲ್ಲ.
14. ಕನ್ನಡ ಮತ್ತು ಇಂಗ್ಲೀಷ್ ಆವೃತ್ತಿಗಳ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳಲ್ಲಿ ಯಾವುದೇ ರೀತಿಯ ವ್ಯತ್ಯಾಸಗಳು ಕಂಡುಬಂದಲ್ಲಿ, ಇಂಗ್ಲೀಷ್ ಆವೃತ್ತಿಗಳಲ್ಲಿರುವುದೇ ಅಂತಿಮವೆಂದು ಪರಿಗಣಿಸಬೇಕು.

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of Hundred multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of the cover page. Do not accept a booklet without sticker seal or open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.

   Example : (A) (B) ● (D)

   where (C) is the correct response.
5. Your responses to the questions are to be indicated in the **OMR Sheet kept inside this Booklet.** If you mark at any place other than in the circles in the OMR Sheet, it will not be evaluated.
6. Read the instructions given in OMR carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. You have to return the OMR Answer Sheet to the invigilators at the end of the examination compulsorily and must NOT carry it with you outside the Examination Hall.
10. You can take away question booklet and carbon copy of OMR Answer Sheet after the examination.
11. **Use only Blue/Black Ball point pen.**
12. **Use of any calculator, electronic gadgets or log table etc., is prohibited.**
13. **There is no negative marks for incorrect answers.**
14. **In case of any discrepancy found in the Kannada translation of a question booklet the question in English version shall be taken as final.**

CHEMICAL SCIENCES
Paper – II

Note : This paper contains **hundred (100)** objective type questions. **Each** question carries **two (2)** marks. **All** questions are **compulsory**.

1. Mendeleev proposed the existence of an unknown element and he named it as eka-aluminum. This element is

(A) Boron   (B) Indium

(C) Gallium   (D) Silicon

2. For the cations, Ce^{3+}, Eu^{3+}, Lu^{3+} and Ho^{3+}, the correct order of increasing ionic radii is [Given : Z Ce(58), Eu(63), Lu(71) and Ho(67)]

(A) $Ce^{3+} < Eu^{3+} < Ho^{3+} < Lu^{3+}$

(B) $Lu^{3+} < Eu^{3+} < Ho^{3+} < Ce^{3+}$

(C) $Ce^{3+} < Ho^{3+} < Eu^{3+} < Lu^{3+}$

(D) $Lu^{3+} < Ho^{3+} < Eu^{3+} < Ce^{3+}$

3. The sulphide ion, S^{2-} is isoelectronic with

(A) O^{2-} (B) Al^{3+}

(C) Na^+ (D) K^+

4. The geometries of IBr_2^+ and Br_3^-, respectively are

(A) Tetrahedral and tetrahedral

(B) Tetrahedral and trigonal bipyramidal

(C) Trigonal bipyramidal and linear

(D) Linear and linear

5. The hybridisations of the central atoms in MnO_4^-, NO_2^- and SO_2, respectively, are

(A) dsp^2, sp^3 and sp^3

(B) sp^3, sp^2 and sp

(C) dsp^2, sp and sp

(D) sd^3, sp^2 and sp^2

6. The bond order for i) NO^+ ii) NO^- and iii) NO is as follows

(A) i < ii < iii   (B) ii < iii < i

(C) i < iii < ii   (D) iii < ii < i

7. Which of the following is the most acidic in nature ?

(A) BeO

(B) MgO

(C) SrO

(D) CaO

8. In the reaction,
$H_2CO_3 + H_2O \rightleftharpoons HCO_3^- + H_3O^+$ the Brönsted acids, respectively are

(A) H_2O and HCO_3^-

(B) H_2O and H_3O^+

(C) H_2CO_3 and H_3O^+

(D) H_2CO_3 and HCO_3^-

9. Lithium nitride on complete hydrolysis yields

(A) Lithium hydroxide and ammonia

(B) Lithium nitrate and water

(C) Lithium oxide and dinitrogen

(D) Lithium and hydrozoic acid

10. The reaction of sodium amide with liquid ammonia (anhydrons) gives

(A) Sodium amide and hydrogen

(B) Sodium hydroxide and hydrazine

(C) Sodium nitride and hydrogen

(D) Sodium nitride and hydrazoic acid

11. The enthalpy change for the reaction, $2CO + O_2 \rightarrow 2CO_2$ is

Given : $C \equiv O$ bond energy = 1074 kJ/mol

$\qquad$ $O = O$ bond energy = 499 kJ/mol

$\qquad$ $C = O$ bond energy = 802 kJ/mol

(A) + 1043 kJ/mole

(B) + 2375 kJ/mole

(C) −744 kJ/mole

(D) −561 kJ/mole

12. The total number of bond pairs and lone pair of electrons present in the H_3PO_4 molecule is

(A) 5 and 2

(B) 8 and 6

(C) 8 and 8

(D) 5 and 8

13. An octahedral complex of formula $[M(AB)(CD)E_2]$ (AB and CD are unsymmetrical bidentate ligands and E is a monodentate ligand) can have

(A) 6 geometrical isomers and 4 of them will be optically active

(B) 5 geometrical isomers and 3 of them will be optically active

(C) 4 geometrical isomers and 2 of them will be optically active

(D) 3 geometrical isomers and 1 of them will be optically active

14. Among the following, the complex that absorbs the longest wavelength is

(A) $[Co(H_2O)_6]^{2+}$

(B) $[Co(NH_3)_6]^{3+}$

(C) $[CoF_6]^{3-}$

(D) $[Co(en)_3]^{2+}$

15. $NiBr_2$ reacts with $Ph_2(Et)$ P at low temperature to give a red colored compound, 'A' which on warming to 25°C forms a green colored compound, 'B'. The observed magnetic moments of A and B are respectively zero and 3.2 μ_B. The geometrics of A and B, respectively, are

(A) Tetrahedral and octahedral

(B) Octahedral and tetrahedral

(C) Tetrahedral and square planar

(D) Square planar and tetrahedral

16. For complexes : $[Co(NH_3)_5F]^{2+}$, $[Co(NH_3)_5Cl]^{2+}$, $[Co(NH_3)_5I]^{2+}$ and $[Co(NH_3)_5Br]^{2+}$, the correct order of decrease in the energy of LMCT bands is

(A) $[Co(NH_3)_5F]^{2+} < [Co(NH_3)_5Cl]^{2+} < [Co(NH_3)_5Br]^{2+} < [Co(NH_3)_5I]^{2+}$

(B) $[Co(NH_3)_5F]^{2+} < [Co(NH_3)_5Cl]^{2+} < [Co(NH_3)_5Br]^{2+} = [Co(NH_3)_5I]^{2+}$

(C) $[Co(NH_3)_5F]^{2+} > [Co(NH_3)_5Cl]^{2+} > [Co(NH_3)_5Br]^{2+} > [Co(NH_3)_5I]^{2+}$

(D) $[Co(NH_3)_5F]^{2+} > [Co(NH_3)_5Cl]^{2+} > [Co(NH_3)_5Br]^{2+} = [Co(NH_3)_5I]^{2+}$

17. Aqueous solution of $[Mn(H_2O)_6]^{2+}$ has very light pink colour. The best reason for it is

(A) d-d transitions are orbital-forbidden but spin allowed

(B) d-d transitions are both orbital-forbidden and spin-forbidden

(C) d-d transitions are orbital-allowed and spin-forbidden

(D) d-d transitions are orbital-allowed and spin allowed

18. Choose the correct statement(s) with reference to thorium (Th) and uranium (U)

i) Th forms iodides of the type, ThI_2, ThI_3 and ThI_4

ii) In the solid state, salts of $[UO_2]^{2+}$ contain a linear cation

iii) Reactions of NaOR with UCl_4 does not yield monomeric $U(OR)_4$ complexes

(A) i and ii only

(B) ii only

(C) i only

(D) ii and iii only

19. The 'total valence electrons' in $[H_2Ru_3(CO)_8(\mu\text{-pph}_2)_2]$ is

(A) 46   (B) 48

(C) 50   (D) 44

20. The total number of M-M bonds in the cluster, $Rh_4(CO)_{12}$ is

(A) Zero   (B) Eight

(C) Six   (D) Four

21. Oxidative addition of H-H, C-H and C-C bonds to a metal complex follows

(A) Electrophilic addition pathway

(B) Always radical pathway

(C) Nucleophilic addition pathway

(D) Three-centre concerted pathway

22. The species showing quadrupole bond (delta bond) is

(A) $Mo_2 (CH_2C_6H_5)_6$

(B) $Mo_2 (OOCCH_3)_4$

(C) $Cr_2 (CO)_4 (n^5 – Cp)_2$

(D) $Os_2 Cl_2 (OOCCH_3)_4$

23. According to Wades rules, the structure type of B_5H_9 is

(A) Nido   (B) Arachno

(C) Closo   (D) Hypo

24. 20 ml of an aqueous solution of Al^{3+} is shaken with 10 ml of oxine in chloroform and allowed to separate. If the extraction of Al in organic solvent is 95%, then the distribution ratio corresponds to

(A) 5   (B) 75

(C) 9.5   (D) 38

25. A constant current of 0.8 A is used to deposit copper at the cathode and O_2 at the anode of an eletrolytic cell. The number of moles of copper and oxygen deposited in 15.2 min, respectively, is (Given : Faraday constant, F = 96485 C $Cu^{2+} + Z\bar{e} \rightarrow Cu_{(s)}; 2H_2O \rightarrow O_2 + 4\bar{e} + 4H^+)$

(A) 3.78×10^{-3} and 3.98×10^{-3}

(B) 729.6 and 364.8

(C) 7.56×10^{-3} and 3.98×10^{-3}

(D) 3.78×10^{-3} and 1.89×10^{-3}

26. In the following metal enzyme catalyzed reactions, the metal ions present respectively, are

i) $2H_2O \rightarrow O_2 + 4H^+ + 4\bar{e}$

ii) $-\overset{\overset{\displaystyle H}{|}}{\underset{|}{C_1}} - \overset{|}{\underset{\underset{\displaystyle X}{|}}{C_2}} - \rightleftharpoons -\overset{\overset{\displaystyle H}{|}}{\underset{|}{C_1}} - \overset{|}{\underset{\underset{\displaystyle X}{|}}{C_2}} -$

iii) $AH_2 + H_2O_2 \rightarrow A + 2H_2O$

iv) $RH + 2H^+ + 2\bar{e} + O_2 \rightarrow ROH + H_2O$

(A) Cobalt, manganese, iron and zinc

(B) Manganese, cobalt, iron and iron

(C) Manganese, cobalt, copper and iron

(D) Iron, zinc, copper and iron

27. The key in the Perutz mechanism is the

(A) Paramagnetic nature of oxyhemoglobin

(B) High spin iron (II) in dioxygen-free heme

(C) Bohr effect in hemoglobin

(D) Sigmoidal curve exhibited by hemoglobin

28. ^1H and ^{31}P NMR spectra of PH_3 (^{31}P, 100% I = ½) consists of respectively,

(A) a doublet and a quartet

(B) a doublet and a doublet

(C) a singlet and a quartet

(D) a singlet and a singlet

29. The spin selection rule for electronic (allowed transitions) and NMR spectroscopy, respectively, are

(A) $\Delta s = \pm 1$ and $\Delta s = \pm 1$

(B) $\Delta s = 0$ and $\Delta s = 0$

(C) $\Delta s = 0$ and $\Delta s = \pm 1$

(D) $\Delta s = \pm 1$ and $\Delta s = 0$

30. In the following nuclear reaction, the 'X' is $^4_2\text{He} + {}^{27}_{13}\text{Al} \rightarrow {}^1_0\text{n} + \text{X}$

(A) $^{30}_{15}\text{Si}$ (B) $^{31}_{15}\text{P}$

(C) $^{31}_{15}\text{S}$ (D) $^{30}_{15}\text{P}$

31. Reaction between tetrachlorosilane and lithium aluminumhydride results in

(A) Silane and lithium tetrachloro aluminate

(B) Silicic acid and aluminum chloride

(C) Silane, lithium chloride and aluminum hydride

(D) Silane and lithium aluminosilicate

32. X-P-X bond angles for POX_3 (X = F, Cl, Br) molecules follow the order

(A) Br (104.1°), Cl (103.3°) and F (101.3°)

(B) Br (101.3°), Cl (103.3°) and F (104.1°)

(C) F (103.3°), Br (104.1°) and Cl (101.3°)

(D) Cl (104.1°), Br (101.3°) and F (104.1°)

33. The IUPAC name of camphor is

(A) 6-OXO-1,2,2-Trimethylbicyclo [2,2,1] heptane

(B) 1,7,7-Trimethylbicyclo [2,2,1] heptane 2-one

(C) 1,5,5-Trimethylbicyclo [2,2,1] heptane-2-one

(D) 1,7,7-Trimethylbicyclo [2,1,2] heptane-2-one

34. The IUPAC name for the following

compound is
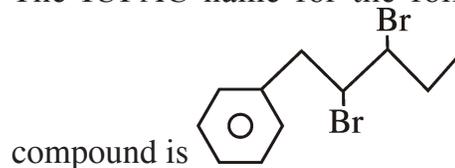
(A) 2,3-Dibromo pentyl benzene

(B) 5-phenyl-3,4-dibromopentane

(C) 2,3-Dibromo-1-phenylpentane

(D) 1-phenyl-2,3-dibromopentane

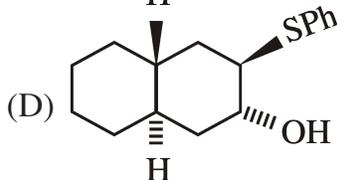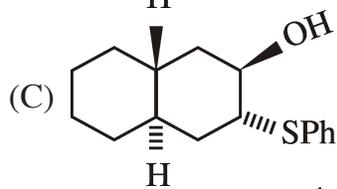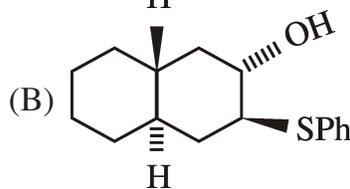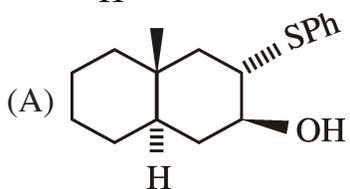**35.** Identify the correct structure of bicyclo [2,2,2] octane
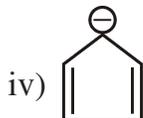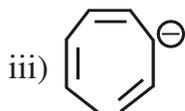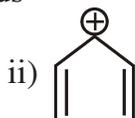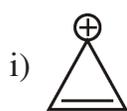
(A)

(B)

(C)

(D)
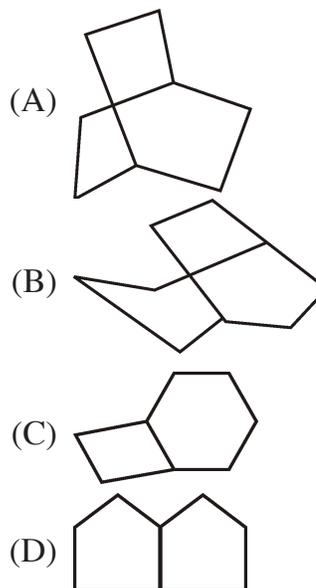
36. Which one of the following object is achiral ?

(A) Letter F (B) Letter P

(C) Ball (D) A pair of hand

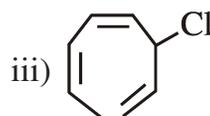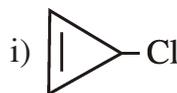**37.** The major product formed in the following reaction is

(A)

(B)

(C)

(D)
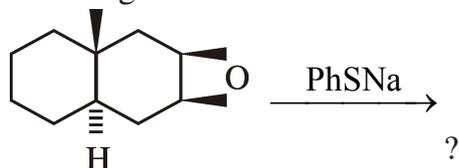
38. Among the following identity the aromatic compounds

i)   ii)

iii)   iv)

(A) i) and iii) (B) ii) and iv)

(C) i) and iv) (D) i) and ii)

39. Among the following which will undergoes ionization easily ?
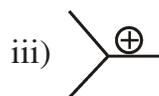
i)   ii)

iii)   iv)

(A) i) and iii)

(B) i) and ii)

(C) ii) and iv)

(D) ii) and iii)

40. The reactive intermediate involved in the carbylamine and Reimer-Tiemann reaction are

(A) Carbene and carbanion

(B) Only carbene

(C) Only carbanion

(D) Carbene and nitrene

41. Arrange the following carbocation in decreasing order of stability

i)   ii)
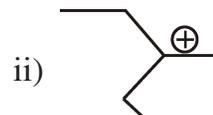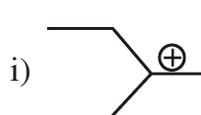
iii)   iv)

(A) i > ii > iii > iv

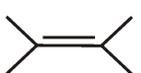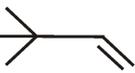(B) iv > i > iii > ii

(C) iii > i > ii > iv

(D) iv > ii > i > iii

42. Among the following the strongest nucleophile is

   (A) C_2H_5SH

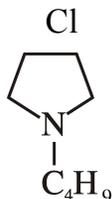   (B) $CH_3C\overset{\ominus}{O}O$

   (C) CH_3NH_2

   (D) $NC - \overset{\ominus}{C}H_2$

43. SN^1 reaction are favoured by

   (A) unsaturation at α-position

   (B) α-Branching

   (C) β-Branching

   (D) Presence of non-polar solvent

44. Dehydration of $(CH_3)_3C - CH(OH)CH_3$ with acid exclusively gives

   (A) >=<   (B) >—\

   (C) >=<   (D) >=\

45. The following reaction is known as

$$C_4H_9 - N - (CH_2)_3 - CH_3 \xrightarrow[\text{ii) Base}]{\text{i) } H_2SO_4}$$
|
Cl
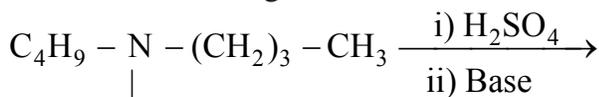
   (A) Shapiro reaction

   (B) Barton reaction

   (C) Baeyer-villiger reaction

   (D) Hofmann-Loeffter-Freytag reaction

46. Reaction of acetaldehyde with excess of formaldehyde in presence of NaOH fields
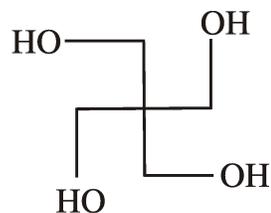
   The name of this reaction is

   (A) Cross cannizarro followed by aldol condensation

   (B) Consecutive aldol condensation followed by cross cannizarro reaction

   (C) Aldol condensation

   (D) Cannizarro reaction

47. Conversion of 1,2-dibromo compound to alkyne can be achieved by

   (A) Treating with aq. KOH

   (B) Fusion with KOH

   (C) Treating with zinc powder

   (D) Treating with triethylamine

48. Toluene can be converted into benzaldehyde by oxidation with

   (A) $KMnO_4$/alkali

   (B) $K_2Cr_2O_7/H_2SO_4$

   (C) CrO_2Cl_2

   (D) O_2/V_2O_5

49. Identify the correct synthetic equivalent for the preparation of following compound

(A) and

(B) +

(C) R – CHO +

(D) + Br

50. Identify the reagents for the following conversion $R - O - CH_2Ph \rightarrow R - OH + Ph - CH_3$

(A) DDQ or LAH

(B) DDQ or $H_2|Pd$

(C) $H_2|Pd$ or LAH

(D) HCl or HI

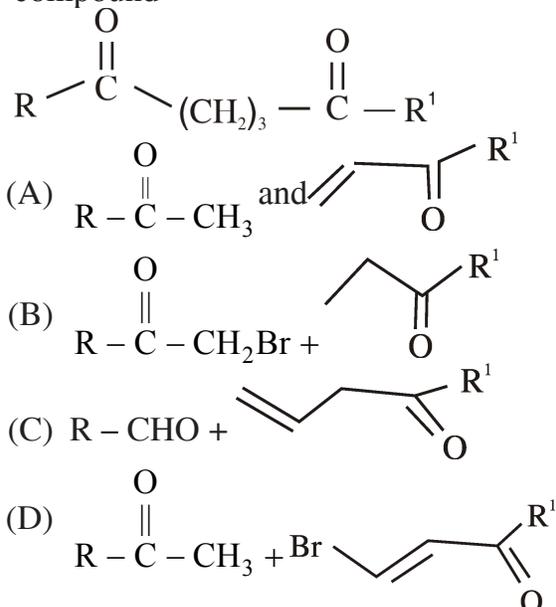**51.** A suitable reagent combination for carrying out the following conversion is
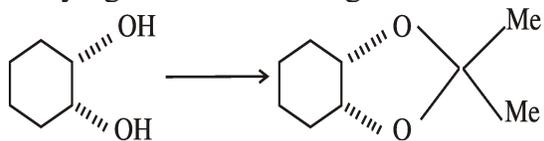
(A) Trimethyl ortho acetate and p-toluene sulfonic acid

(B) Trimethyl ortho acetate and sodium hydroxide

(C) 2-methoxypropene and p-toluene sulfonic acid

(D) 2-methoxypropene and sodium hydroxide

52. Selective reagents for the cis-hydroxylation of cyclohexene to cis-cyclohexane-1,2-diol are

(A) Perbenzoic acid followed by acid hydrolysis

(B) Bromination followed by hydrolysis

(C) Alkaline $KMnO_4$

(D) 1% $KMnO_4$ followed by hydrolysis

53. The reaction given below is an example of
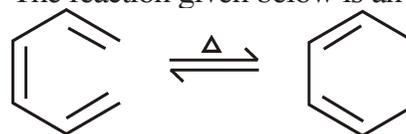
(A) Cycloaddition reaction

(B) Ene reaction

(C) Electrocyclic reaction

(D) Sigmatropic reaction

54. Identify the final product in the following
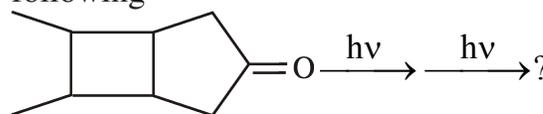
(A)

(B)

(C)

(D)

55. Among the following pericyclic reaction which is thermally allowed ?

(A) $\pi^2 s + \pi^2 s$

(B) $\pi^2 a + \pi^2 a$

(C) $\pi^2 s + \pi^4 a$

(D) $\pi^2 s + \pi^4 s$

56. Which of the following is more reactive than benzene towards electrophilic substitution reaction ?

(A) Pyrrole

(B) Furan

(C) Pyridine

(D) Both pyrrole and Furan

57. Nitration of furan is achieved by the following nitrating agent

(A) Fuming HNO_3

(B) $\overset{\oplus}{N}O_2 \ \overset{\ominus}{B}F_4$

(C) $ACONO_2$

(D) $HNO_3 + H_2SO_4$

58. Indole undergoes electrophilic substitution mainly at

(A) Position – 2

(B) Position –3

(C) Position – 4

(D) Position – 6 and 7

59. A compound with molecular mass m/z, 112 is transparent in the uv spectrum. In IR it shows two bands at 2940 cm^{-1} and 1464 cm^{-1}. In the PMR it gave a singlet at δ 1.52. What is the compound ?

(A) Octane

(B) Heptane

(C) Toluene

(D) Cyclooctane

60. The expected apparent mass of the metastable ion produced when ion having m/z, 77 decomposes by loss of acetylene to m/z, 51 will be

(A) 43.4

(B) 33.4

(C) 66.8

(D) 51.0

61. Which of the following ketone absorbs IR near 1750 cm^{-1} ?

(A) Acetone

(B) 2-methyl cyclobutanone

(C) 2-methyl cyclohexanone

(D) 2-methyl cyclopentanone

62. Which base is present in RNA, but not in DNA ?

(A) Uracil

(B) Cytosine

(C) Thymine

(D) Guanidine

63. Complete hydrolysis of cellulose gives

(A) D-Fructose

(B) D-Ribose

(C) D-Glucose

(D) L-Glucose

64. Predict the number of double bonds present in linolinic acid

(A) 3

(B) 2

(C) 1

(D) 4

65. Which of the following spectroscopy can give bond length in molecule ?

(A) Rotational spectroscopy

(B) Vibrational spectroscopy

(C) FTIR spectroscopy

(D) NMR spectroscopy

66. Precision refers to

(A) Agreement of measured parameters with the expected value

(B) Agreement among respective values of the measured parameters

(C) Agreement of highest and lowest values of the measured parameters

(D) Systematic error only

67. Using method of averages for fitting a data set $\{x_i, y_i\}$ to the equation $y = mx$, the coefficient 'm' is estimated by

(A) $\dfrac{\Sigma y_i^2}{\Sigma x_i^2}$

(B) $\dfrac{\Sigma x_i}{\Sigma y_i}$

(C) $\dfrac{\Sigma x_i y_i}{\Sigma y_i^2}$

(D) $\dfrac{\Sigma x_i y_i}{\Sigma x_i^2}$

68. AB_6 type of molecule having O_h point group if made to AB_5C type, the point group will become

(A) T_d

(B) C_{4V}

(C) C_{5V}

(D) C_{4h}

69. The product of two symmetry operations for a given molecule is always a symmetry operation. The product $\sigma(xy)\, S_4(z)$ gives

(A) $C_4(x)$

(B) $C_4(y)$

(C) $C_4(z)$

(D) $S_4(x)$

70. Part of the character table for the C_{3v} point group is given below

C_{3V}	E	$2C_3$	$3\sigma_v$	
A_1	1	1	1	Z
A_2	1	1	−1	
E	2	−1	0	(x,y)

for reducible representation, τ expressed as

C_{3v}	E	$2C_3$	$3\sigma_V$
τ	6	3	0

the reducible components are

(A) $E + 2A_1 + 2A_2$

(B) $2E + A_1 + A_2$

(C) $E + 3A_1 + A_2$

(D) $E + A_1 + 3A_2$

71. Mixing of gas 'X' with gas 'X' should not produce entropy change, is associated with

(A) Russell's paradox

(B) Helmholtz paradox

(C) Gibb's paradox

(D) Curry's paradox

72. Which of the following is the largest number ?

    (A) Planck constant

    (B) Boltzmann constant

    (C) Faraday constant

    (D) Gas constant

73. An open thermodynamic system is one in which

    (A) Mass does not cross boundaries of the system, but energy may do so

    (B) Neither mass nor energy crosses the boundaries of the system

    (C) Both energy and mass cross the boundaries of the system

    (D) Mass crosses the boundary but not the energy

74. For a chemical reaction $\Delta H = -100$ KJ and $\Delta S = -100$ J/K this reaction will be spontaneous at

    (A) 900 K   (B) 1000 K

    (C) 1100 K   (D) 1200 K

75. According to the phase rule, the number of degrees of freedom for a mixture of three gasses at constant temperature and pressure will be

    (A) Zero

    (B) One

    (C) Two

    (D) Three

76. The filling of molecular orbitals takes place according to

    (A) The Aufbau principle

    (B) Pauli Exclusion principle

    (C) Hund's rule of maximum multiplicity

    (D) All of the mentioned above

77. Which of the following is not a Hückel approximation in Hückel Molecular Orbital Theory (HMOT) ?

    (A) HMOT is applicable to planar molecules

    (B) The overlap integrals S_{ij} are taken as δ_{ij}

    (C) The energy integrals H_{ij} are taken as α (alpha)

    (D) The energy integrals H_{ij} are taken as either β (beta) or zero

78. For a free particle in one direction which of the following is correct ?

    (A) The energy is quantized

    (B) The energy can take any negative value

    (C) The wave function can be normalized

    (D) The energy can take any positive value

79. Which of the following is true for the acceptable wave function for bound state ?

    (A) The wave function must be real

    (B) The wave function must be even function

    (C) The wave function must be quadratically integrable

    (D) The wave function must be anti-symmetric with respect to interchange of any two particles

80. For a function $f(x) = Ae^{-2ix}$ for $1 \leq x \leq 5$, which one of the following is the value A such that the function is normalised for the given range of values ?

    (A) Zero

    (B) One

    (C) Two

    (D) Three

81. In an electrolytic solution molar conductance is related to the temperature as

    (A) Increases with increase in temperature

    (B) Decreases with increase in temperature

    (C) First increases and then decreases with increase of temperature

    (D) Not affected by temperature

82. Which of the following statement is the accurate explanation of the effect of adding CN^- to the cathode of a cell with a reaction

    $Cd + 2Ag^+ \rightarrow 2Ag + Cd^{2+}$ $E^0 = 1.2V$

    (A) $E°$ decreases because $Cd\,(CN)_4^{2-}$ formation

    (B) $E°$ increases because $Cd\,(CN)_4^{2-}$ formation

    (C) $E°$ increases because $Ag(CN)_2^-$ formation

    (D) $E°$ decreases because $Ag(CN)_2^-$ formation

83. The value of equilibrium constant for a feasible electrochemical cell reaction is

    (A) Less than zero

    (B) Zero

    (C) Equal to one

    (D) Greater than one

84. Substances whose solutions can readily diffuse through animal membranes are named as

    (A) Colloids   (B) Crystalloids

    (C) Electrolytes   (D) Non-electrolytes

85. The depolariser used in a dry cell battery is

    (A) NH_4Cl (B) MnO_2

    (C) KOH (D) Na_3PO_4

86. In electrochemical series, aluminium is above hydrogen, but it is stable in air and water, because

(A) Aluminium is non-reactive

(B) The layer of Al_2O_3 formed at the surface makes it stable

(C) ΔG is negative and the reaction is thermodynamically not favorable

(D) The activation energy is very high

87. Identify the incorrect statement.

(A) Rate law is an experimental observation but law of mass action is theoretical concept

(B) Rate law is different from expression of law of mass action

(C) Rate law is more useful than law of mass action in the development of mechanism

(D) Order of a reaction is equal to the sum of powers of concentration terms in rate law

88. Collision theory of a chemical reaction explains

(A) Rate of a reaction

(B) Order of a reaction

(C) Molecularity of a reaction

(D) Rate, order and molecularity

89. The velocity of a chemical reaction can be increased by all the factors except

(A) Increasing the temperature

(B) Increasing the concentration of reactants

(C) Increasing the activation energy

(D) Using a catalyst

90. For an elementary, irreversible parallel reaction $A \xrightarrow{k_1} R$, $A \xrightarrow{k_2} S$ the rate of consumption of A is given by

(A) $(k_1 - k_2)\, C_A$

(B) $(k_1 + k_2)\, C_A$

(C) $\dfrac{1}{2}(k_1 + k_2)\, C_A$

(D) $k_1\, C_A$

91. The rate of a reaction is represented by the following expression
$$+\frac{1}{2}\frac{d[C]}{dt} = -\frac{1}{3}\frac{d[D]}{dt} = +\frac{1}{4}\frac{d[A]}{dt}$$
the reaction is

(A) $4A + B \rightarrow 2C + 3D$

(B) $B + 3D \rightarrow 4A + 2C$

(C) $4A + 2C \rightarrow B + 3D$

(D) $2A + 3B \rightarrow 4C + D$

92. In a crystal the atoms are located at the position of

(A) Zero potential energy

(B) Infinite potential energy

(C) Minimum potential energy

(D) Maximum potential energy

93. Which of the following oxide shows electrical properties like metals ?

   (A) SiO_2

   (B) MgO

   (C) $SO_2(s)$

   (D) CrO_2

94. Which one of the following is not applicable to chemisorption ?

   (A) High magnitude of ΔH

   (B) Occurs at higher temperature

   (C) It is reversible

   (D) It forms monolayer

95. Addition of different types of monomers to form a polymer chain is known as

   (A) Chain reaction polymerisation

   (B) Copolymerisation

   (C) Addition polymerisation

   (D) Disproportionation

96. Which of the following is not a characteristic trait of polymer material ?

   (A) Low density

   (B) Resistant to chemical attack

   (C) Low cost

   (D) High strength

97. Excess of sodium ions in our body causes

   (A) High blood pressure

   (B) Low blood pressure

   (C) Diabetics

   (D) Anaemia

98. Total surface area for two identical particles separated by distance having perfect cubical shape of one unit length is _____ square unit.

   (A) 2

   (B) 4

   (C) 8

   (D) 12

99. The main pollutant of leather tannesies in the waste water is due to the salt of

   (A) Cs (III)

   (B) Pb (II)

   (C) Mg (II)

   (D) Cr (VI)

100. When the BOD value of a water sample is less than 5 ppm it indicates that water sample is

   (A) Rich in dissolved nitrogen

   (B) Poor in dissolved oxygen

   (C) Least polluted

   (D) Not suitable for aquatic life

Space for Rough Work