Test Paper : **II**

Test Subject : **CHEMICAL SCIENCES**

Test Subject Code : **K-2718**

Roll No. | | | | | | | | |

(Figures as per admission card)

OMR Sheet No. : _______________

TEST BOOKLET SERIAL 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 ಪತ್ರಿಕೆಯು 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) ಪಶ್ನೆಪುಸ್ತಿಕೆಗೆ 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 ಅಂಡಾಕೃತಿಯಲ್ಲದೆ 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 test 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. Among the following : NH_3 ; SO_3 ; PBr_3 ; $[SO_4]^{2-}$; $[NO_3]^-$; $AlCl_3$, the correct option showing species, containing a C_3 axis and a σ_h plane is

(A) $AlCl_3$, SO_3 and $[NO_3]^-$

(B) NH_3, PBr_3 and $[SO_4]^{2-}$

(C) $AlCl_3$, NH_3 and PBr_3

(D) SO_3, $[SO_4]^{2-}$ and NH_3

2. For the lanthanide ion having f^8 electronic configuration, the ground state term symbol and the number of microstates respectively are

(A) ${}^7F_6$ and 3003

(B) ${}^6H_{15/2}$ and 2002

(C) ${}^8S_{7/2}$ and 3003

(D) ${}^5I_8$ and 2002

3. The reaction between potassium amide and ammonium iodide in liquid ammonia is called as

(A) redox reaction

(B) precipitation reaction

(C) acid-base reaction

(D) complexometric reaction

4. The main difference between HPLC and UPLC is

(A) HPLC operates at higher mobile phase pressure and is reverse phase always

(B) UPLC employs smaller stationary phase particle size

(C) HPLC and UPLC employs different mobile phases

(D) HPLC and UPLC employs different detection methods

5. A thermogram of calcium oxalate monohydrate weighing 20.0 mg loses 2.46 mg in the temperature range of 105 – 260°C. The residue product formed is

(A) H_2O (B) $CaCO_3$

(C) $CaC_2O_4.H_2O$ (D) CaC_2O_4

6. The height equivalent of theoretical plates and total number of plates if the elution peak of the sample is 9.34 minutes with a base width of 0.43 minute and column length of 18.3 cm respectively are

(A) 2.42×10^{-2} and 7.55×10^3

(B) 2.42×10^{-3} and 0.755×10^3

(C) 2.42×10^{-3} and 7.55×10^3

(D) 3.88×10^{-2} and 471.79

7. In the coulometric titration of U^{4+} in the presence of excess Ce^{4+}, it was found to require 652 seconds to reach the equivalence point using a constant current of 100.0 mA. The number of moles of U^{4+} present in the solution is

[Given : $U^{4+} + 2Ce^{4+} + 2H_2O \rightleftharpoons UO_2^{2+} + 2Ce^{3+} + 4H^+$]

(A) 1.35×10^{-3} (B) 6.76×10^{-4}

(C) 1.69×10^{-4} (D) 3.38×10^{-4}

8. The active site of metalloprotein, oxyhemocyanin contains

(A) Fe (II) and O_2^{2-}

(B) Cu (II) and O_2^{2-}

(C) Fe (II) and O_2^-

(D) Fe (III) and O_2^{2-}

9. N-methyl imidazole coordinated iron (II) – picket fence porphyrin was employed as a model compound for the active site of

(A) rubredoxin (B) cytochromes

(C) peroxidase (D) myoglobin

10. The functions of transferrin, cytochrome and nitrogenase respectively are

(A) iron storage, electron transfer and nitrogen fixation

(B) iron transport, oxygen storage and nitrogen fixation

(C) iron storage, electron transfer and N_2H_4 fixation

(D) iron transfer, electron transfer and nitrogen fixation

11. A molecule shows two absorption peaks (^{13}C) at 870 and 975 Hz in a magnetic field of 3T. The corresponding chemical shifts in ppm are $\left(\text{Magnetogyric ratio for } ^{13}C = 6.7263\times10^{7} \text{ rad } T^{-1}s^{-1} \text{ ; for } ^{13}C = \frac{1}{2}\right)$.

(A) 277.1 and 310.5 ppm

(B) 13.6 and 15.2 ppm

(C) 27.1 and 30.4 ppm

(D) 32.1 and 35.8 ppm

12. The order of carbonyl stretching frequency in the IR spectra of acetone, benzamide and acetic anhydride is

(A) Acetic anhydride > acetone > benzamide

(B) Acetone > benzamide > acetic anhydride

(C) Benzamide > acetone > acetic anhydride

(D) Acetic anhydride > benzamide > acetone

13. The ^{13}C NMR spectrum of $CDCl_3$ consists of

(A) a singlet

(B) a doublet of 1 : 1 intensity

(C) a triplet of 1 : 2 : 1 intensity

(D) a triplet of 1 : 1 : 1 intensity

14. Choose the correct statements about CuI, $AuCl_2$ and $[Au(CN)_2]^-$ from the following :

i. CuI is white powder and $AuCl_2$ is unstable

ii. Both CuI and $[Au(CN)_2]^-$ are diamagnetic

iii. Both $AuCl_2$ and $[Au(CN)_2]^-$ are unstable

iv. CuI is diamagnetic but $[Au(CN)_2]^-$ is paramagnetic

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

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

15. The absorption spectrum of $[Ti(H_2O)_6]^{3+}$ shows a broad band with a shoulder because

(A) The ground state of $[Ti(H_2O)_6]^{3+}$ is Jahn-Teller distorted

(B) Under UV light, $[Ti(H_2O)_6]^{3+}$ is reduced to $[Ti(H_2O)_6]^{2+}$

(C) The excited state of $[Ti(H_2O)_6]^{3+}$ undergoes Jahn-Teller distortion

(D) $[Ti(H_2O)_6]^{3+}$ is a d^2 ion and hence two absorption bands are displayed

16. For the following, the correct option containing species which shows color that is NOT due to a d-d transition is : $VO^{2+}, CrO_4^{2-}, MnO_4^{2-}$ & MnO_4^-

(A) MnO_4^{2-} and CrO_4^{2-}

(B) VO^{2+} and MnO_4^-

(C) CrO_4^{2-} and MnO_4^-

(D) VO^{2+} and CrO_4^{2-}

17. The 'd' orbital(s) involved in the hybridisation representing square pyramidal geometry is (are)

(A) $d_{x^2-y^2}$ only

(B) $d_{x^2-y^2}$ and d_{z^2}

(C) d_{z^2} and d_{yz}

(D) d_{z^2} only

18. Among the following, the complex with a magnetic moment of 5.9 BM and also both EPR and Mössbauer active is

(A) $[Fe(CN)_6]^{3-}$ (B) $[Mn(H_2O)_6]^{2+}$

(C) $[Fe(H_2O)_6]^{2+}$ (D) $[Fe(H_2O)_6]^{3+}$

19. The complexes having square planar geometry and 16 valence electrons are

(A) Pd $(PPh_3)_4$ and Ni $(CO)_4$

(B) Pd $(PPh_3)_4$ and $PtCl_2$ $(PPh_3)_2$

(C) RhCl (CO) $(PPh_3)_2$ and Ni $(CO)_4$

(D) $PtCl_2$ $(PPh_3)_2$ and RhCl (CO) $(PPh_3)_2$

20. In the following catalytic reaction, the products obtained are

$$CH_4 \xrightarrow[\text{Steam, 800°C}]{\text{Ni Catalyst}} ?$$

(A) H_2 and CO

(B) H_2O and CO_2

(C) H_2 and CO_2

(D) H_2O and CO

21. The new isotope formed when atoms aluminum-27 are bombarded with alpha particles, along with a 'neutron' emission is

(A) $^{31}_{14}Si$ (B) $^{31}_{16}S$

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

22. The product nucleus obtained as a result of β(beta) decay is

(A) One atomic number lower than the original element

(B) Two atomic numbers higher than the original element

(C) One atomic number higher than the original element

(D) Two atomic numbers lower than the original element

23. Use the following data to calculate the <u>lattice</u> <u>enthalpy</u> of $KI_{(s)}$ at 298 K. All values are given in KJ/mol.

Enthalpy of sublimation of $K_{(s)}$ = 81

Ionization enthalpy of $K_{(g)}$ = 418

Enthalpy of dissociation of $I_{2(g)}$ = 214

Enthalpy of electron attachment to $I_{(g)} = -295$

Enthalpy of formation of $KI_{(s)}$ from $K_{(s)}$ and $\frac{1}{2} I_{2(g)}$ – 328

(A) 639 KJ/mol

(B) 573 KJ/mol

(C) 746 KJ/mol

(D) 680 KJ/mol

24. According to Wade's rules, boron hydride $[B_5H_5]^{2-}$ shows

(A) nido structure

(B) closo structure

(C) arachno structure

(D) hypho structure

25. Solid state structure of phosphorus pentachloride is best represented as

(A) $[PCl_4]^+[Cl]^-$

(B) $[PCl_4]^+[PCl_6]^-$

(C) PCl_5

(D) $Cl_5P - PCl_5$

26. Plaster of Paris is

(A) $CaSO_4 \cdot 2H_2O$

(B) $CaSO_4 \cdot 0.5H_2O$

(C) $CaCO_3 \cdot 2H_2O$

(D) $CaCO_3 \cdot 0.5H_2O$

27. The π bond strengths to carbon are in the order

(A) C = C > C = Si > C = Ge > C = Sn

(B) C = C < C = Si < C = Ge < C = Sn

(C) C = Si > C = C > C = Ge > C = Sn

(D) C = C < C = Si > C = Ge > C = Sn

28. Oxidation states of Xenon in $[XeO_2F_3]^-$ and $XeO_2(OTeF_5)_2$ respectively, are

(A) + 4 and + 6

(B) + 6 and + 8

(C) + 6 and + 6

(D) + 4 and + 8

29. The complex that shows quadrupole bonding (delta bond) is

(A) $[Re_2Cl_8]^{4-}$

(B) $[Mo_2(OAc)_4]$

(C) $[Re_2Br_4(PMe_3)_2]$

(D) $[Re_2Cl_6(PPh_3)_2]$

30. Column – I and Column – II contain, respectively, the molecular species and possible geometries. Match the species in Column – I with one or more correct geometries in Column – II. The correct option is

Column – I	**Column – II**
P. ICl_4^-	1. tetrahedral
Q. SOF_4	2. octahedral
R. XeF_4	3. square planar
S. SiH_4	4. trigonal bipyramidal
	5. trigonal pyramidal
	6. square pyramidal

(A) P = 4 ; Q = 6 ; R = 4 ; S = 1

(B) P = 4 ; Q = 2 ; R = 2 ; S = 3

(C) P = 2 ; Q = 4 ; R = 2 ; S = 1

(D) P = 2 ; Q = 6 ; R = 4 ; S = 5

31. Among the following chemical reactions, hydrogen acting as an oxidizing agent is

(A) $H_2 + Cl_2 \rightarrow 2HCl$

(B) $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

(C) $2Na + H_2 \rightarrow 2NaH$

(D) $CuO + H_2 \rightarrow Cu + H_2O$

32. The correct equation to calculate the screening constant (σ) for d-electron of Br (Z = 35) is

(A) $1 \times 10 + 0.85 \times 8 + 10 \times 0.35$

(B) $1 \times 18 + 0.35 \times 9$

(C) $0.85 \times 18 + 0.35 \times 10$

(D) $1 \times 10 + 0.85 \times 8 + 0.35 \times 9$

33. The following is the correct order as a result of polarisation in (i) melting points of the compounds : LiF, LiCl, LiBr and LiI and (ii) solubility of the compounds in polar solvents : AgF, AgCl, AgBr and AgI

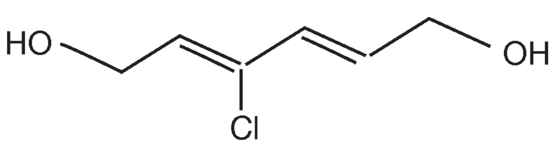
(A) LiF > LiCl > LiBr > LiI ; AgF > AgCl > AgBr > AgI

(B) LiF < LiCl < LiBr < LiI ; AgF < AgCl < AgBr < AgI

(C) LiF > LiCl > LiBr > LiI ; AgF < AgCl < AgBr < AgI

(D) LiF < LiCl < LiBr < LiI ; AgF > AgCl < AgBr > AgI

34. The IUPAC name of the following compound is



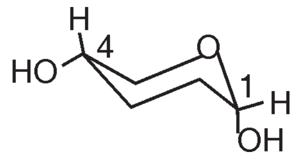
(A) 2E, 4E – 3 – chlorohex – 2, 4 – diene – 1, 6 – diol

(B) 2Z, 4E – 3 – chlorohex – 2, 4 – diene – 1, 6 – diol

(C) 2Z, 4Z – 4 – chlorohex – 2, 4 – diene – 1, 6 – diol

(D) 2E, 4Z – 4 – chlorohex – 2, 4 – diene – 1, 6 – diol

35. Which is the correct configurational notation for the following at C_1 and C_4 centres ?



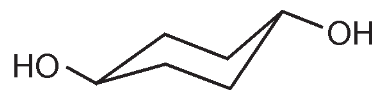
(A) 1R, 4R

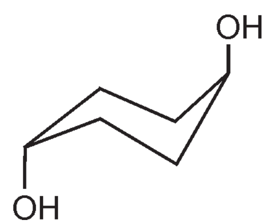
(B) 1S, 4R

(C) 1S, 4S

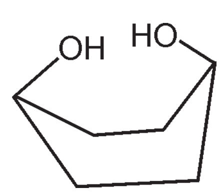
(D) 1R, 4S

36. Among the following, the most stable isomer for 1, 4 – cyclohexane diol is

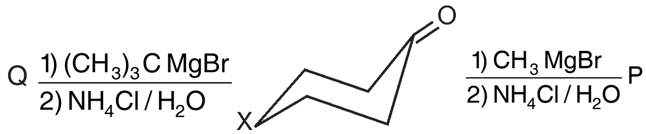
(A) 

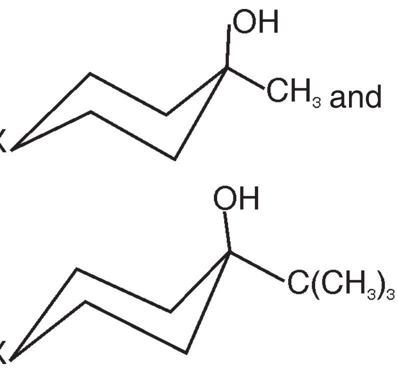
(B) 

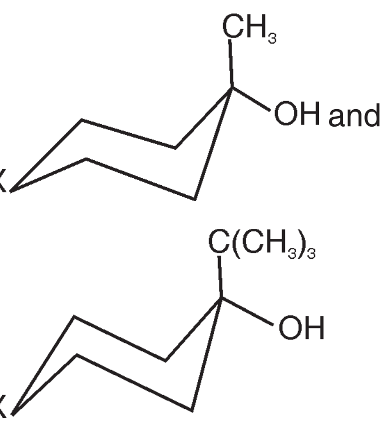
(C) 

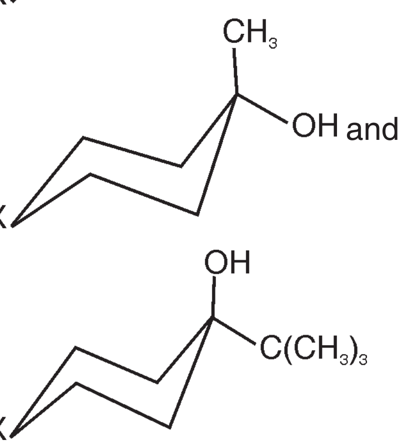
(D) 

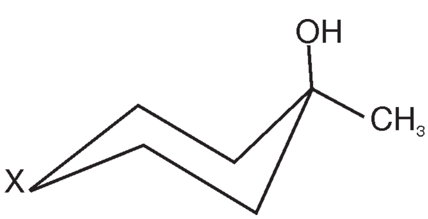
37. In the given reactions P and Q respectively are



(A) 

(B) 

(C) 

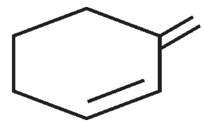
(D) Only 

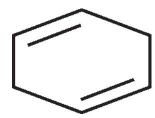
38. The major product in the following reaction is

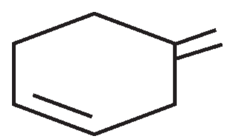
$$\text{Benzaldehyde} \xrightarrow[\text{ii) } H_3O^{\oplus}/\Delta]{\text{i) } Ph_3P = CHOCH_3} ?$$

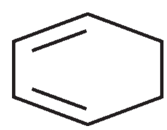
(A) $PhCH = CHCH_3$
(B) $PhCH_2CHO$
(C) $PhCH_2CH_2OH$
(D) $Ph - CH = CH - OCH_3$

39. Which of the following dienes is suitable as the diene component in a Diel's – Alder reaction ?

(A) 

(B) 

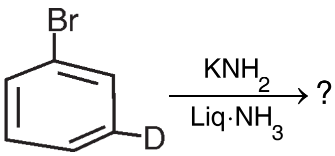
(C) 

(D) 

40. Which of the following is a non-aromatic annulene ?
(A) 18 – annulene
(B) 8 – annulene dianion
(C) 8 – annulene
(D) 9 – annulene anion

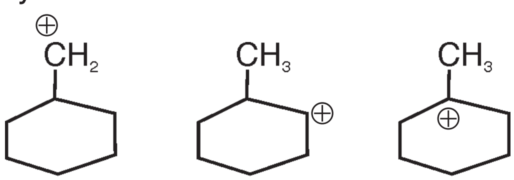
41. Butadiene on thermal electrocyclic ring closure reaction shows
(A) Dis-rotatory process
(B) Suprafacial rotatory process
(C) Con-rotatory process
(D) Antarafacial rotatory process

42. In the following reaction, the number of isomeric deutero anilines formed is



(A) only one (B) only two
(C) three (D) four

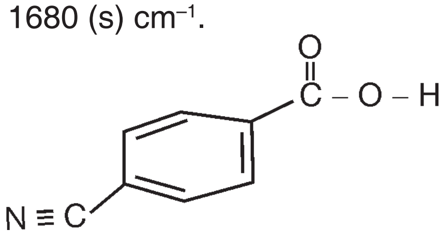
43. Which of the following carbocation is likely to undergo rearrangement through hydride shift ?



X Y Z

(A) only X (B) X and Y
(C) only Y (D) only Z

44. The IR stretching frequencies for the compound shown below are as follows : 3300 – 3500 (s, br), 3000 (m), 2225 (s), 1680 (s) cm^{-1}.



The correct assignment of the absorption band is

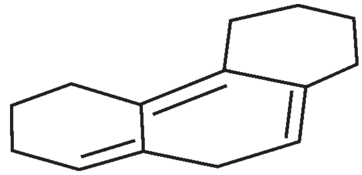
(A) $\gamma_{OH} = 3300 - 3500$; $\gamma_{CH} = 3000$
$\gamma_{CN} = 1680$; $\gamma_{CO} = 2225\ cm^{-1}$

(B) $\gamma_{OH} = 3300 - 3500$; $\gamma_{CH} = 2225$;
$\gamma_{CN} = 3000$; $\gamma_{CO} = 1680\ cm^{-1}$

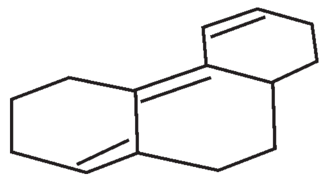
(C) $\gamma_{OH} = 3000$; $\gamma_{CH} = 3300 - 3500$;
$\gamma_{CN} = 2225$; $\gamma_{CO} = 1680\ cm^{-1}$

(D) $\gamma_{OH} = 3300 - 3500$; $\gamma_{CH} = 3000$;
$\gamma_{CN} = 2225$; $\gamma_{CO} = 1680\ cm^{-1}$

45. λ_{max} for the following compounds are



and



(A) 284 nm and 333 nm

(B) 333 nm and 284 nm

(C) 280 nm and 330 nm

(D) 330 nm and 280 nm

46. The formation of the base peak in mass spectrometry is due to

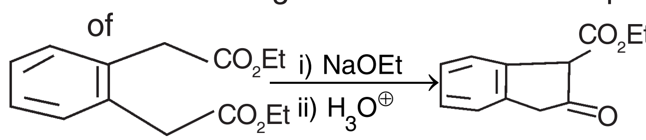
(A) only ionisation

(B) ionisation and stability of cation/ radical cation

(C) ionisation and stability of radical

(D) ionisation and stability of anion

47. The reaction given below is an example of



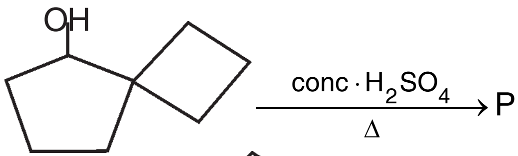
(A) Aldol condensation

(B) Knoevenagel condensation

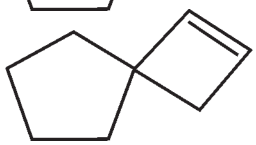
(C) Dieckmann cyclisation

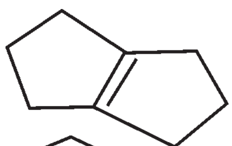
(D) Acyloin cyclisation

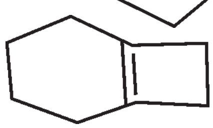
48. The rearranged product P of the reaction is



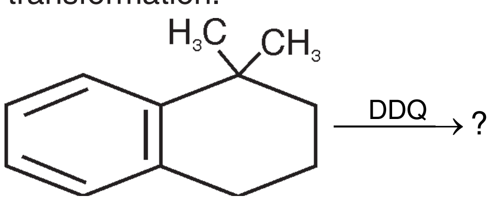
(A) 

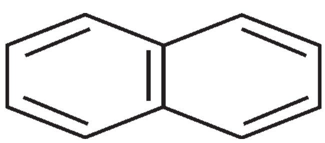
(B) 

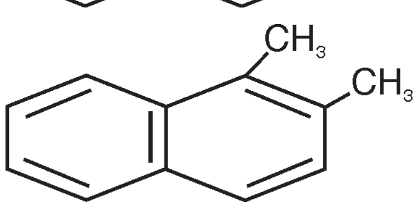
(C) 

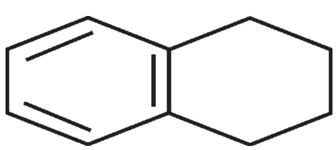
(D) 

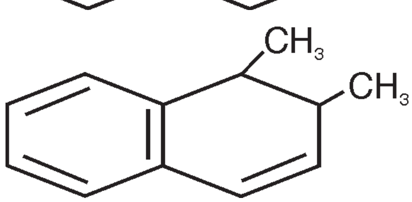
49. Predict the product for the following transformation.



(A) 

(B) 

(C) 

(D) 

50. α-D-glucose is converted to a mixture of α-D-glucose and β-D-glucose in water due to

(A) mutarotation
(B) epimerization
(C) conformational change
(D) racemization

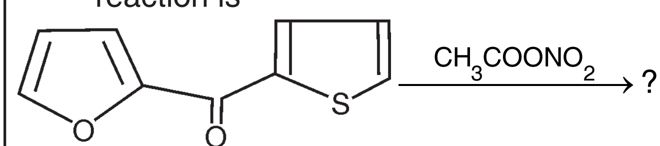
51. What is the sequence of bases in RNA molecule synthesized on the TATCTACCTGGA strand of DNA ?

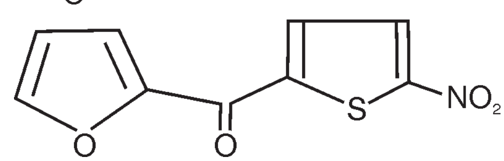
(A) AVAGAUGGACCU
(B) ATAGATGGACCT
(C) TATCTACCTGGA
(D) ATTUGGAATG

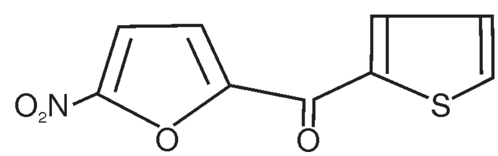
52. Hofmann degradation is useful in the structural determination of

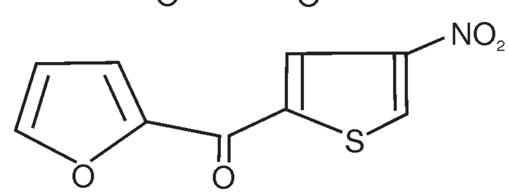
(A) Terpenoids (B) Lipids
(C) Steroids (D) Alkaloids

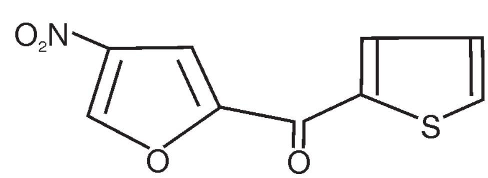
53. The major product formed in the following reaction is



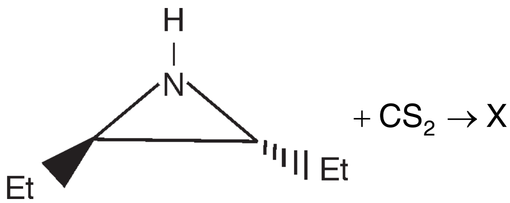
(A) 

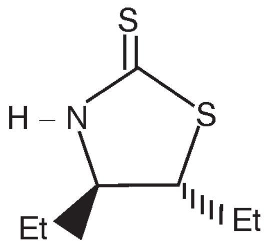
(B) 

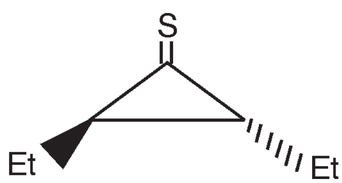
(C) 

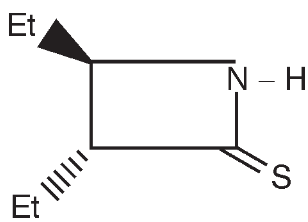
(D) 

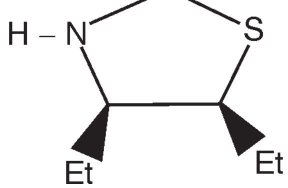
54. In the following reaction, X is



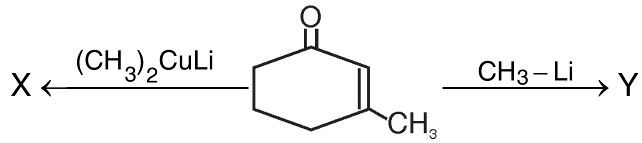
(A) 

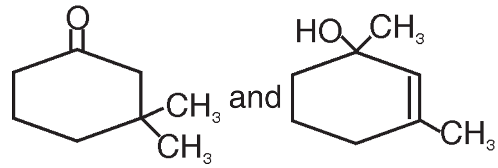
(B) 

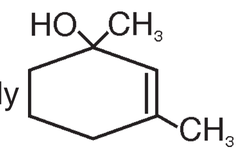
(C) 

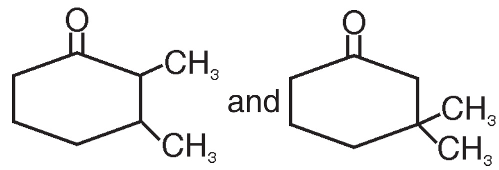
(D) 

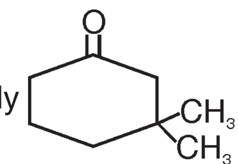
55. The products X and Y in the following reactions are



(A) 

(B) only 

(C) 

(D) only 

56. An organic compound of molecular formula $C_9H_{10}O_2$ showed three peaks in the PMR spectrum as given below : δ 1.96, singlet (3H), δ 5.0, singlet (2H) and δ 7.2, singlet (5H). In IR spectrum one of the intense bands of this compound appears at 1740 cm^{-1}. The structure of the compound is

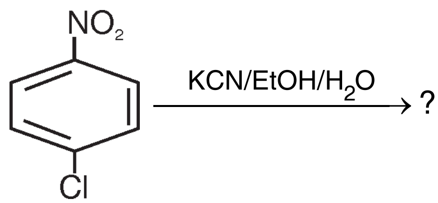
(A) $C_6H_5-CH_2-O-\overset{\overset{\large O}{||}}{C}-CH_3$

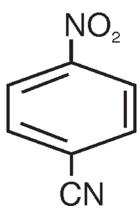
(B) $C_6H_5-CH_2-\overset{\overset{\large O}{||}}{C}-OCH_3$

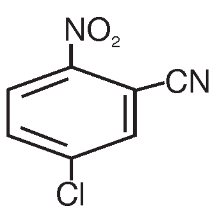
(C) $C_6H_5-O-CH_2-\overset{\overset{\large O}{||}}{C}-CH_3$

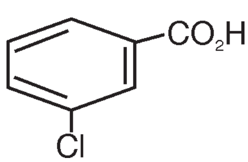
(D) $C_6H_5-O-\overset{\overset{\large O}{||}}{C}-CH_2-CH_3$

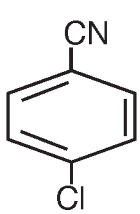
57. The product X formed in the following reaction is



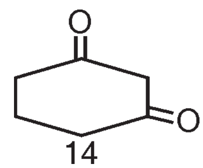
(A) 

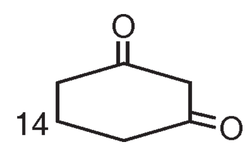
(B) 

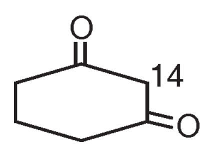
(C) 

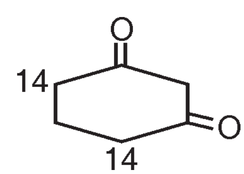
(D) 

58. Which of the following compound yields $^{14}CH_2I_2$ as a product when treated with I_2 in presence of NaOH ?

(A) 

(B) 

(C) 

(D) 

59. What happens when chloroform is oxidised on exposure to air ?

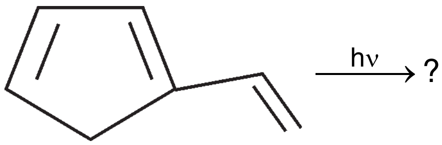
(A) Dichlorocarbene is produced

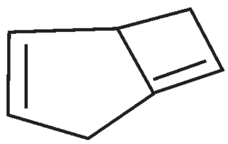
(B) Carbon dioxide is produced

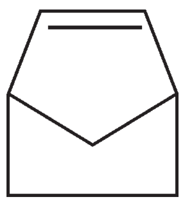
(C) Phosgene is produced

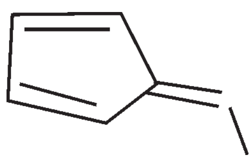
(D) Carbon monoxide is produced

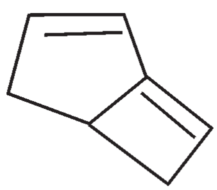
60. The most probable product in the following reaction is



(A) 

(B) 

(C) 

(D) 

61. Which one is not a green solvent among the following ?

(A) Liquid carbon dioxide

(B) Liquid ammonia

(C) Ionic liquids

(D) Water

62. The chemical bonding of carbon nanotubes is composed entirely by

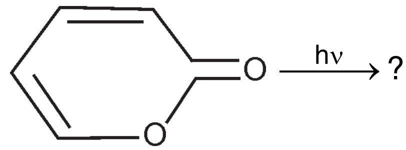
(A) sp bonds

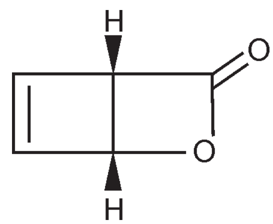
(B) sp^2 bonds

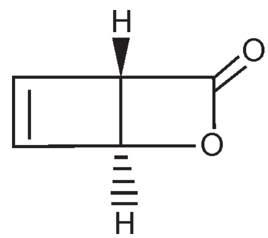
(C) sp^3 bonds

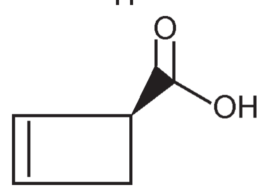
(D) sp and sp^3 bonds

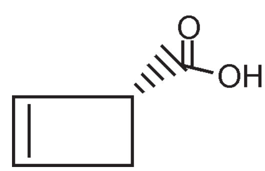
63. The product formed in the following reaction is



(A) 

(B) 

(C) 

(D) 

64. The products formed in the following reaction are

$$C_6H_5-O-CH_3 \xrightarrow[\text{ii) } H_3O^{\oplus}]{\text{i) } Me_3Si-I} ?$$

(A) C_6H_5-I and CH_3-OH

(B) C_6H_5-OH and CH_3-I

(C) $C_6H_5-SiMe_3$ and CH_3-OH

(D) C_6H_5-OH and CH_3-SiMe_3

65. The effective catalyst for the mutarotation of monosaccharides is

(A) pyridine

(B) phenol

(C) 2-hydroxypyridine

(D) anhydrous acetic acid

66. Among the following the narcotic analgesic is

(A) Heroin (B) Ibuprofen

(C) Naproxen (D) Aspirin

67. Crown ether and creptate have

(A) N and O donor atoms respectively

(B) S and N donor atoms respectively

(C) O and N donor atoms respectively

(D) O and S donor atoms respectively

68. ∇^2 in $\nabla^2\Psi + \frac{8\pi^2 m}{h^2}(E - V)\Psi = 0$ is known as

(A) Hamiltonian operator

(B) Laplacian operator

(C) Angular momentum

(D) Energy operator

69. If the function $f = e^{-ax}$ is acted upon by the operator $\frac{d}{dx}$, the eigen value and eigen function respectively are

(A) – a and e^{-ax} (B) 2a and e^{ax}

(C) ax and e^{-2x} (D) $\frac{d}{dx}$ and e^{ax}

70. The quantum mechanical operator for kinetic energy of a particle moving in three directions is

(A) $\frac{-h^2}{8\pi^2 m}\nabla^2$ (B) $\frac{h}{2\pi i}\nabla$

(C) $\frac{h}{8\pi^2 m}\nabla^2$ (D) $\frac{8\pi^2 m}{h^2}\nabla^2$

71. According to Schrodinger equation the energy of a particle (E_n) in one dimensional box

(A) $E_n = \frac{n^2h^2}{ma^2}$ (B) $E_n = \frac{n^2h^2}{4ma}$

(C) $E_n = \frac{n^2h^2}{8ma^2}$ (D) $E_n = \frac{nh}{8ma^2}$

72. The ground state term symbol for Nb (atomic number : 41) is ^6D.
The electronic configuration is

(A) [Kr] $4d^35s^2$ (B) [Kr] $4d^45s^1$

(C) [Kr] $4d^55s^0$ (D) [Kr] $4d^35s^15p^1$

73. The hybridization sp^3d gives rise to the following arrangement

(A) Linear

(B) Octahedral

(C) Trigonal bipyramidal

(D) Trigonal planar

74. In the following molecule, the hybrid state of 1 and 3 carbon atoms is
$CH_2 = C = CH_2$

(A) sp (B) sp^2

(C) sp^3 (D) sp^3d

75. The bond order of the super oxide (O_2^-) is

(A) 1.5 (B) 2.5

(C) 1.0 (D) 2.0

76. Which of the following species possesses both C_2 and C_3 axis ?

(A) SO_3 (B) NH_3

(C) PCl_3 (D) $\overset{\oplus}{H_3}O$

77. The symmetric streching vibrational mode of CO_2 molecule is

(A) IR and Raman inactive

(B) IR and Raman active

(C) IR inactive but Raman active

(D) IR active but Raman inactive

78. Arrange the methyl halides (CH_3Br, CH_3Cl, CH_3I, CH_3F) in the order of increasing field strength by ′HNMR technique.

(A) CH_3Cl, CH_3Br, CH_3I, CH_3F

(B) CH_3Br, CH_3Cl, CH_3I, CH_3F

(C) CH_3I, CH_3Br, CH_3Cl, CH_3F

(D) CH_3F, CH_3Cl, CH_3Br, CH_3I

79. The relation between ΔE and ΔH is
(A) $\Delta E = \Delta H + P\Delta V$
(B) $\Delta E = \Delta H - V\Delta P$
(C) $\Delta H = \Delta E + P\Delta V$
(D) $\Delta H = \Delta E - V\Delta P$

80. Using the fundamental equation $dA = - SdT - PdV$ the Maxwell relation is
(A) $\left(\frac{\partial S}{\partial T}\right)_T = \left(\frac{\partial V}{\partial S}\right)_V$
(B) $\left(\frac{\partial S}{\partial V}\right)_P = \left(\frac{\partial P}{\partial T}\right)_V$
(C) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_T$
(D) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$

81. The condensed phase rule used for Pb – Ag system is
(A) F = C – P + 1
(B) F = C + P – 1
(C) F = C – P + 2
(D) F = C + P + 2

82. The number of phases in equilibrium at triple point in water system are
(A) One (B) Two
(C) Three (D) Zero

83. The value of $1.38 \times 10^{-23}\ JK^{-1}$ represents
(A) Boltzmann constant
(B) Avogadro number
(C) Planck constant
(D) Gas constant

84. The rate of entropy production is
(A) sum of force and flux
(B) product of force and flux
(C) differences of force and flux
(D) $\frac{\text{force}}{\text{flux}}$

85. A quantity of PCl_5 was heated in a 10 litre vessel at 250°C. At equilibrium the vessel contains 0.10 mole of PCl_5, 0.20 mole of PCl_3 and 0.20 mole of Cl_2. The equilibrium constant of the reaction, $PCl_{5\,(g)} \rightleftharpoons PCl_{3\,(g)} + Cl_{2\,(g)}$ is
(A) 0.02 (B) 0.05
(C) 0.04 (D) 0.025

86. Le Chatelier's principle is not applicable to
(A) $Fe_{(s)} + S_{(s)} \rightleftharpoons FeS_{(s)}$
(B) $H_{2\,(g)} + I_{2\,(g)} \rightleftharpoons 2HI_{(g)}$
(C) $N_{2\,(g)} + 3H_{2\,(g)} \rightleftharpoons 2NH_{3\,(g)}$
(D) $N_{2\,(g)} + O_{2\,(g)} \rightleftharpoons 2NO_{(g)}$

87. The value of standard electrode potential for the change $Fe^{3+}_{(aq)} + e^- \rightarrow Fe^{2+}_{(aq)}$ will be $\left(\text{Given, } E^0_{Fe^{3+}/Fe} = -0.036\,V;\ E^0_{Fe^{2+}/Fe} = -0.439\,V\right)$
(A) – 0.072 V (B) + 0.385 V
(C) + 0.770 V (D) – 0.270 V

88. The standard E^0_{red} values of A, B and C are + 0.68 V, – 2.54 V, – 0.50 V respectively. The order of their reducing power is
(A) A > B > C (B) A > C > B
(C) C > B > A (D) B > C > A

89. The rate of equation for the reaction, $2\,AB + B_2 \rightarrow 2AB_2$ is given by rate = k [AB] [B_2]
A possible mechanism consistent with this rate law is
(A) $2AB + B_2 \xrightarrow{\text{slow}} 2\,AB_2$
(B) $AB + B_2 \xrightarrow{\text{slow}} AB_3$
$AB_3 + AB \xrightarrow{\text{fast}} 2\,AB_2$
(C) $AB + AB \rightleftharpoons A_2B_2$ (fast)
$A_2B_2 + B_2 \xrightarrow{\text{slow}} 2\,AB_2$
(D) $AB + B_2 \rightleftharpoons AB_3$ (fast)
$AB_3 + AB \xrightarrow{\text{slow}} 2\,AB_2$

90. Half life of a reaction is found to be inversely proportional to the cube of initial concentration. The order of the reaction is

(A) $1/3$ (B) 2

(C) 3 (D) 4

91. Which of the following is the Wilkinson's catalyst ?

(A) $(PPh_3)_2$ Ir (CO) Cl

(B) $(PPh_3)_3$ RhCl

(C) PtO_2

(D) Ra – Ni

92. The correct statements among the following are

1. A catalyst does not affect the equilibrium constant.
2. Le Chatelier's principle states that a system at equilibrium, when subjected to a disturbance responds in a way that minimizes the effect of the disturbance.
3. Increase in temperature favours the reactants in endothermic reactions and products in exothermic reactions.
4. Oxidation is the removal of electrons from a species and reduction is the addition of electrons to a species.

(A) 1, 2 and 3 (B) 1, 2 and 4

(C) 1, 3 and 4 (D) 2, 3 and 4

93. The following compound is used in the preparation of Terylene

(A) Adipic acid

(B) Bisphenol A

(C) Glycine

(D) Dimethyl terephthalate

94. The number average molecular weight of a polymer sample containing equal number of molecules of molecular mass 10^4 and 10^{15} is

(A) 0.5×10^9 (B) 0.5×10^{20}

(C) 5.5×10^4 (D) 5.0×10^4

95. The atoms in a molecule of water adopts what kind of geometry

(A) Square planar

(B) Trigonal planar

(C) Linear

(D) Tetrahedral

96. The coordinates for the atoms in a body centred cubic (bcc) unit cell are

(A) (0, 0, 0) and $\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right)$

(B) (0, 0, 0) and $\left(\frac{1}{2}, 0, 0\right)$

(C) (0, 0, 0) and $\left(0, \frac{1}{2}, 0\right)$

(D) (0, 0, 0) and $\left(0, 0, \frac{1}{2}\right)$

97. When a beam of light is passed through a colloidal solution, it gets

(A) scattered (B) absorbed

(C) reflected (D) refracted

98. An arsenic sulfide sol. carries (–)ve charge. The maximum precipitating power for this sol. is possessed by

(A) K_2SO_4 (B) $CaCl_2$

(C) Na_3PO_4 (D) $AlCl_3$

99. Median of the following set of results 0.124, 0.130, 0.128, 0.126 and 0.122 is

(A) 0.124 (B) 0.126

(C) 0.129 (D) 0.130

100. Precision refers to

(A) agreement of measured parameters with the theoretical value

(B) agreement among respective values of the measured parameters

(C) difference between the highest and lowest values of the measured parameters

(D) systematic errors only

Space for Rough Work