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PG-EE-2015

SUBJECT : Chemistry

A

10341

Sr. No. ....

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Father's Name \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

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(Signature of the Candidate)

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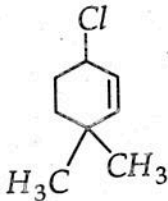
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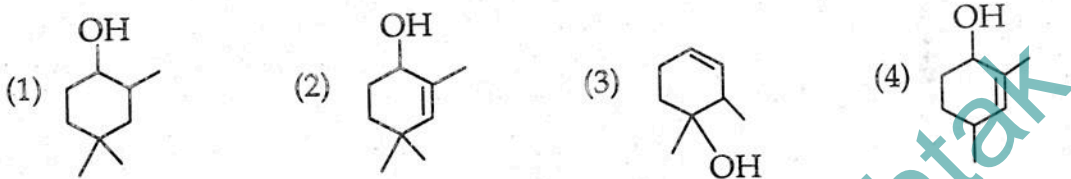
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2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
4. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
5. **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.**
6. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
7. *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-2015/Chemistry/(A)

SEAL

1. The number of optically active isomers of  $\text{HOCH}_2(\text{CHOH})_4\text{CHO}$  is :  
 (1) 4 (2) 8 (3) 16 (4) 24
2. Geometry of trifluoromethyl free radical is :  
 (1) Planar (2) Pyramidal (3) V-shaped (4) Tetrahedral

3.  on treatment with aqueous KOH gives :



4. Chloroform easily gets converted to poisonous phosgene in presence of air and sunlight. Which of the following substances is added to prevent formation of phosgene ?

- (1) Ethanol (2) Sodium carbonate  
 (3) Diethyl carbonate (4) Sodium hydroxide

5. n-Butane reacts with  $\text{Br}_2$  at  $130^\circ$  to give more amount of :

- (1)  $\text{CH}_3 - \text{CH}_2 - \underset{\text{Br}}{\text{CH}} - \text{CH}_3$  (2)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$

- (3)  $\text{H}_3\text{C} - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{Br}$  (4) All in equal amounts

6. The reaction of  $\text{CH}_3\text{CH}=\text{CH}-\text{C}_6\text{H}_4-\text{OH}$  with  $\text{HBr}$  gives :

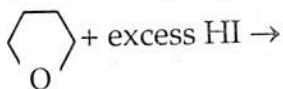
- (1)  $\text{CH}_3\text{CH}_2\text{CHBr}-\text{C}_6\text{H}_4-\text{OH}$  (2)  $\text{CH}_3\text{CH}_2\text{CHBr}-\text{C}_6\text{H}_3(\text{Br})-\text{OH}$   
 (3)  $\text{CH}_3\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{C}_6\text{H}_4-\text{OH}$  (4)  $\text{CH}_3\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{C}_6\text{H}_3(\text{Br})-\text{OH}$

7. Preparation of alkyl halides in laboratory is least preferred by :

- (1) Halide exchange (2) Direct halogenation of alkanes  
 (3) Treatment of alcohols (4) Addition of hydrogen halides to alkenes

8. Allyl alcohol is obtained when glycerol reacts with following at  $260^{\circ}\text{C}$  :  
 (1) Formic acid (2) Oxalic acid (3) Both (4) None

9. Predict the major product :

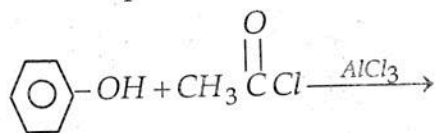


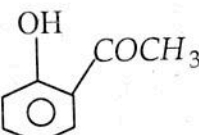
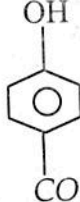

- (1)  $\text{HO}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{I}$  (2)  $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
 (3)  $\text{I}-\text{CH}_2\text{CH}_2\text{CH}_2-\text{CH}_2-\text{I}$  (4) No reaction

10. Conversion of chlorobenzene into phenol of Dow's process is an example of :

- (1) Free radical substitution (2) Nucleophilic substitution  
 (3) Electrophilic substitution (4) Rearrangement

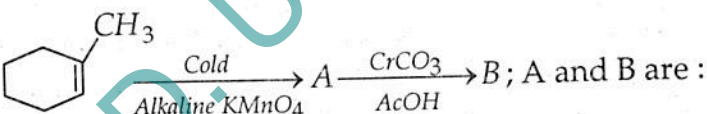
11. Predict the products of reaction below :

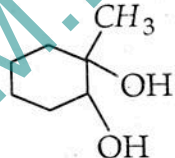
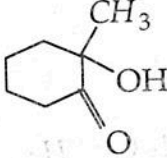
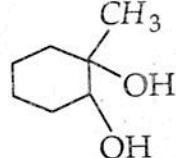
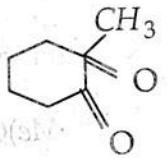
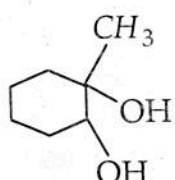
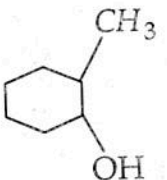


- (1)  (2)  (3)  (4) Both (1) and (2)

12. The product formed in the following reaction  $\text{C}_6\text{H}_5-\text{O}-\text{CH}_3 \xrightarrow[\text{Heat}]{\text{HI}}$  are :

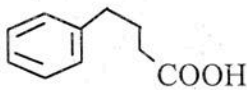
- (1)  $\text{C}_6\text{H}_5\text{OH}$  and  $\text{CH}_3\text{I}$  (2)  $\text{C}_6\text{H}_5\text{I}$  and  $\text{CH}_3\text{OH}$   
 (3)  $\text{C}_6\text{H}_5\text{I}$  and  $\text{CH}_3\text{I}$  (4)  $\text{C}_6\text{H}_6$  and  $\text{CH}_3\text{OI}$

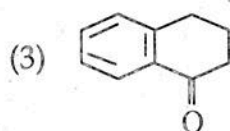
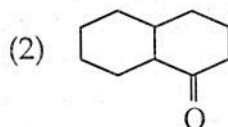
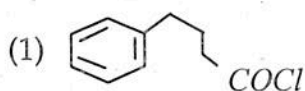
13.  ; A and B are :

- (1)  ,  (2)  ,   
 (3)  ,  (4) None of these



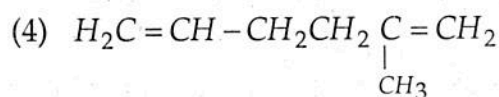
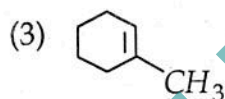
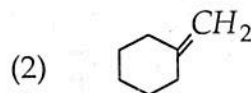
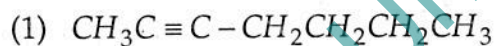
14. 3-methyl, 3-hexanol can be prepared by :
- (1)  $CH_3MgI$  and 3-hexanone, followed by hydrolysis
  - (2)  $C_2H_5MgI$  and 2-pentanone, followed by hydrolysis
  - (3)  $C_3H_7MgI$  and 2-butanone, followed by hydrolysis
  - (4) Any of the methods above
15. Which of the following does not give ethylamine on reduction ?
- (1) Methylcyanide (2) Ethylnitrile (3) Nitroethane (4) Acetamide
16. Activation of benzene ring by  $-NH_2$  in aniline can be reduced by treating with :
- (1) Dilute  $HCl$  (2) Ethyl alcohol (3) Acetic acid (4) Acetyl chloride

17.  on reaction with  $SOCl_2$  and then  $AlCl_3$  forms :

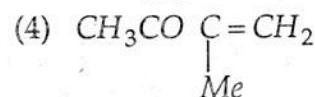
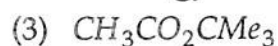
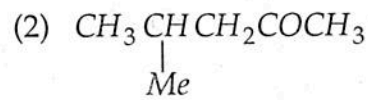
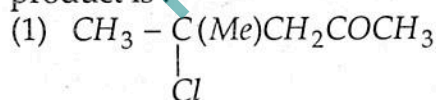


18. Hydrogenation of  $C_6H_5CHOHCOOH$  over  $Pd-Al_2O_3$  catalyst in methanol gives :
- (1)  $C_6H_5COOH$  (2)  $C_6H_{11}CHOHCOOH$
  - (3)  $C_6H_5CHOHCH_2OH$  (4)  $C_6H_{11}CH_2COOH$

19.  $C_7H_{12} \xrightarrow[\text{(iii) } \Delta]{\text{(i) } KMnO_4, \text{ (ii) } H^+} H_3C - \overset{\overset{O}{||}}{C} - CH_2 - CH_2 - CH_2 - CH_2 - COOH$ ,  $C_7H_{12}$  is :

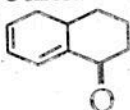


20. When 2-methyl propene is heated with acetyl chloride in presence of  $SnCl_2$ , the product is :





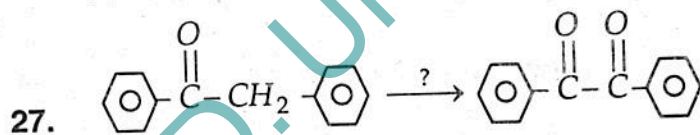
21. A nitrogenous substance X is treated with  $HNO_2$  and the product so formed is further treated with  $NaOH$  solution, which produces blue colouration. X can be :  
 (1)  $CH_3CH_2NH_2$  (2)  $CH_3CH_2NO_2$  (3)  $CH_3CH_2ONO$  (4)  $(CH_3)_2CHNO_2$
22. The monomeric unit present in natural rubber is :  
 (1) Butadiene (2) Terephthalic acid  
 (3) Hexamethylenetetramine (4) Isoprene
23. Ethylacetoacetate reacts with hydroxylamine and product formed immediately loses a molecule of ethanol to form :  
 (1) Methyl phenyl pyrazolone (2) 4-methylcoumarin  
 (3) Methyl oxazolone (4) Methyl isoxazolone
24. In UV the following compound would show absorption at :



- (1) 280 nm (2) 259 nm (3) 304 nm (4) 317 nm
25. Which of following reaction involves rearrangement of nitrogen yields ?  
 (1) Wittig reaction (2) Von-Richter reaction  
 (3) Sommet-Hauser rearrangement (4) Pinacol-Pinacolone rearrangement

26. Absolute configuration of  $\begin{array}{c} \text{COOH} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{COOH} \end{array}$  is :

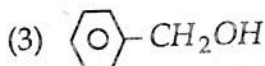
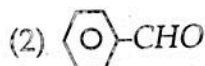
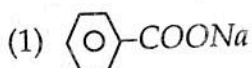
- (1) 2S, 3S (2) 2R, 3R (3) 2S, 3R (4) 2R, 3S



Reagent used for above reaction is :

- (1)  $NaBH_4 / CH_3OH$  (2)  $MnO_2$   
 (3)  $SeO_2$  (4)  $Br_2$  followed by reaction with  $KOH$

28. In the reaction  $\text{C}_6\text{H}_5\text{COCl} \xrightarrow{H_2 / Pd - BaSO_4} A \xrightarrow{NaOH} \text{Product}$ . The product is :



29. Heterocyclic  $\beta$ -ketoesters can be prepared by which one of following reactions ?

- (1) Aldol condensation
- (2) Micheal addition followed by Dieckmann condensation
- (3) Claisen ester condensation
- (4) Micheal addition

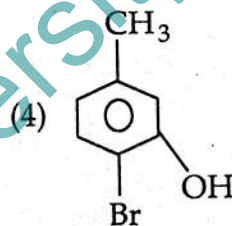
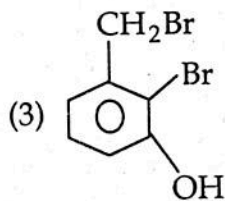
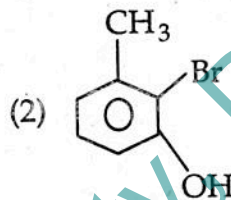
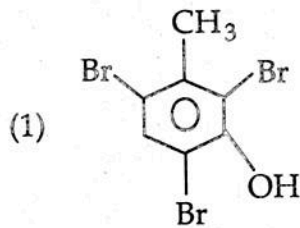
30. The artificial sweetner used in soft drinks is :

- (1) Glucose
- (2) Fructose
- (3) Asparatin
- (4) Glycerol

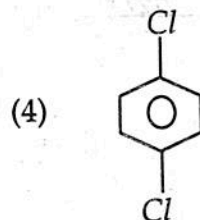
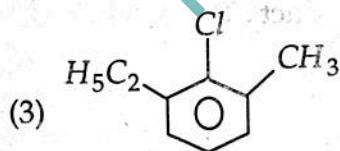
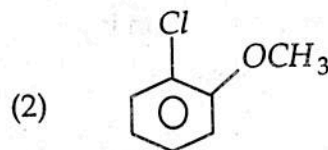
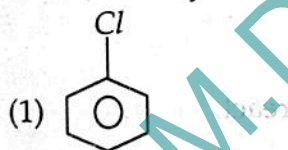
31. The IUPAC name of compound  $\begin{array}{c} \text{CH}_2 - \text{C} - \text{C} - \text{COOMe} \\ | \quad \quad \quad || \\ \text{COOMe} \quad \text{CH}_2 \end{array}$  is :

- (1) 2,3-dimethoxycarbonyl pent-1, 3-diene
- (2) 2-Ethylidene-3-methylidene dimethyl pentan-1, 5-dioate
- (3) 2-Ethylidene-3-methylidene-methyl-pentan-1, 5-dioate
- (4) None of these

32. m-cresol on bromination gives :



33. Which of the following compounds on reaction with  $\text{KNH}_2$  in  $\text{Liq NH}_3$  does not involve Benzyne intermediate ?



34. Allylic halogen substitution can be done with :  
 (1) Halogen at high temperature (2) NBS in sunlight  
 (3) Sulphuryl chloride in sunlight (4) All of these
35. Which of the following sets of quantum numbers is not allowed ?  
 (1)  $n = 3, l = 1, m = +2$  (2)  $n = 3, l = 1, m = \pm 1$   
 (3)  $n = 3, l = 0, m = 0$  (4)  $n = 3, l = 2, m = \pm 2$
36. Which of the following orbitals has zero probability of finding the electron in  $yz$  plane  
 (1)  $P_x$  (2)  $P_y$  (3)  $P_z$  (4)  $d_{yz}$
37. Which of the following orders regarding the ionization energy is correct ?  
 (1)  $N > O > F$  (2)  $F > O > N$  (3)  $N > O < F$  (4)  $O > F > N$
38. Most favourable conditions to form a covalent bond is :  
 (1) large cation and small anion (2) large cation and large anion  
 (3) small cation and small anion (4) small cation and large anion
39. Silicon doped with arsenic is an example of which type of semiconductor ?  
 (1) p-type (2) n-type (3) n, p-type (4) intrinsic
40. Which of the following defect, if present lowers the density of the crystal ?  
 (1) Frenkel (2) Schottky  
 (3) Edge dislocation (4) Constitution of F-centres
41. A hybrid orbital formed from  $s$  and  $p$  orbital can contribute to :  
 (1) a  $\sigma$  bond only (2)  $\pi$ -bond only  
 (3) either a  $\sigma$  or  $\pi$  bond (4) cannot be predicted
42. During change of  $NO^+$  to  $NO$ , the electron is added to :  
 (1)  $\sigma$ -orbital (2)  $\pi$ -orbital (3)  $\sigma^*$ -orbital (4)  $\pi^*$ -orbital
43. Intramolecular H-bonding is present in :  
 (1) meta nitrophenol (2) salicylaldehyde  
 (3) hydrogen chloride (4) benzophenone
44. Which forces are strongest amongst the following ?  
 (1) Ion-ion interaction (2) Ion-dipole forces  
 (3) Dipole-dipole forces (4) Dipole induced dipole forces
45. The product obtained in the reaction of diborane with excess of ammonia is :  
 (1)  $B_2H_6 \cdot NH_3$  (2)  $B_2H_6 \cdot 2NH_3$  (3)  $(BN)_x$  (4) Borazine



46. Pyrophosphoric acid is :  
(1) monobasic (2) dibasic (3) tribasic (4) tetrabasic
47. The basic unit in layer and sheet silicates is :  
(1)  $SiO_4^{4-}$  (2)  $Si_2O_7^{6-}$  (3)  $(SiO_3)_n^{2n-}$  (4)  $(Si_2O_5)_n^{2n-}$
48. Which of the following bonds is the strongest ?  
(1)  $F-F$  (2)  $Cl-Cl$  (3)  $I-I$  (4)  $Br-Br$
49. Hybridization and structure of  $XeF_4$  is :  
(1)  $sp^3d$ , trigonal bipyramidal (2)  $sp^3$ , tetrahedral  
(3)  $sp^3d^2$ , square planar (4)  $sp^3d^2$ , hexagonal
50. Which of the following transition element shows the highest oxidation state ?  
(1)  $Mn$  (2)  $Fe$  (3)  $V$  (4)  $Cr$
51. The planar complex (MABCD) gives :  
(1) two optical isomers (2) two geometrical isomers  
(3) three optical isomers (4) three geometrical isomers
52. Which one of the following compounds will behave as ammono base in ammonia ?  
(1)  $NaNH_2$  (2)  $NH_4OH$  (3)  $(NH_4)_2SO_2$  (4)  $(NH_4)_2CO_3$
53. The +3 ion of which of the following has half filled subshell ?  
(1)  $La$  (2)  $Lu$  (3)  $Gd$  (4)  $Ac$
54. In a nuclear reactor, oxides of which of the following metals are used as a fuel material ?  
(1) Uranium and Actinium (2) Thorium and Actinium  
(3) Uranium, Thorium and Plutonium (4) Thorium, Actinium and Plutonium
55. In qualitative analysis  $NH_4Cl$  is added before  $NH_4OH$  :  
(1) to decrease  $OH^-$  concentration (2) to increase  $OH^-$  concentration  
(3) for making  $HCl$  (4) statement is wrong
56. The brown ring test for  $NO_2^-$  and  $NO_3^-$  is due to the formation of complex ion having the formula :  
(1)  $[Fe(H_2O)_6]^{2+}$  (2)  $[Fe(NO)(CN)_5]^{2+}$   
(3)  $[Fe(H_2O)_5NO]^{2+}$  (4)  $[Fe(H_2O)(NO)_5]^{2+}$
57. The crystal field stabilization energy (CFSE) will be the highest for :  
(1)  $[CoF_6]^{3-}$  (2)  $[Co(CNS)_4]^{2-}$  (3)  $[Mn(H_2O)_6]^{2+}$  (4)  $[Co(NH_3)_6]^{3+}$

58. The expected spin-only magnetic moments for  $[Fe(CN)_6]^{4-}$  and  $[FeF_6]^{3-}$  respectively are :
- (1) 1.73 and 1.73 BM (2) 1.73 and 5.92 BM  
 (3) 0.0 and 1.73 BM (4) 0.0 and 5.92 BM
59. In tetrahedral geometry, which are of the following sets of electronic configurations will have orbital contribution to the magnetic moment ?
- (1)  $d^3, d^4, d^8$  and  $d^9$  (2)  $d^1, d^6, d^7$  and  $d^9$   
 (3)  $d^3, d^4, d^7$  and  $d^9$  (4)  $d^1, d^3, d^4$  and  $d^9$
60. The most suitable route to prepare the trans isomer of  $[PtCl_2(NH_3)(PPh_3)]$  is :
- (1)  $[PtCl_4]^{2-}$  with  $PPh_3$  followed by reaction with  $NH_3$   
 (2)  $[PtCl_4]^{2-}$  with  $NH_3$  followed by reaction with  $PPh_3$   
 (3)  $[Pt(NH_3)_4]^{2+}$  with  $HCl$  followed by reaction with  $PPh_3$   
 (4)  $[Pt(NH_3)_4]^{2+}$  with  $PPh_3$  followed by reaction with  $HCl$
61. The ground state term symbol for  $d^3$  is :
- (1)  ${}^4F_{3/2}$  (2)  ${}^4F_{9/2}$  (3)  ${}^4D_{5/2}$  (4)  ${}^4P_{3/2}$
62. The pair of metal carbonyl complexes that are isoelectronic is :
- (1)  $[Ni(CO)_4]$  and  $V(CO)_6$  (2)  $[Co(CO)_4]^-$  and  $Ni(CO)_4$   
 (3)  $[Cr(CO)_6]$  and  $V(CO)_6$  (4)  $[Fe(CO)_4]^-$  and  $Cr(CO)_6$
63. Which one of the following is a soft acid according to Pearson's concept of hard and soft acids ?
- (1)  $Ag^+$  (2)  $I^{7+}$  (3)  $Sr^{2+}$  (4)  $Al^{3+}$
64. Which one of the following chemical species can behave both as a Bronsted-Lowry acid and a base ?
- (1)  $H_3O^+$  (2)  $HCO_3^-$  (3)  $NO_3^-$  (4)  $SO_4^{2-}$
65. In oxyhaemoglobin  $Fe$  is in state :
- (1) Low spin and diamagnetic (2) Low spin and paramagnetic  
 (3) High spin and diamagnetic (4) High spin and paramagnetic
66. Zeise's salt is represented by :
- (1)  $H_2PtCl_6$  (2)  $[PtCl_4]^{2-}$  (3)  $[ZnCl_4]^{2-}$  (4)  $[PtCl_3(n^2-C_2H_4)]^-$
67. The asymmetry in the electronic absorption spectrum in the visible region of  $[Ti(H_2O)_6]^{3+}$  is caused by :
- (1) charge transfer (2)  $t_2 \rightarrow e$   
 (3)  $e \rightarrow t$  (4) John-Teller effect



68. Which of the following is correct ?

- (1)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + [\hat{A}, \hat{B}] \hat{A}$  (2)  $[A^2, B] = \hat{A}[\hat{B}, \hat{A}] + [\hat{A}, \hat{B}] \hat{A}$   
 (3)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + \hat{A}[\hat{A}, \hat{B}]$  (4) None of the above

69. The operator for square of linear momentum,  $\hat{p}^2$  is given by :

- (1)  $\hat{p}^2 = \hbar^2 \nabla^2$  (2)  $h^2 \nabla^2$  (3)  $\hat{p}^2 = -\hbar^2 \nabla^2$  (4)  $i\hbar \nabla^2$

70. Eigen value is always a :

- (1) zero value (2) infinite value (3) positive value (4) negative value

71. Entropy is related to probability by relation :

- (1)  $S = R \ln W$  (2)  $S = \frac{R}{\ln W}$  (3)  $S = k \ln W$  (4)  $S = \frac{k}{\ln W}$

72. The organic compound  $C_2H_6O$  possess :

- (1) One equivalent  $CH_3$  group (2) Two equivalent  $CH_3$  groups  
 (3) Two non-equivalent  $CH_3$  groups (4) None of these

73. Thermal conductivity of gas is independent of :

- (1) Pressure (2) Temperature  
 (3) Mean free path (4) Heat capacity at constant volume

74. The vibrational degrees of freedom of a protein molecule containing 44,700 atoms are :

- (1) 13,410 (2) 44,700 (3) 31 (4) 1,34,100

75. The equation for predicting atmospheric pressure, called Barometric formula is :

- (1)  $P = P_0 \exp\left(\frac{-Mgx}{RT}\right)$  (2)  $P = P_0 \exp\left(\frac{Mgx}{RT}\right)$   
 (3)  $P = P_0 \exp\left(\frac{Mg}{RT}\right)$  (4)  $P = P_0 \exp\left(\frac{Mgx^2}{RT}\right)$

where  $x, g$  are the altitude and acceleration due to gravity.

76. The Vander Waals equation for 'n' moles of gas is expressed by :

- (1)  $P = \frac{RT}{V-nb} - \frac{an^2}{V^2}$  (2)  $P = \frac{nRT}{V-nb} - \frac{an^2}{V^2}$   
 (3)  $P = \frac{nRT}{nV-b} - \frac{an^2}{V^2}$  (4)  $P = \frac{nRT}{V-b} - \frac{an^2}{V^2}$

77. The mass less particles are :

- (1) Protons (2)  $\alpha$ -rays (3) gamma rays (4)  $\beta$ -particles

78. Absorbance A of the solution is expressed as :

- (1)  $\log\left(\frac{I}{I_0}\right)$  (2)  $\frac{I}{I_0}$  (3)  $\ln\left(\frac{I}{I_0}\right)$  (4)  $\log\frac{I_0}{I}$



79. A real gas most closely approaches the behaviour of a perfect gas at :  
 (1) low pressure and high temperature (2) high pressure and low temperature  
 (3) low pressure and low temperature (4) high pressure and high temperature
80. The boiling point of a liquid is  $36^\circ\text{C}$ . Assuming that it obeys Trouton's rule, its molar heat of vaporization will be :  
 (1)  $271.92 \text{ KJ mol}^{-1}$  (2)  $27.192 \text{ KJ mol}^{-1}$   
 (3)  $2719.2 \text{ KJ mol}^{-1}$  (4)  $2.71 \text{ KJ mol}^{-1}$
81. The Miller indices of crystal planes which cut through the crystal axis at  $(2a, -3b, -3c)$  are :  
 (1)  $(\bar{2} \bar{2} 3)$  (2)  $(\bar{2} 3 \bar{2})$  (3)  $(3 \bar{2} \bar{2})$  (4)  $(2 3 2)$
82. A tetragonal crystal possesses the following axis of symmetry :  
 (1) two-fold (2) six-fold (3) four-fold (4) three-fold
83. The temperature below which a gas becomes cooler on expansion is called :  
 (1) Boyle temperature (2) Inversion temperature  
 (3) Critical temperature (4) Boiling point
84. For one mole of the gaseous mixture, the entropy of mixing is given by :  
 (1)  $\Delta S_{mix} = -R \sum r_i \ln x_i$  (2)  $\Delta S_{mix} = -R \sum \ln x_i$   
 (3)  $\Delta S_{mix} = -R \sum r_i \ln r_i$  (4)  $\Delta S_{mix} = -R \sum x_i \ln x_i$   
 where  $r_i, x_i$  represent activity coefficient and mole fraction of components in the mixture.
85. Which of the followings is correct ?  
 (1)  $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$  (2)  $\left(\frac{\partial S}{\partial P}\right)_T = \left(\frac{\partial V}{\partial S}\right)_P$   
 (3)  $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$  (4)  $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$
86. The standard state for a solid is the pure state of solid at :  
 (1) one atmospheric pressure and  $273^\circ\text{C}$   
 (2) one atmospheric pressure and given temperature  
 (3)  $273 \text{ K}$   
 (4) one atmospheric pressure and  $273 \text{ K}$
87. In the limit  $T \rightarrow 0$ , for a crystal :  
 (1)  $S_T = C_P$  (2)  $S_T = C_V$  (3)  $S_T = C_{P/3}$  (4)  $S_T = C_{V/T}$   
 where  $C_P, C_V$  are heat capacity at constant pressure and volume respectively.

88. Which aqueous solution of urea freezes at  $-0.93^{\circ}\text{C}$  ( $k_f = 1.86$ ) ?  
 (1) 30 gm in one litre of solution (2) 150 gm in 5 litre of water  
 (3) 30 gm in 500 ml of water (4) 150 gm in five litre of solution
89. The parameters of an orthorhombic unit cell is  $a = 50$  pm,  $b = 100$  pm,  $c = 150$  pm. The spacing between (123) planes will be :  
 (1) 29 pm (2) 0.029 pm (3) 0.29 pm (4) 2.9 pm
90. Milk is a/an :  
 (1) Gel (2) Emulsion (3) Suspension (4) Pure solution
91. The rate constant for a second-order reaction is  $3.33 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ . If the initial concentration of the reactant is  $0.05 \text{ mol dm}^{-3}$ , then its half life period is :  
 (1) 100 minutes (2) 10 minutes (3) 300 seconds (4) 1.0 minute
92. Triple point is the point where :  
 (1) Three components are in equilibrium  
 (2) The number of degrees of freedom is three  
 (3) The number of degrees of freedom is zero  
 (4) Three components are not in equilibrium
93. For the distribution of organic solute between water ( $C_1$ ) and benzene ( $C_2$ ), partition coefficient  $k = \sqrt{C_2} / C_1$  suggest that :  
 (1) solute exist as monomer in Benzene  
 (2) solute as exist as dimer in benzene  
 (3) solute exist as dimer in water  
 (4) None of these
94. In the lead acid battery during charging the cathodic reaction is :  
 (1) Formation of  $\text{PbSO}_4$  (2) Formation of  $\text{PbO}_2$   
 (3) Reduction of  $\text{Pb}^{2+}$  to  $\text{Pb}^{+1}$  (4) Reduction of  $\text{Pb}^{+2}$  to  $\text{Pb}$
95. Which of the following is not a state function ?  
 (1) Work (2) Enthalpy (3) Heat (4) Gibbs free energy
96. The pH of a solution obtained by mixing 25 ml of 0.2 M  $\text{HCl}$  with 50 ml of  $\text{NaOH}$  ( $k_w = 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ ) will be :  
 (1) 10 (2) 1.3 (3) 13 (4) 12
97. The emulsifiers consist of :  
 (1) Ionic compound  
 (2) Ionic surfactants  
 (3) Ionic as well as Non-ionogenic surfactant  
 (4) Non-ionic surfactants

98. The rotational spectra of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :
- (1)  $2B$                       (2)  $B$                       (3)  $3B$                       (4)  $3B/2$
- where  $B$  is the rotational constant.
99. Strong covalent bond exists between polymer chains in :
- (1) Thermoplasts    (2) Thermosets    (3) Elastomers    (4) All polymers
100. Choose the correct one :
- (1)  $1 \text{ eV} = 806.56 \text{ cm}^{-1}$                       (2)  $1 \text{ eV} = 806506 \text{ cm}^{-1}$   
(3)  $1 \text{ eV} = 80.656 \text{ cm}^{-1}$                       (4)  $1 \text{ eV} = 8065.6 \text{ cm}^{-1}$

M.D. University, Rohtak



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**PG-EE-2015**  
**SUBJECT : Chemistry**

**B**

Sr. No. .... **10350** .....

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Father's Name \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

\_\_\_\_\_  
(Signature of the Candidate)

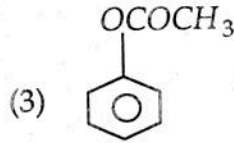
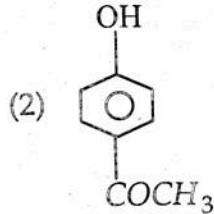
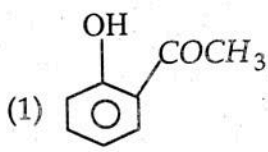
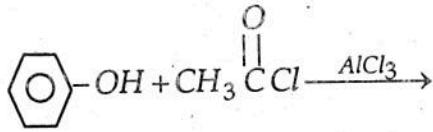
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STARTING THE QUESTION PAPER.**

1. **All questions are compulsory.**
2. 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/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
4. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
5. **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.**
6. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
7. **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.**

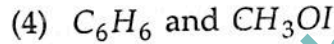
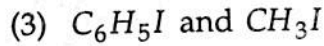
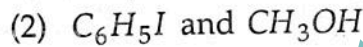
PG-EE-2015/Chemistry/(B)

1. Predict the products of reaction below :

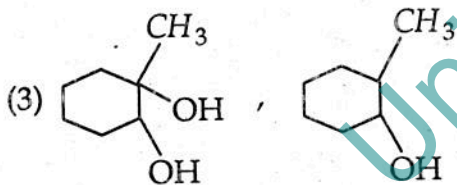
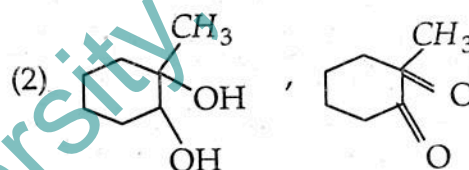
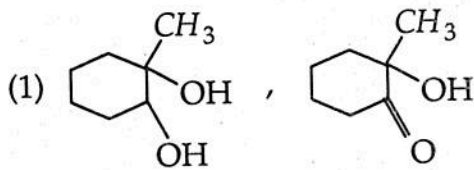


(4) Both (1) and (2)

2. The product formed in the following reaction  $\text{C}_6\text{H}_5\text{OCH}_3 \xrightarrow[\text{Heat}]{\text{HI}}$  are :

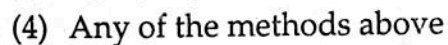
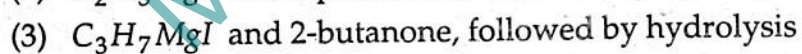
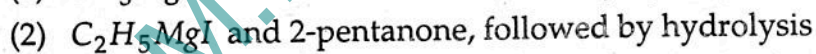
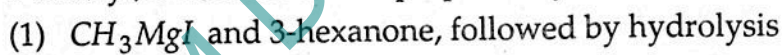


3. A and B are :



(4) None of these

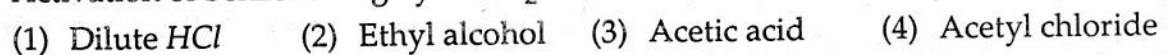
4. 3-methyl, 3-hexanol can be prepared by :

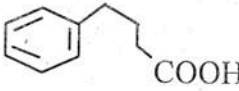


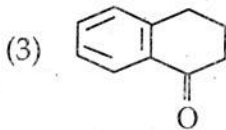
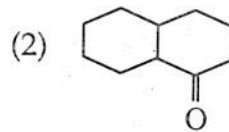
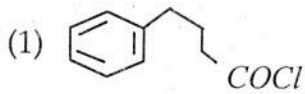
5. Which of the following does not give ethylamine on reduction ?



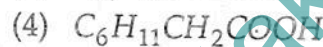
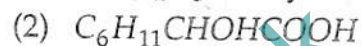
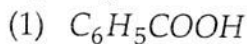
6. Activation of benzene ring by  $-\text{NH}_2$  in aniline can be reduced by treating with :



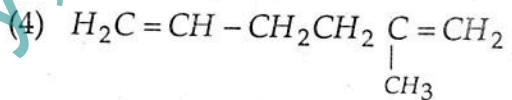
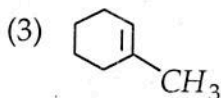
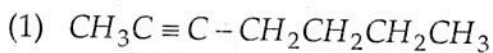
7.  on reaction with  $\text{SOCl}_2$  and then  $\text{AlCl}_3$  forms :



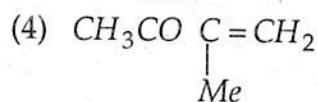
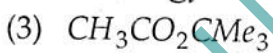
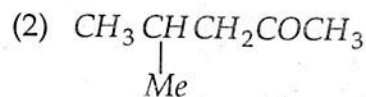
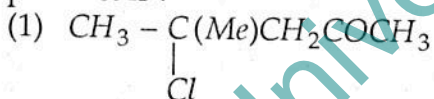
8. Hydrogenation of  $\text{C}_6\text{H}_5\text{CHOHCOOH}$  over  $\text{Pd} - \text{Al}_2\text{O}_3$  catalyst in methanol gives :



9.  $\text{C}_7\text{H}_{12} \xrightarrow[\text{(iii) } \Delta]{\text{(i) } \text{KMnO}_4, \text{(ii) } \text{H}^+} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{COOH}$ ,  $\text{C}_7\text{H}_{12}$  is :



10. When 2-methyl propene is heated with acetyl chloride in presence of  $\text{SnCl}_2$ , the product is :



11. The rate constant for a second-order reaction is  $3.33 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ . If the initial concentration of the reactant is  $0.05 \text{ mol dm}^{-3}$ , then its half life period is :

(1) 100 minutes

(2) 10 minutes

(3) 300 seconds

(4) 1.0 minute

12. Triple point is the point where :

(1) Three components are in equilibrium

(2) The number of degrees of freedom is three

(3) The number of degrees of freedom is zero

(4) Three components are not in equilibrium



13. For the distribution of organic solute between water ( $C_1$ ) and benzene ( $C_2$ ), partition coefficient  $k = \sqrt{C_2} / C_1$  suggest that :
- (1) solute exist as monomer in Benzene
  - (2) solute as exist as dimer in benzene
  - (3) solute exist as dimer in water
  - (4) None of these
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- (1) Formation of  $PbSO_4$
  - (2) Formation of  $PbO_2$
  - (3) Reduction of  $Pb^{2+}$  to  $Pb^{+1}$
  - (4) Reduction of  $Pb^{+2}$  to  $Pb$
15. Which of the following is not a state function ?
- (1) Work
  - (2) Enthalpy
  - (3) Heat
  - (4) Gibbs free energy
16. The pH of a solution obtained by mixing 25 ml of 0.2 M  $HCl$  with 50 ml of  $NaOH$  ( $k_w = 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ ) will be :
- (1) 10
  - (2) 1.3
  - (3) 13
  - (4) 12
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  - (2) Ionic surfactants
  - (3) Ionic as well as Non-ionogenic surfactant
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  - (2)  $B$
  - (3)  $3B$
  - (4)  $3B/2$
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  - (3) Elastomers
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  - (2)  $1 \text{ eV} = 806506 \text{ cm}^{-1}$
  - (3)  $1 \text{ eV} = 80.656 \text{ cm}^{-1}$
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  - (2)  $S = \frac{R}{\ln W}$
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  - (4)  $S = \frac{k}{\ln W}$
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  - (3) Two non-equivalent  $CH_3$  groups
  - (4) None of these

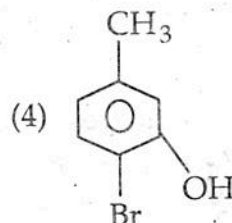
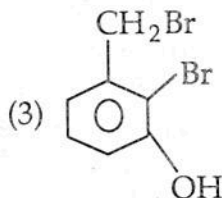
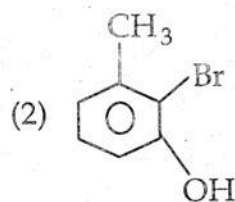
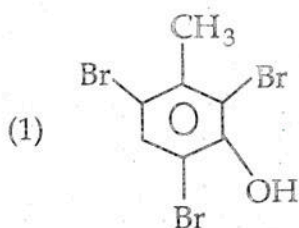
23. Thermal conductivity of gas is independent of :  
 (1) Pressure (2) Temperature  
 (3) Mean free path (4) Heat capacity at constant volume
24. The vibrational degrees of freedom of a protein molecule containing 44,700 atoms are :  
 (1) 13,410 (2) 44,700 (3) 31 (4) 1,34,100
25. The equation for predicting atmospheric pressure, called Barometric formula is :  
 (1)  $P = P_0 \exp\left(\frac{-Mgx}{RT}\right)$  (2)  $P = P_0 \exp\left(\frac{Mgx}{RT}\right)$   
 (3)  $P = P_0 \exp\left(\frac{Mg}{RT}\right)$  (4)  $P = P_0 \exp\left(\frac{Mgx^2}{RT}\right)$   
 where  $x, g$  are the altitude and acceleration due to gravity.
26. The Vander Waals equation for 'n' moles of gas is expressed by :  
 (1)  $P = \frac{RT}{V-nb} - \frac{an^2}{V^2}$  (2)  $P = \frac{nRT}{V-nb} - \frac{an^2}{V^2}$   
 (3)  $P = \frac{nRT}{nV-b} - \frac{an^2}{V^2}$  (4)  $P = \frac{nRT}{V-b} - \frac{an^2}{V^2}$
27. The mass less particles are :  
 (1) Protons (2)  $\alpha$ -rays (3) gamma rays (4)  $\beta$ -particles
28. Absorbance A of the solution is expressed as :  
 (1)  $\log\left(\frac{I}{I_0}\right)$  (2)  $\frac{I}{I_0}$  (3)  $\ln\left(\frac{I}{I_0}\right)$  (4)  $\log\frac{I_0}{I}$
29. A real gas most closely approaches the behaviour of a perfect gas at :  
 (1) low pressure and high temperature (2) high pressure and low temperature  
 (3) low pressure and low temperature (4) high pressure and high temperature
30. The boiling point of a liquid is  $36^\circ\text{C}$ . Assuming that it obeys Trouton's rule, its molar heat of vaporization will be :  
 (1)  $271.92 \text{ KJ mol}^{-1}$  (2)  $27.192 \text{ KJ mol}^{-1}$   
 (3)  $2719.2 \text{ KJ mol}^{-1}$  (4)  $2.71 \text{ KJ mol}^{-1}$
31. The planar complex (MABCD) gives :  
 (1) two optical isomers (2) two geometrical isomers  
 (3) three optical isomers (4) three geometrical isomers
32. Which one of the following compounds will behave as ammonio base in ammonia ?  
 (1)  $\text{NaNH}_2$  (2)  $\text{NH}_4\text{OH}$  (3)  $(\text{NH}_4)_2\text{SO}_2$  (4)  $(\text{NH}_4)_2\text{CO}_3$
33. The +3 ion of which of the following has half filled of subshell ?  
 (1) La (2) Lu (3) Gd (4) Ac



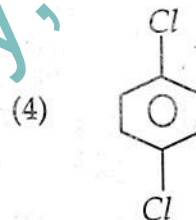
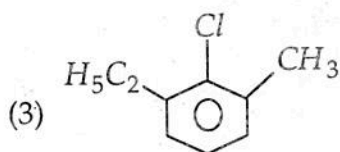
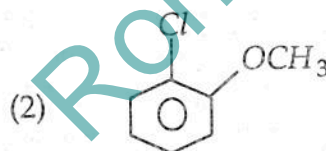
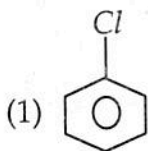
34. In a nuclear reactor, oxides of which of the following metals are used as a fuel material ?  
 (1) Uranium and Actinium (2) Thorium and Actinium  
 (3) Uranium, Thorium and Plutonium (4) Thorium, Actinium and Plutonium
35. In qualitative analysis  $NH_4Cl$  is added before  $NH_4OH$  :  
 (1) to decrease  $OH^-$  concentration (2) to increase  $OH^-$  concentration  
 (3) for making  $HCl$  (4) statement is wrong
36. The brown ring test for  $NO_2^-$  and  $NO_3^-$  is due to the formation of complex ion having the formula :  
 (1)  $[Fe(H_2O)_6]^{2+}$  (2)  $[Fe(NO)(CN)_5]^{2+}$   
 (3)  $[Fe(H_2O)_5NO]^{2+}$  (4)  $[Fe(H_2O)(NO)_5]^{2+}$
37. The crystal field stabilization energy (CFSE) will be the highest for :  
 (1)  $[CoF_6]^{3-}$  (2)  $[Co(CNS)_4]^{2-}$  (3)  $[Mn(H_2O)_6]^{2+}$  (4)  $[Co(NH_3)_6]^{3+}$
38. The expected spin-only magnetic moments for  $[Fe(CN)_6]^{4-}$  and  $[FeF_6]^{3-}$  respectively are :  
 (1) 1.73 and 1.73 BM (2) 1.73 and 5.92 BM  
 (3) 0.0 and 1.73 BM (4) 0.0 and 5.92 BM
39. In tetrahedral geometry, which are of the following sets of electronic configurations will have orbital contribution to the magnetic moment ?  
 (1)  $d^3, d^4, d^8$  and  $d^9$  (2)  $d^1, d^6, d^7$  and  $d^9$   
 (3)  $d^3, d^4, d^7$  and  $d^9$  (4)  $d^1, d^3, d^4$  and  $d^9$
40. The most suitable route to prepare the trans isomer of  $[PtCl_2(NH_3)(PPh_3)]$  is :  
 (1)  $[PtCl_4]^{2-}$  with  $PPh_3$  followed by reaction with  $NH_3$   
 (2)  $[PtCl_4]^{2-}$  with  $NH_3$  followed by reaction with  $PPh_3$   
 (3)  $[Pt(NH_3)_4]^{2+}$  with  $HCl$  followed by reaction with  $PPh_3$   
 (4)  $[Pt(NH_3)_4]^{2+}$  with  $PPh_3$  followed by reaction with  $HCl$
41. The IUPAC name of compound  $CH_2 - C - \overset{\overset{CH-CH_3}{||}}{C} - COOMe$  is :  
 $\begin{array}{c} | \\ COOMe \end{array} \quad \begin{array}{c} || \\ CH_2 \end{array}$   
 (1) 2,3-dimethoxycarbonyl pent-1, 3-diene  
 (2) 2-Ethylidene-3-methylidene dimethyl pentan-1, 5-dioate  
 (3) 2-Ethylidene-3-methylidene-methyl-pentan-1, 5-dioate  
 (4) None of these



42. m-cresol on bromination gives :



43. Which of the following compounds on reaction with  $\text{KNH}_2$  in  $\text{Liq NH}_3$  does not involve Benzyne intermediate ?



44. Allylic halogen substitution can be done with :

- (1) Halogen at high temperature      (2) NBS in sunlight  
(3) Sulphuryl chloride in sunlight      (4) All of these

45. Which of the following sets of quantum numbers is not allowed ?

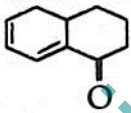
- (1)  $n = 3, l = 1, m = +2$       (2)  $n = 3, l = 1, m = \pm 1$   
(3)  $n = 3, l = 0, m = 0$       (4)  $n = 3, l = 2, m = \pm 2$

46. Which of the following orbitals has zero probability of finding the electron in  $yz$  plane ?

- (1)  $P_x$       (2)  $P_y$       (3)  $P_z$       (4)  $d_{yz}$

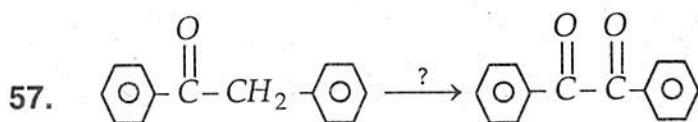
47. Which of the following orders regarding the ionization energy is correct ?

- (1)  $N > O > F$       (2)  $F > O > N$       (3)  $N > O < F$       (4)  $O > F > N$

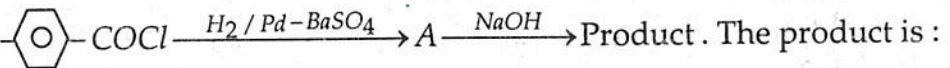
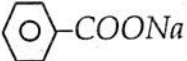
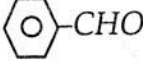
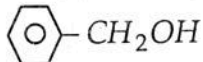

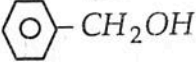
48. Most favourable conditions to form a covalent bond is :  
 (1) large cation and small anion (2) large cation and large anion  
 (3) small cation and small anion (4) small cation and large anion
49. Silicon doped with arsenic is an example of which type of semiconductor ?  
 (1) p-type (2) n-type (3) n, p-type (4) intrinsic
50. Which of the following defect, if present lowers the density of the crystal ?  
 (1) Frenkel (2) Schottky  
 (3) Edge dislocation (4) Constitution of F-centres
51. A nitrogenous substance X is treated with  $HNO_2$  and the product so formed is further treated with  $NaOH$  solution, which produces blue colouration. X can be :  
 (1)  $CH_3CH_2NH_2$  (2)  $CH_3CH_2NO_2$  (3)  $CH_3CH_2ONO$  (4)  $(CH_3)_2CHNO_2$
52. The monomeric unit present in natural rubber is :  
 (1) Butadiene (2) Terephthalic acid  
 (3) Hexamethylenetetramine (4) Isoprene
53. Ethylacetoacetate reacts with hydroxylamine and product formed immediately loses a molecule of ethanol to form :  
 (1) Methyl phenyl pyrazolone (2) 4-methylcoumarin  
 (3) Methyl oxazolone (4) Methyl isoxazolone
54. In UV the following compound would show absorption at :  
  
 (1) 280 nm (2) 259 nm (3) 304 nm (4) 317 nm
55. Which of following reaction involves rearrangement of nitrogen yields ?  
 (1) Wittig reaction (2) Von-Richter reaction  
 (3) Sommler-Hauser rearrangement (4) Pinacol-Pinacolone rearrangement

56. Absolute configuration of  $\begin{array}{c} \text{COOH} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{COOH} \end{array}$  is :

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



Reagent used for above reaction is :

- (1)  $\text{NaBH}_4 / \text{CH}_3\text{OH}$  (2)  $\text{MnO}_2$   
 (3)  $\text{SeO}_2$  (4)  $\text{Br}_2$  followed by reaction with  $\text{KOH}$
58. In the reaction . The product is :
- (1)  (2)   
 (3)  (4) Both  and 
59. Heterocyclic  $\beta$ -ketoesters can be prepared by which one of following reactions ?
- (1) Aldol condensation  
 (2) Micheal addition followed by Dieckmann condensation  
 (3) Claisen ester condensation  
 (4) Micheal addition
60. The artificial sweetener used in soft drinks is :
- (1) Glucose (2) Fructose (3) Aspartin (4) Glycerol
61. A hybrid orbital formed from  $s$  and  $p$  orbital can contribute to :
- (1) a  $\sigma$  bond only (2)  $\pi$ -bond only  
 (3) either a  $\sigma$  or  $\pi$  bond (4) cannot be predicted
62. During change of  $\text{NO}^+$  to  $\text{NO}$ , the electron is added to :
- (1)  $\sigma$ -orbital (2)  $\pi$ -orbital (3)  $\sigma^*$ -orbital (4)  $\pi^*$ -orbital
63. Intramolecular H-bonding is present in :
- (1) meta nitrophenol (2) salicylaldehyde  
 (3) hydrogen chloride (4) benzophenone
64. Which forces are strongest amongst the following ?
- (1) Ion-ion interaction (2) Ion-dipole forces  
 (3) Dipole-dipole forces (4) Dipole induced dipole forces
65. The product obtained in the reaction of diborane with excess of ammonia is :
- (1)  $\text{B}_2\text{H}_6 \cdot \text{NH}_3$  (2)  $\text{B}_2\text{H}_6 \cdot 2\text{NH}_3$  (3)  $(\text{BN})_x$  (4) Borazine
66. Pyrophosphoric acid is :
- (1) monobasic (2) dibasic (3) tribasic (4) tetrabasic



67. The basic unit in layer and sheet silicates is :  
 (1)  $SiO_4^{4-}$  (2)  $Si_2O_7^{6-}$  (3)  $(SiO_3)_n^{2n-}$  (4)  $(Si_2O_5)_n^{2n-}$
68. Which of the following bonds is the strongest ?  
 (1) F-F (2) Cl-Cl (3) I-I (4) Br-Br
69. Hybridization and structure of  $XeF_4$  is :  
 (1)  $sp^3d$ , trigonal bipyramidal (2)  $sp^3$ , tetrahedral  
 (3)  $sp^3d^2$ , square planar (4)  $sp^3d^2$ , hexagonal
70. Which of the following transition element shows the highest oxidation state ?  
 (1) Mn (2) Fe (3) V (4) Cr
71. The ground state term symbol for  $d^3$  is :  
 (1)  $^4F_{3/2}$  (2)  $^4F_{9/2}$  (3)  $^4D_{5/2}$  (4)  $^4P_{3/2}$
72. The pair of metal carbonyl complexes that are isoelectronic is :  
 (1)  $[Ni(CO)_4]$  and  $V(CO)_6$  (2)  $[Co(CO)_4]^-$  and  $Ni(CO)_4$   
 (3)  $[Cr(CO)_6]$  and  $V(CO)_6$  (4)  $[Fe(CO)_4]^-$  and  $Cr(CO)_6$
73. Which one of the following is a soft acid according to Pearson's concept of hard and soft acids ?  
 (1)  $Ag^+$  (2)  $I^{7+}$  (3)  $Sr^{2+}$  (4)  $Al^{3+}$
74. Which one of the following chemical species can behave both as a Bronsted-Lowry acid and a base ?  
 (1)  $H_3O^+$  (2)  $HCO_3^-$  (3)  $NO_3^-$  (4)  $SO_4^{2-}$
75. In oxyhaemoglobin Fe is in state :  
 (1) Low spin and diamagnetic (2) Low spin and paramagnetic  
 (3) High spin and diamagnetic (4) High spin and paramagnetic
76. Zeise's salt is represented by :  
 (1)  $H_2PtCl_6$  (2)  $[PtCl_4]^{2-}$  (3)  $[ZnCl_4]^{2-}$  (4)  $[PtCl_3(n^2 - C_2H_4)]^-$
77. The asymmetry in the electronic absorption spectrum in the visible region of  $[Ti(H_2O)_6]^{3+}$  is caused by :  
 (1) charge transfer (2)  $t_2 \rightarrow e$   
 (3)  $e \rightarrow t$  (4) John-Teller effect
78. Which of the following is correct ?  
 (1)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + [\hat{A}, \hat{B}] \hat{A}$  (2)  $[A^2, B] = \hat{A}[\hat{B}, \hat{A}] + [\hat{A}, \hat{B}] \hat{A}$   
 (3)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + \hat{A}[\hat{A}, \hat{B}]$  (4) None of the above

79. The operator for square of linear momentum,  $\hat{p}^2$  is given by :

- (1)  $\hat{p}^2 = \hbar^2 \nabla^2$       (2)  $\hbar^2 \nabla^2$       (3)  $\hat{p}^2 = -\hbar^2 \nabla^2$       (4)  $i\hbar \nabla^2$

80. Eigen value is always a :

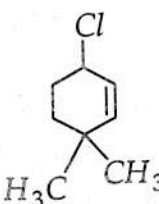
- (1) zero value      (2) infinite value      (3) positive value      (4) negative value

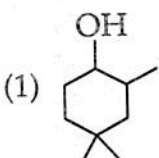
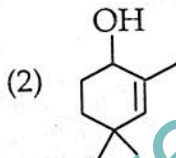
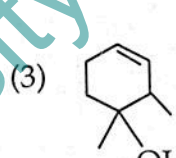
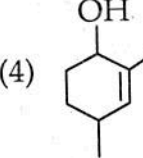
81. The number of optically active isomers of  $HOCH_2(CHOH)_4CHO$  is :

- (1) 4      (2) 8      (3) 16      (4) 24

82. Geometry of trifluoromethyl free radical is :

- (1) Planar      (2) Pyramidal      (3) V-shaped      (4) Tetrahedral

83.  on treatment with aqueous KOH gives :

- (1)       (2)       (3)       (4) 

84. Chloroform easily gets converted to poisonous phosgene in presence of air and sunlight. Which of the following substances is added to prevent formation of phosgene ?

- (1) Ethanol      (2) Sodium carbonate  
(3) Diethyl carbonate      (4) Sodium hydroxide

85. n-Butane reacts with  $Br_2$  at  $130^\circ$  to give more amount of :

- (1)  $CH_3 - CH_2 - \underset{\text{Br}}{\text{CH}} - CH_3$       (2)  $CH_3CH_2CH_2CH_2Br$

- (3)  $H_3C - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - Br$       (4) All in equal amounts

86. The reaction of  $CH_3CH=CH-\text{C}_6\text{H}_4-\text{OH}$  with  $\text{HBr}$  gives :

- (1)  $CH_3CH_2CHBr-\text{C}_6\text{H}_4-\text{OH}$                       (2)  $CH_3CH_2CHBr-\text{C}_6\text{H}_4-\text{Br}$   
 (3)  $CH_3\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{C}_6\text{H}_4-\text{OH}$                       (4)  $CH_3\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{C}_6\text{H}_4-\text{Br}$

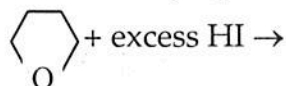
87. Preparation of alkyl halides in laboratory is least preferred by :

- (1) Halide exchange                                      (2) Direct halogenation of alkanes  
 (3) Treatment of alcohols                              (4) Addition of hydrogen halides to alkenes

88. Allyl alcohol is obtained when glycerol reacts with following at  $260^\circ\text{C}$  :

- (1) Formic acid      (2) Oxalic acid      (3) Both                      (4) None

89. Predict the major product :



- (1)  $\text{HO}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{I}$       (2)  $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
 (3)  $\text{I}-\text{CH}_2\text{CH}_2\text{CH}_2-\text{CH}_2-\text{I}$                       (4) No reaction

90. Conversion of chlorobenzene into phenol of Dow's process is an example of :

- (1) Free radical substitution                      (2) Nucleophilic substitution  
 (3) Electrophilic substitution                      (4) Rearrangement

91. The Miller indices of crystal planes which cut through the crystal axis at  $(2a, -3b, -3c)$  are :

- (1)  $(\bar{2} \bar{2} 3)$                       (2)  $(\bar{2} 3 \bar{2})$                       (3)  $(3 \bar{2} \bar{2})$                       (4)  $(2 3 2)$

92. A tetragonal crystal possesses the following axis of symmetry :

- (1) two-fold                      (2) six-fold                      (3) four-fold                      (4) three-fold

93. The temperature below which a gas becomes cooler on expansion is called :

- (1) Boyle temperature                              (2) Inversion temperature  
 (3) Critical temperature                              (4) Boiling point

94. For one mole of the gaseous mixture, the entropy of mixing is given by :

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

where  $r_i, x_i$  represent activity coefficient and mole fraction of components in the mixture.



95. Which of the followings is correct ?

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

96. The standard state for a solid is the pure state of solid at :

- (1) one atmospheric pressure and 273°C  
 (2) one atmospheric pressure and given temperature  
 (3) 273 K  
 (4) one atmospheric pressure and 273 K

97. In the limit  $T \rightarrow 0$ , for a crystal :

- (1)  $S_T = C_P$                       (2)  $S_T = C_V$                       (3)  $S_T = C_P/3$                       (4)  $S_T = C_V/T$

where  $C_P$ ,  $C_V$  are heat capacity at constant pressure and volume respectively.

98. Which aqueous solution of urea freezes at  $-0.93^\circ\text{C}$  ( $k_f = 1.86$ ) ?

- (1) 30 gm in one litre of solution                      (2) 150 gm in 5 litre of water  
 (3) 30 gm in 500 ml of water                      (4) 150 gm in five litre of solution

99. The parameters of an orthorhombic unit cell is  $a = 50$  pm,  $b = 100$  pm,  $c = 150$  pm. The spacing between (123) planes will be :

- (1) 29 pm                      (2) 0.029 pm                      (3) 0.29 pm                      (4) 2.9 pm

100. Milk is a/an :

- (1) Gel                      (2) Emulsion                      (3) Suspension                      (4) Pure solution

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Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Father's Name \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

\_\_\_\_\_  
(Signature of the Candidate)

\_\_\_\_\_  
(Signature of the Invigilator)

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

1. **All questions are compulsory.**
2. 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/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
4. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
5. **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.**
6. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
7. **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-2015/Chemistry/(C)

SEAL



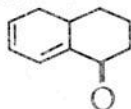
1. A hybrid orbital formed from  $s$  and  $p$  orbital can contribute to :  
(1) a  $\sigma$  bond only (2)  $\pi$ -bond only  
(3) either a  $\sigma$  or  $\pi$  bond (4) cannot be predicted
2. During change of  $NO^+$  to  $NO$ , the electron is added to :  
(1)  $\sigma$ -orbital (2)  $\pi$ -orbital (3)  $\sigma^*$ -orbital (4)  $\pi^*$ -orbital
3. Intramolecular H-bonding is present in :  
(1) meta nitrophenol (2) salicylaldehyde  
(3) hydrogen chloride (4) benzophenone
4. Which forces are strongest amongst the following ?  
(1) Ion-ion interaction (2) Ion-dipole forces  
(3) Dipole-dipole forces (4) Dipole induced dipole forces
5. The product obtained in the reaction of diborane with excess of ammonia is :  
(1)  $B_2H_6 \cdot NH_3$  (2)  $B_2H_6 \cdot 2NH_3$  (3)  $(BN)_x$  (4) Borazine
6. Pyrophosphoric acid is :  
(1) monobasic (2) dibasic (3) tribasic (4) tetrabasic
7. The basic unit in layer and sheet silicates is :  
(1)  $SiO_4^{4-}$  (2)  $Si_2O_7^{6-}$  (3)  $(SiO_3)_n^{2n-}$  (4)  $(Si_2O_5)_n^{2n-}$
8. Which of the following bonds is the strongest ?  
(1)  $F-F$  (2)  $Cl-Cl$  (3)  $I-I$  (4)  $Br-Br$
9. Hybridization and structure of  $XeF_4$  is :  
(1)  $sp^3d$ , trigonal bipyramidal (2)  $sp^3$ , tetrahedral  
(3)  $sp^3d^2$ , square planar (4)  $sp^3d^2$ , hexagonal
10. Which of the following transition element shows the highest oxidation state ?  
(1)  $Mn$  (2)  $Fe$  (3)  $V$  (4)  $Cr$
11. A nitrogenous substance  $X$  is treated with  $HNO_2$  and the product so formed is further treated with  $NaOH$  solution, which produces blue colouration.  $X$  can be :  
(1)  $CH_3CH_2NH_2$  (2)  $CH_3CH_2NO_2$  (3)  $CH_3CH_2ONO$  (4)  $(CH_3)_2CHNO_2$
12. The monomeric unit present in natural rubber is :  
(1) Butadiene (2) Terephthalic acid  
(3) Hexamethylenetetramine (4) Isoprene



13. Ethylacetoacetate reacts with hydroxylamine and product formed immediately loses a molecule of ethanol to form :

- (1) Methyl phenyl pyrazolone (2) 4-methylcoumarin  
(3) Methyl oxazolone (4) Methyl isoxazolone

14. In UV the following compound would show absorption at :



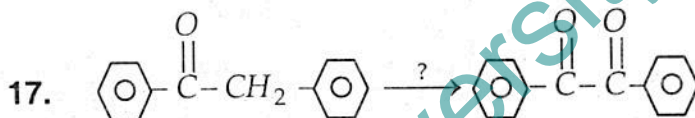
- (1) 280 nm (2) 259 nm (3) 304 nm (4) 317 nm

15. Which of the following reaction involves rearrangement of nitrogen yields ?

- (1) Wittig reaction (2) Von-Richter reaction  
(3) Sommet-Hauser rearrangement (4) Pinacol-Pinacolone rearrangement

16. Absolute configuration of  $\begin{array}{c} \text{COOH} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{COOH} \end{array}$  is :

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



Reagent used for above reaction is :

- (1)  $\text{NaBH}_4 / \text{CH}_3\text{OH}$  (2)  $\text{MnO}_2$   
(3)  $\text{SeO}_2$  (4)  $\text{Br}_2$  followed by reaction with  $\text{KOH}$

18. In the reaction  $\text{C}_6\text{H}_5\text{COCl} \xrightarrow{\text{H}_2 / \text{Pd}-\text{BaSO}_4} \text{A} \xrightarrow{\text{NaOH}} \text{Product}$ . The product is :

- (1)  $\text{C}_6\text{H}_5\text{COONa}$  (2)  $\text{C}_6\text{H}_5\text{CHO}$   
(3)  $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$  (4) Both  $\text{C}_6\text{H}_5\text{COONa}$  and  $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$

19. Heterocyclic  $\beta$ -ketoesters can be prepared by which one of the following reactions ?

- (1) Aldol condensation  
(2) Michael addition followed by Dieckmann condensation  
(3) Claisen ester condensation  
(4) Michael addition

20. The artificial sweetener used in soft drinks is :

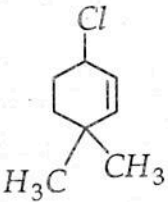
- (1) Glucose (2) Fructose (3) Aspartin (4) Glycerol

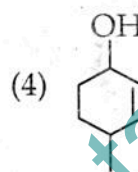
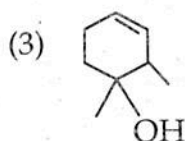
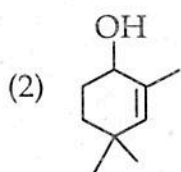
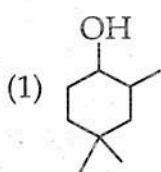
21. The number of optically active isomers of  $\text{HOCH}_2(\text{CHOH})_4\text{CHO}$  is :

- (1) 4                      (2) 8                      (3) 16                      (4) 24

22. Geometry of trifluoromethyl free radical is :

- (1) Planar                      (2) Pyramidal                      (3) V-shaped                      (4) Tetrahedral

23.  on treatment with aqueous KOH gives :



24. Chloroform easily gets converted to poisonous phosgene in presence of air and sunlight. Which of the following substances is added to prevent formation of phosgene ?

- (1) Ethanol                      (2) Sodium carbonate  
(3) Diethyl carbonate                      (4) Sodium hydroxide

25. n-Butane reacts with  $\text{Br}_2$  at  $130^\circ$  to give more amount of :

- (1)  $\text{CH}_3 - \text{CH}_2 - \underset{\text{Br}}{\text{CH}} - \text{CH}_3$                       (2)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$

- (3)  $\text{H}_3\text{C} - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{Br}$                       (4) All in equal amounts

26. The reaction of  $\text{CH}_3\text{CH}=\text{CH}-\text{C}_6\text{H}_4-\text{OH}$  with  $\text{HBr}$  gives :

- (1)  $\text{CH}_3\text{CH}_2\text{CHBr}-\text{C}_6\text{H}_4-\text{OH}$                       (2)  $\text{CH}_3\text{CH}_2\text{CHBr}-\text{C}_6\text{H}_4-\text{Br}$

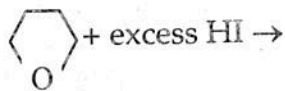
- (3)  $\text{CH}_3\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{C}_6\text{H}_4-\text{OH}$                       (4)  $\text{CH}_3\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{C}_6\text{H}_4-\text{Br}$

27. Preparation of alkyl halides in laboratory is least preferred by :

- (1) Halide exchange                      (2) Direct halogenation of alkanes  
(3) Treatment of alcohols                      (4) Addition of hydrogen halides to alkenes

28. Allyl alcohol is obtained when glycerol reacts with following at 260°C :  
 (1) Formic acid (2) Oxalic acid (3) Both (4) None

29. Predict the major product :



- (1)  $\text{HO}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{I}$  (2)  $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
 (3)  $\text{I}-\text{CH}_2\text{CH}_2\text{CH}_2-\text{CH}_2-\text{I}$  (4) No reaction

30. Conversion of chlorobenzene into phenol of Dow's process is an example of :

- (1) Free radical substitution (2) Nucleophilic substitution  
 (3) Electrophilic substitution (4) Rearrangement

31. The rate constant for a second-order reaction is  $3.33 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ . If the initial concentration of the reactant is  $0.05 \text{ mol dm}^{-3}$ , then its half life period is :

- (1) 100 minutes (2) 10 minutes (3) 300 seconds (4) 1.0 minute

32. Triple point is the point where :

- (1) Three components are in equilibrium  
 (2) The number of degrees of freedom is three  
 (3) The number of degrees of freedom is zero  
 (4) Three components are not in equilibrium

33. For the distribution of organic solute between water ( $C_1$ ) and benzene ( $C_2$ ), partition coefficient  $k = \sqrt{C_2} / C_1$  suggest that :

- (1) solute exist as monomer in Benzene  
 (2) solute as exist as dimer in benzene  
 (3) solute exist as dimer in water  
 (4) None of these

34. In the lead acid battery during charging the cathodic reaction is :

- (1) Formation of  $\text{PbSO}_4$  (2) Formation of  $\text{PbO}_2$   
 (3) Reduction of  $\text{Pb}^{2+}$  to  $\text{Pb}^{+1}$  (4) Reduction of  $\text{Pb}^{+2}$  to  $\text{Pb}$

35. Which of the following is not a state function ?

- (1) Work (2) Enthalpy (3) Heat (4) Gibbs free energy

36. The pH of a solution obtained by mixing 25 ml of 0.2 M  $\text{HCl}$  with 50 ml of  $\text{NaC}$  ( $k_w = 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ ) will be :

- (1) 10 (2) 1.3 (3) 13 (4) 12



37. The emulsifiers consist of :
- (1) Ionic compound
  - (2) Ionic surfactants
  - (3) Ionic as well as Non-ionogenic surfactant
  - (4) Non-ionic surfactants
38. The rotational spectra of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :
- (1)  $2B$
  - (2)  $B$
  - (3)  $3B$
  - (4)  $3B/2$
- where  $B$  is the rotational constant.
39. Strong covalent bond exists between polymer chains in :
- (1) Thermoplasts
  - (2) Thermosets
  - (3) Elastomers
  - (4) All polymers
40. Choose the correct one :
- (1)  $1 \text{ eV} = 806.56 \text{ cm}^{-1}$
  - (2)  $1 \text{ eV} = 806506 \text{ cm}^{-1}$
  - (3)  $1 \text{ eV} = 80.656 \text{ cm}^{-1}$
  - (4)  $1 \text{ eV} = 8065.6 \text{ cm}^{-1}$
41. The ground state term symbol for  $d^3$  is :
- (1)  ${}^4F_{3/2}$
  - (2)  ${}^4F_{9/2}$
  - (3)  ${}^4D_{5/2}$
  - (4)  ${}^4P_{3/2}$
42. The pair of metal carbonyl complexes that are isoelectronic is :
- (1)  $[Ni(CO)_4]$  and  $V(CO)_6$
  - (2)  $[Co(CO)_4]^-$  and  $Ni(CO)_4$
  - (3)  $[Cr(CO)_6]$  and  $V(CO)_6$
  - (4)  $[Fe(CO)_4]^-$  and  $Cr(CO)_6$
43. Which one of the following is a soft acid according to Pearson's concept of hard and soft acids ?
- (1)  $Ag^+$
  - (2)  $I^{7+}$
  - (3)  $Sr^{2+}$
  - (4)  $Al^{3+}$
44. Which one of the following chemical species can behave both as a Bronsted-Lowry acid and a base ?
- (1)  $H_3O^+$
  - (2)  $HCO_3^-$
  - (3)  $NO_3^-$
  - (4)  $SO_4^{2-}$
45. In oxyhaemoglobin  $Fe$  is in state :
- (1) Low spin and diamagnetic
  - (2) Low spin and paramagnetic
  - (3) High spin and diamagnetic
  - (4) High spin and paramagnetic
46. Zeise's salt is represented by :
- (1)  $H_2PtCl_6$
  - (2)  $[PtCl_4]^{2-}$
  - (3)  $[ZnCl_4]^{2-}$
  - (4)  $[PtCl_3(n^2 - C_2H_4)]^-$

47. The asymmetry in the electronic absorption spectrum in the visible region of  $[Ti(H_2O)_6]^{3+}$  is caused by :

- (1) charge transfer (2)  $t_2 \rightarrow e$   
 (3)  $e \rightarrow t$  (4) Jahn-Teller effect

48. Which of the following is correct ?

- (1)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + [\hat{A}, \hat{B}] \hat{A}$  (2)  $[A^2, B] = \hat{A}[\hat{B}, \hat{A}] + [\hat{A}, \hat{B}] \hat{A}$   
 (3)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + \hat{A}[\hat{A}, \hat{B}]$  (4) None of the above

49. The operator for square of linear momentum,  $\hat{p}^2$  is given by :

- (1)  $\hat{p}^2 = \hbar^2 \nabla^2$  (2)  $h^2 \nabla^2$  (3)  $\hat{p}^2 = -\hbar^2 \nabla^2$  (4)  $i\hbar \nabla^2$

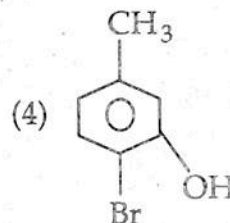
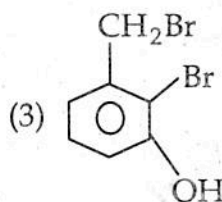
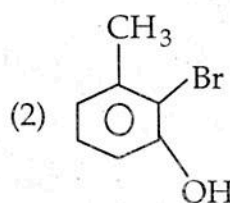
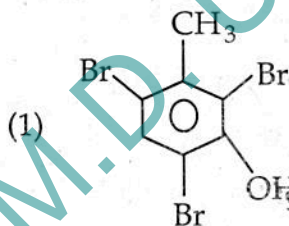
50. Eigen value is always a :

- (1) zero value (2) infinite value (3) positive value (4) negative value

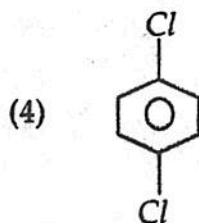
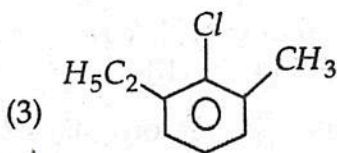
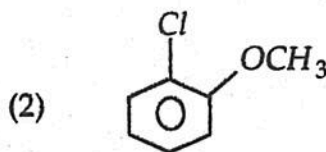
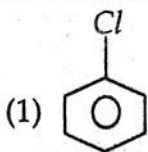
51. The IUPAC name of compound  $\begin{array}{c} \text{CH}_2 - \text{C} - \text{C} - \text{COOMe} \\ | \quad \quad \quad || \\ \text{COOMe} \quad \text{CH}_2 \end{array}$  is :

- (1) 2,3-dimethoxycarbonyl pent-1, 3-diene  
 (2) 2-Ethylidene-3-methylidene dimethyl pentan-1, 5-dioate  
 (3) 2-Ethylidene-3-methylidene-methyl-pentan-1, 5-dioate  
 (4) None of these

52. m-cresol on bromination gives :



53. Which of the following compounds on reaction with  $\text{KNH}_2$  in  $\text{Liq NH}_3$  does not involve Benzyne intermediate ?



54. Allylic halogen substitution can be done with :

- (1) Halogen at high temperature      (2) NBS in sunlight  
 (3) Sulphuryl chloride in sunlight      (4) All of these

55. Which of the following sets of quantum numbers is not allowed ?

- (1)  $n = 3, l = 1, m = +2$       (2)  $n = 3, l = 1, m = \pm 1$   
 (3)  $n = 3, l = 0, m = 0$       (4)  $n = 3, l = 2, m = \pm 2$

56. Which of the following orbitals has zero probability of finding the electron in  $yz$  plane ?

- (1)  $P_x$       (2)  $P_y$       (3)  $P_z$       (4)  $d_{yz}$

57. Which of the following orders regarding the ionization energy is correct ?

- (1)  $N > O > F$       (2)  $F > O > N$       (3)  $N > O < F$       (4)  $O > F > N$

58. Most favourable conditions to form a covalent bond is :

- (1) large cation and small anion      (2) large cation and large anion  
 (3) small cation and small anion      (4) small cation and large anion

59. Silicon doped with arsenic is an example of which type of semiconductor ?

- (1) p-type      (2) n-type      (3) n, p-type      (4) intrinsic

60. Which of the following defect, if present lowers the density of the crystal ?

- (1) Frenkel      (2) Schottky  
 (3) Edge dislocation      (4) Constitution of F-centres

61. Entropy is related to probability by relation :

- (1)  $S = R \ln W$       (2)  $S = \frac{R}{\ln W}$       (3)  $S = k \ln W$       (4)  $S = \frac{k}{\ln W}$



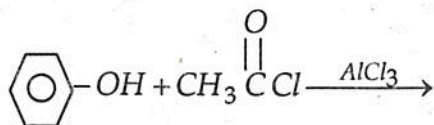
62. The organic compound  $C_2H_6O$  possess :  
 (1) One equivalent  $CH_3$  group (2) Two equivalent  $CH_3$  groups  
 (3) Two non-equivalent  $CH_3$  groups (4) None of these
63. Thermal conductivity of gas is independent of :  
 (1) Pressure (2) Temperature  
 (3) Mean free path (4) Heat capacity at constant volume
64. The vibrational degrees of freedom of a protein molecule containing 44,700 atoms are :  
 (1) 13,410 (2) 44,700 (3) 31 (4) 1,34,100
65. The equation for predicting atmospheric pressure, called Barometric formula is :  
 (1)  $P = P_0 \exp\left(\frac{-Mgx}{RT}\right)$  (2)  $P = P_0 \exp\left(\frac{Mgx}{RT}\right)$   
 (3)  $P = P_0 \exp\left(\frac{Mg}{RT}\right)$  (4)  $P = P_0 \exp\left(\frac{Mgx^2}{RT}\right)$

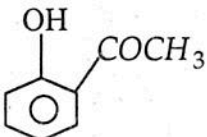
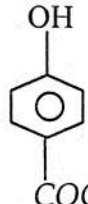
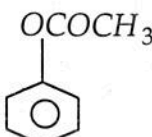
where  $x, g$  are the altitude and acceleration due to gravity.

66. The Vander Waals equation for ' $n$ ' moles of gas is expressed by :  
 (1)  $P = \frac{RT}{V-nb} - \frac{an^2}{V^2}$  (2)  $P = \frac{nRT}{V-nb} - \frac{an^2}{V^2}$   
 (3)  $P = \frac{nRT}{nV-b} - \frac{an^2}{V^2}$  (4)  $P = \frac{nRT}{V-b} - \frac{an^2}{V^2}$
67. The mass less particles are :  
 (1) Protons (2)  $\alpha$ -rays (3) gamma rays (4)  $\beta$ -particles
68. Absorbance  $A$  of the solution is expressed as :  
 (1)  $\log\left(\frac{I}{I_0}\right)$  (2)  $\frac{I}{I_0}$  (3)  $\ln\left(\frac{I}{I_0}\right)$  (4)  $\log\frac{I_0}{I}$
69. A real gas most closely approaches the behaviour of a perfect gas at :  
 (1) low pressure and high temperature (2) high pressure and low temperature  
 (3) low pressure and low temperature (4) high pressure and high temperature
70. The boiling point of a liquid is  $36^\circ C$ . Assuming that it obeys Trouton's rule, its molar heat of vaporization will be :  
 (1)  $271.92 \text{ KJ mol}^{-1}$  (2)  $27.192 \text{ KJ mol}^{-1}$   
 (3)  $2719.2 \text{ KJ mol}^{-1}$  (4)  $2.71 \text{ KJ mol}^{-1}$
71. The Miller indices of crystal planes which cut through the crystal axis at  $(2a, -3b, -3c)$  are :  
 (1)  $(\bar{2} \bar{2} 3)$  (2)  $(\bar{2} 3 \bar{2})$  (3)  $(3 \bar{2} \bar{2})$  (4)  $(2 3 2)$

72. A tetragonal crystal possesses the following axis of symmetry :  
 (1) two-fold (2) six-fold (3) four-fold (4) three-fold
73. The temperature below which a gas becomes cooler on expansion is called :  
 (1) Boyle temperature (2) Inversion temperature  
 (3) Critical temperature (4) Boiling point
74. For one mole of the gaseous mixture, the entropy of mixing is given by :  
 (1)  $\Delta S_{mix} = -R \sum r_i \ln x_i$  (2)  $\Delta S_{mix} = -R \sum \ln x_i$   
 (3)  $\Delta S_{mix} = -R \sum r_i \ln r_i$  (4)  $\Delta S_{mix} = -R \sum x_i \ln x_i$   
 where  $r_i, x_i$  represent activity coefficient and mole fraction of components in the mixture.
75. Which of the followings is correct ?  
 (1)  $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$  (2)  $\left(\frac{\partial S}{\partial P}\right)_T = \left(\frac{\partial V}{\partial S}\right)_P$   
 (3)  $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$  (4)  $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$
76. The standard state for a solid is the pure state of solid at :  
 (1) one atmospheric pressure and 273°C  
 (2) one atmospheric pressure and given temperature  
 (3) 273 K  
 (4) one atmospheric pressure and 273 K
77. In the limit  $T \rightarrow 0$ , for a crystal :  
 (1)  $S_T = C_P$  (2)  $S_T = C_V$  (3)  $S_T = C_{P/3}$  (4)  $S_T = C_{V/T}$   
 where  $C_P, C_V$  are heat capacity at constant pressure and volume respectively.
78. Which aqueous solution of urea freezes at  $-0.93^\circ\text{C}$  ( $k_f = 1.86$ ) ?  
 (1) 30 gm in one litre of solution (2) 150 gm in 5 litre of water  
 (3) 30 gm in 500 ml of water (4) 150 gm in five litre of solution
79. The parameters of an orthorhombic unit cell is  $a = 50 \text{ pm}$ ,  $b = 100 \text{ pm}$ ,  $c = 150 \text{ pm}$ . The spacing between (123) planes will be :  
 (1) 29 pm (2) 0.029 pm (3) 0.29 pm (4) 2.9 pm
80. Milk is a/an :  
 (1) Gel (2) Emulsion (3) Suspension (4) Pure solution

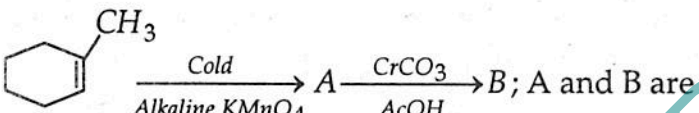
81. Predict the products of reaction below :

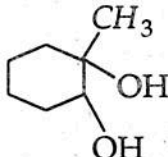
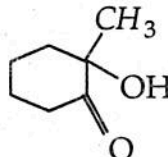
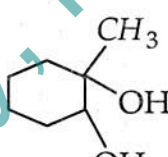
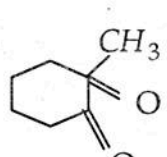
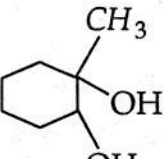
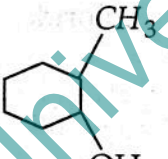


- (1)  (2)  (3)  (4) Both (1) and (2)

82. The product formed in the following reaction  $\text{C}_6\text{H}_5\text{OCH}_3 \xrightarrow[\text{Heat}]{\text{HI}}$  are :

- (1)  $\text{C}_6\text{H}_5\text{OH}$  and  $\text{CH}_3\text{I}$  (2)  $\text{C}_6\text{H}_5\text{I}$  and  $\text{CH}_3\text{OH}$   
 (3)  $\text{C}_6\text{H}_5\text{I}$  and  $\text{CH}_3\text{I}$  (4)  $\text{C}_6\text{H}_6$  and  $\text{CH}_3\text{OI}$

83.  ; A and B are :

- (1)  ,  (2)  ,   
 (3)  ,  (4) None of these

84. 3-methyl, 3-hexanol can be prepared by :

- (1)  $\text{CH}_3\text{MgI}$  and 3-hexanone, followed by hydrolysis  
 (2)  $\text{C}_2\text{H}_5\text{MgI}$  and 2-pentanone, followed by hydrolysis  
 (3)  $\text{C}_3\text{H}_7\text{MgI}$  and 2-butanone, followed by hydrolysis  
 (4) Any of the methods above

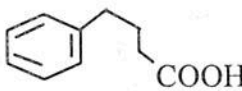
85. Which of the following does not give ethylamine on reduction ?

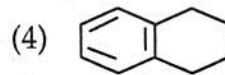
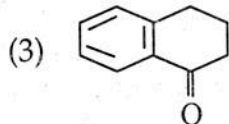
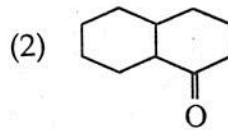
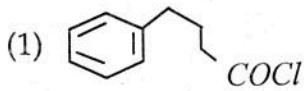
- (1) Methylcyanide (2) Ethylnitrile (3) Nitroethane (4) Acetamide

86. Activation of benzene ring by  $-\text{NH}_2$  in aniline can be reduced by treating with :

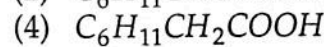
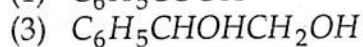
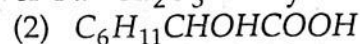
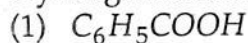
- (1) Dilute  $\text{HCl}$  (2) Ethyl alcohol (3) Acetic acid (4) Acetyl chloride



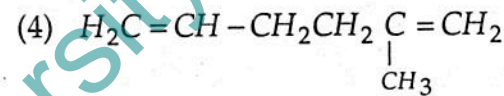
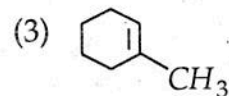
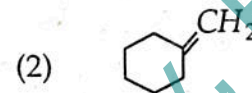
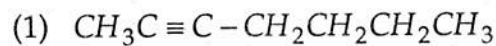
87.  on reaction with  $\text{SOCl}_2$  and then  $\text{AlCl}_3$  forms :



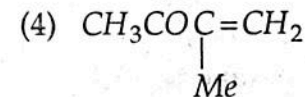
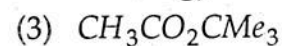
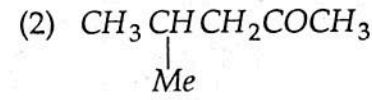
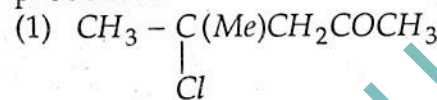
88. Hydrogenation of  $\text{C}_6\text{H}_5\text{CHOHCOOH}$  over  $\text{Pd}-\text{Al}_2\text{O}_3$  catalyst in methanol gives :



89.  $\text{C}_7\text{H}_{12} \xrightarrow[\text{(iii) } \Delta]{\text{(i) } \text{KMnO}_4} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{COOH}$ ,  $\text{C}_7\text{H}_{12}$  is :



90. When 2-methyl propene is heated with acetyl chloride in presence of  $\text{SnCl}_2$ , the product is :



91. The planar complex (MABCD) gives :

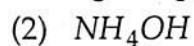
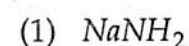
(1) two optical isomers

(2) two geometrical isomers

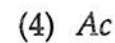
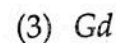
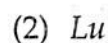
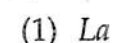
(3) three optical isomers

(4) three geometrical isomers

92. Which one of the following compounds will behave as ammono base in ammonia ?



93. The +3 ion of which of the following has half filled of subshell ?



94. In a nuclear reactor, oxides of which of the following metals are used as a fuel material ?
- (1) Uranium and Actinium (2) Thorium and Actinium  
 (3) Uranium, Thorium and Plutonium (4) Thorium, Actinium and Plutonium
95. In qualitative analysis  $NH_4Cl$  is added before  $NH_4OH$  :
- (1) to decrease  $OH^-$  concentration (2) to increase  $OH^-$  concentration  
 (3) for making  $HCl$  (4) statement is wrong
96. The brown ring test for  $NO_2^-$  and  $NO_3^-$  is due to the formation of complex ion having the formula :
- (1)  $[Fe(H_2O)_6]^{2+}$  (2)  $[Fe(NO)(CN)_5]^{2+}$   
 (3)  $[Fe(H_2O)_5NO]^{2+}$  (4)  $[Fe(H_2O)(NO)_5]^{2+}$
97. The crystal field stabilization energy (CFSE) will be the highest for :
- (1)  $[CoF_6]^{3-}$  (2)  $[Co(CNS)_4]^{2-}$  (3)  $[Mn(H_2O)_6]^{2+}$  (4)  $[Co(NH_3)_6]^{3+}$
98. The expected spin-only magnetic moments for  $[Fe(CN)_6]^{4-}$  and  $[FeF_6]^{3-}$  respectively are :
- (1) 1.73 and 1.73 BM (2) 1.73 and 5.92 BM  
 (3) 0.0 and 1.73 BM (4) 0.0 and 5.92 BM
99. In tetrahedral geometry, which are of the following sets of electronic configurations will have orbital contribution to the magnetic moment ?
- (1)  $d^3, d^4, d^8$  and  $d^9$  (2)  $d^1, d^6, d^7$  and  $d^9$   
 (3)  $d^3, d^4, d^7$  and  $d^9$  (4)  $d^1, d^3, d^4$  and  $d^9$
100. The most suitable route to prepare the trans isomer of  $[PtCl_2(NH_3)(PPh_3)]$  is :
- (1)  $[PtCl_4]^{2-}$  with  $PPh_3$  followed by reaction with  $NH_3$   
 (2)  $[PtCl_4]^{2-}$  with  $NH_3$  followed by reaction with  $PPh_3$   
 (3)  $[Pt(NH_3)_4]^{2+}$  with  $HCl$  followed by reaction with  $PPh_3$   
 (4)  $[Pt(NH_3)_4]^{2+}$  with  $PPh_3$  followed by reaction with  $HCl$



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9/12/15

Total No. of Printed Pages : 13

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

**PG-EE-2015**  
**SUBJECT : Chemistry**

**D**

10364

Sr. No. ....

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) \_\_\_\_\_ (in words) \_\_\_\_\_

Name \_\_\_\_\_ Father's Name \_\_\_\_\_

Mother's Name \_\_\_\_\_ Date of Examination \_\_\_\_\_

\_\_\_\_\_  
(Signature of the Candidate)

\_\_\_\_\_  
(Signature of the Invigilator)

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

1. **All questions are compulsory.**
2. 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/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
4. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
5. **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.**
6. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
7. **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-2015/Chemistry/(D)

SEAL



1. Entropy is related to probability by relation :

(1)  $S = R \ln W$       (2)  $S = \frac{R}{\ln W}$       (3)  $S = k \ln W$       (4)  $S = \frac{k}{\ln W}$

2. The organic compound  $C_2H_6O$  possess :

- (1) One equivalent  $CH_3$  group      (2) Two equivalent  $CH_3$  groups  
(3) Two non-equivalent  $CH_3$  groups      (4) None of these

3. Thermal conductivity of gas is independent of :

- (1) Pressure      (2) Temperature  
(3) Mean free path      (4) Heat capacity at constant volume

4. The vibrational degrees of freedom of a protein molecule containing 44,700 atoms are :

- (1) 13,410      (2) 44,700      (3) 31      (4) 1,34,100

5. The equation for predicting atmospheric pressure, called Barometric formula is :

(1)  $P = P_0 \exp\left(\frac{-Mgx}{RT}\right)$       (2)  $P = P_0 \exp\left(\frac{Mgx}{RT}\right)$   
(3)  $P = P_0 \exp\left(\frac{Mg}{RT}\right)$       (4)  $P = P_0 \exp\left(\frac{Mgx^2}{RT}\right)$

where  $x, g$  are the altitude and acceleration due to gravity.

6. The Vander Waals equation for ' $n$ ' moles of gas is expressed by :

(1)  $P = \frac{RT}{V-nb} - \frac{an^2}{V^2}$       (2)  $P = \frac{nRT}{V-nb} - \frac{an^2}{V^2}$   
(3)  $P = \frac{nRT}{nV-b} - \frac{an^2}{V^2}$       (4)  $P = \frac{nRT}{V-b} - \frac{an^2}{V^2}$

7. The mass less particles are :

- (1) Protons      (2)  $\alpha$ -rays      (3) gamma rays      (4)  $\beta$ -particles

8. Absorbance  $A$  of the solution is expressed as :

(1)  $\log\left(\frac{I}{I_0}\right)$       (2)  $\frac{I}{I_0}$       (3)  $\ln\left(\frac{I}{I_0}\right)$       (4)  $\log\frac{I_0}{I}$

9. A real gas most closely approaches the behaviour of a perfect gas at :

- (1) low pressure and high temperature      (2) high pressure and low temperature  
(3) low pressure and low temperature      (4) high pressure and high temperature

10. The boiling point of a liquid is  $36^\circ\text{C}$ . Assuming that it obeys Trouton's rule, its molar heat of vaporization will be :

- (1)  $271.92 \text{ KJ mol}^{-1}$       (2)  $27.192 \text{ KJ mol}^{-1}$   
(3)  $2719.2 \text{ KJ mol}^{-1}$       (4)  $2.71 \text{ KJ mol}^{-1}$

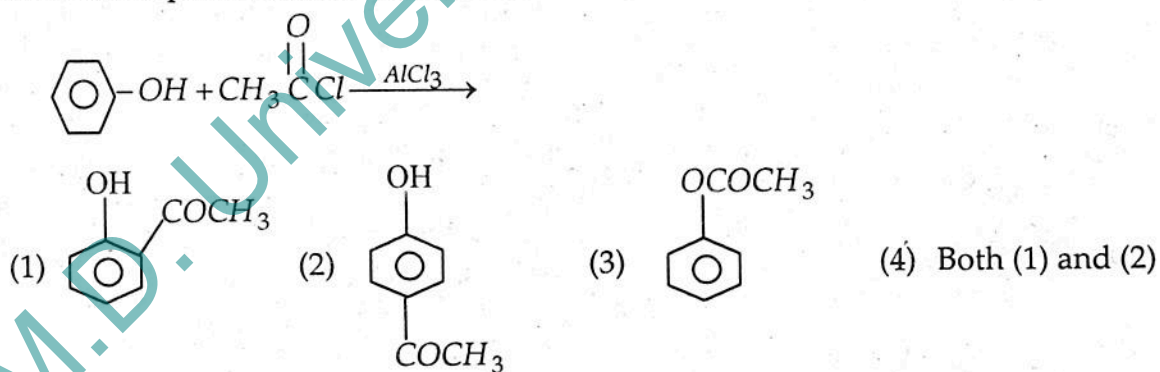
11. The planar complex (MABCD) gives :  
 (1) two optical isomers (2) two geometrical isomers  
 (3) three optical isomers (4) three geometrical isomers
12. Which one of the following compounds will behave as ammonio base in ammonia ?  
 (1)  $\text{NaNH}_2$  (2)  $\text{NH}_4\text{OH}$  (3)  $(\text{NH}_4)_2\text{SO}_2$  (4)  $(\text{NH}_4)_2\text{CO}_3$
13. The +3 ion of which of the following has half filled of subshell ?  
 (1) *La* (2) *Lu* (3) *Gd* (4) *Ac*
14. In a nuclear reactor, oxides of which of the following metals are used as a fuel material ?  
 (1) Uranium and Actinium (2) Thorium and Actinium  
 (3) Uranium, Thorium and Plutonium (4) Thorium, Actinium and Plutonium
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 (3) for making  $\text{HCl}$  (4) statement is wrong
16. The brown ring test for  $\text{NO}_2^-$  and  $\text{NO}_3^-$  is due to the formation of complex ion having the formula :  
 (1)  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$  (2)  $[\text{Fe}(\text{NO})(\text{CN})_5]^{2+}$   
 (3)  $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$  (4)  $[\text{Fe}(\text{H}_2\text{O})(\text{NO})_5]^{2+}$
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 (1) 1.73 and 1.73 BM (2) 1.73 and 5.92 BM  
 (3) 0.0 and 1.73 BM (4) 0.0 and 5.92 BM
19. In tetrahedral geometry, which are of the following sets of electronic configuration will have orbital contribution to the magnetic moment ?  
 (1)  $d^3, d^4, d^8$  and  $d^9$  (2)  $d^1, d^6, d^7$  and  $d^9$   
 (3)  $d^3, d^4, d^7$  and  $d^9$  (4)  $d^1, d^3, d^4$  and  $d^9$
20. The most suitable route to prepare the trans isomer of  $[\text{PtCl}_2(\text{NH}_3)(\text{PPh}_3)]$  is :  
 (1)  $[\text{PtCl}_4]^{2-}$  with  $\text{PPh}_3$  followed by reaction with  $\text{NH}_3$   
 (2)  $[\text{PtCl}_4]^{2-}$  with  $\text{NH}_3$  followed by reaction with  $\text{PPh}_3$   
 (3)  $[\text{Pt}(\text{NH}_3)_4]^{2+}$  with  $\text{HCl}$  followed by reaction with  $\text{PPh}_3$   
 (4)  $[\text{Pt}(\text{NH}_3)_4]^{2+}$  with  $\text{PPh}_3$  followed by reaction with  $\text{HCl}$



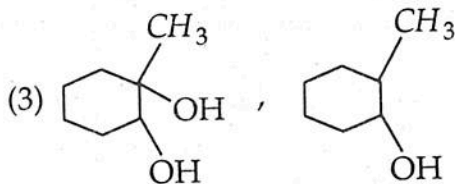
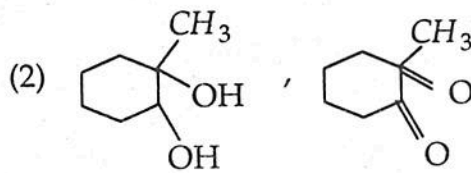
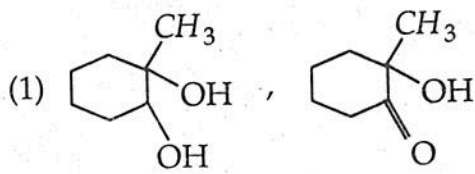
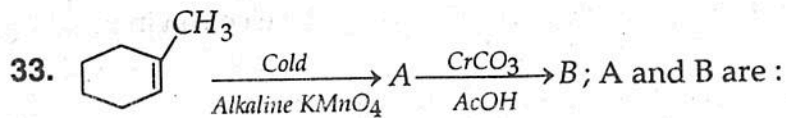


26. Which of the following orbitals has zero probability of finding the electron in  $yz$  plane?  
 (1)  $P_x$  (2)  $P_y$  (3)  $P_z$  (4)  $dyz$
27. Which of the following orders regarding the ionization energy is correct?  
 (1)  $N > O > F$  (2)  $F > O > N$  (3)  $N > O < F$  (4)  $O > F > N$
28. Most favourable conditions to form a covalent bond is :  
 (1) large cation and small anion (2) large cation and large anion  
 (3) small cation and small anion (4) small cation and large anion
29. Silicon doped with arsenic is an example of which type of semiconductor?  
 (1) p-type (2) n-type (3) n, p-type (4) intrinsic
30. Which of the following defect, if present lowers the density of the crystal?  
 (1) Frenkel (2) Schottky  
 (3) Edge dislocation (4) Constitution of F-centres

31. Predict the products of reaction below :



32. The product formed in the following reaction  $\text{C}_6\text{H}_5 - \text{O} - \text{CH}_3 \xrightarrow[\text{Heat}]{\text{HI}}$  are :  
 (1)  $\text{C}_6\text{H}_5\text{OH}$  and  $\text{CH}_3\text{I}$  (2)  $\text{C}_6\text{H}_5\text{I}$  and  $\text{CH}_3\text{OH}$   
 (3)  $\text{C}_6\text{H}_5\text{I}$  and  $\text{CH}_3\text{I}$  (4)  $\text{C}_6\text{H}_6$  and  $\text{CH}_3\text{OI}$



(4) None of these

34. 3-methyl, 3-hexanol can be prepared by :

- (1)  $\text{CH}_3\text{MgI}$  and 3-hexanone, followed by hydrolysis
- (2)  $\text{C}_2\text{H}_5\text{MgI}$  and 2-pentanone, followed by hydrolysis
- (3)  $\text{C}_3\text{H}_7\text{MgI}$  and 2-butanone, followed by hydrolysis
- (4) Any of the methods above

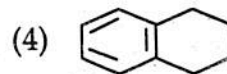
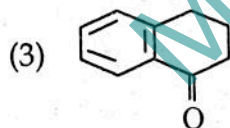
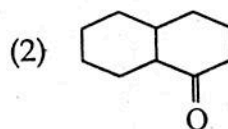
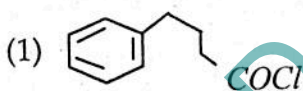
35. Which of the following does not give ethylamine on reduction ?

- (1) Methylcyanide
- (2) Ethylnitrile
- (3) Nitroethane
- (4) Acetamide

36. Activation of benzene ring by  $-\text{NH}_2$  in aniline can be reduced by treating with :

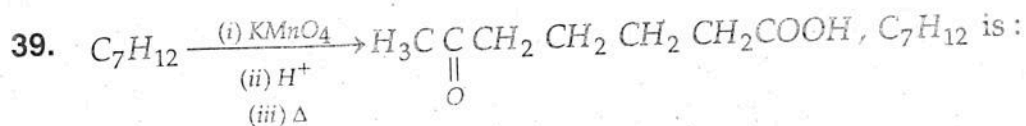
- (1) Dilute  $\text{HCl}$
- (2) Ethyl alcohol
- (3) Acetic acid
- (4) Acetyl chloride

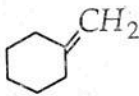
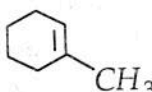
37.  on reaction with  $\text{SOCl}_2$  and then  $\text{AlCl}_3$  forms :



38. Hydrogenation of  $\text{C}_6\text{H}_5\text{CHOHCOOH}$  over  $\text{Pd}-\text{Al}_2\text{O}_3$  catalyst in methanol gives :

- (1)  $\text{C}_6\text{H}_5\text{COOH}$
- (2)  $\text{C}_6\text{H}_{11}\text{CHOHCOOH}$
- (3)  $\text{C}_6\text{H}_5\text{CHOHCH}_2\text{OH}$
- (4)  $\text{C}_6\text{H}_{11}\text{CH}_2\text{COOH}$



- (1)  $CH_3C \equiv C - CH_2CH_2CH_2CH_3$  (2) 
- (3)  (4)  $H_2C = CH - CH_2CH_2 - \underset{\text{CH}_3}{\underset{|}{C}} = CH_2$

40. When 2-methyl propene is heated with acetyl chloride in presence of  $SnCl_2$ , the product is :

- (1)  $CH_3 - \underset{\text{Cl}}{\underset{|}{C}}(Me)CH_2COCH_3$  (2)  $CH_3 - \underset{\text{Me}}{\underset{|}{CH}} - CH_2COCH_3$
- (3)  $CH_3CO_2CMe_3$  (4)  $CH_3 - \underset{\text{Me}}{\underset{|}{C}}OC = CH_2$

41. The rate constant for a second-order reaction is  $3.33 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ . If the initial concentration of the reactant is  $0.05 \text{ mol dm}^{-3}$ , then its half life period is :

- (1) 100 minutes (2) 10 minutes (3) 300 seconds (4) 1.0 minute

42. Triple point is the point where :

- (1) Three components are in equilibrium  
 (2) The number of degrees of freedom is three  
 (3) The number of degrees of freedom is zero  
 (4) Three components are not in equilibrium

43. For the distribution of organic solute between water ( $C_1$ ) and benzene ( $C_2$ ), partition coefficient  $k = \sqrt{C_2} / C_1$  suggest that :

- (1) solute exist as monomer in Benzene  
 (2) solute as exist as dimer in benzene  
 (3) solute exist as dimer in water  
 (4) None of these

44. In the lead acid battery during charging the cathodic reaction is :

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

45. Which of the following is not a state function ?

- (1) Work (2) Enthalpy (3) Heat (4) Gibbs free energy



46. The pH of a solution obtained by mixing 25 ml of 0.2 M  $HCl$  with 50 ml of  $NaOH$  ( $k_w = 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ ) will be :  
(1) 10 (2) 1.3 (3) 13 (4) 12
47. The emulsifiers consist of :  
(1) Ionic compound  
(2) Ionic surfactants  
(3) Ionic as well as Non-ionogenic surfactant  
(4) Non-ionic surfactants
48. The rotational spectra of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :  
(1)  $2B$  (2)  $B$  (3)  $3B$  (4)  $3B/2$   
where  $B$  is the rotational constant.
49. Strong covalent bond exists between polymer chains in :  
(1) Thermoplasts (2) Thermosets (3) Elastomers (4) All polymers
50. Choose the correct one :  
(1)  $1 \text{ eV} = 806.56 \text{ cm}^{-1}$  (2)  $1 \text{ eV} = 806506 \text{ cm}^{-1}$   
(3)  $1 \text{ eV} = 80.656 \text{ cm}^{-1}$  (4)  $1 \text{ eV} = 8065.6 \text{ cm}^{-1}$
51. The ground state term symbol for  $d^3$  is :  
(1)  ${}^4F_{3/2}$  (2)  ${}^4F_{9/2}$  (3)  ${}^4D_{5/2}$  (4)  ${}^4P_{3/2}$
52. The pair of metal carbonyl complexes that are isoelectronic is :  
(1)  $[Ni(CO)_4]$  and  $V(CO)_6$  (2)  $[Co(CO)_4]^-$  and  $Ni(CO)_4$   
(3)  $[Cr(CO)_6]$  and  $V(CO)_6$  (4)  $[Fe(CO)_4]^-$  and  $Cr(CO)_6$
53. Which one of the following is a soft acid according to Pearson's concept of hard and soft acids ?  
(1)  $Ag^+$  (2)  $I^{7+}$  (3)  $Sr^{2+}$  (4)  $Al^{3+}$
54. Which one of the following chemical species can behave both as a Bronsted-Lowry acid and a base ?  
(1)  $H_3O^+$  (2)  $HCO_3^-$  (3)  $NO_3^-$  (4)  $SO_4^{2-}$
55. In oxyhaemoglobin  $Fe$  is in state :  
(1) Low spin and diamagnetic (2) Low spin and paramagnetic  
(3) High spin and diamagnetic (4) High spin and paramagnetic

56. Zeise's salt is represented by :

- (1)  $H_2PtCl_6$       (2)  $[PtCl_4]^{2-}$       (3)  $[ZnCl_4]^{2-}$       (4)  $[PtCl_3(n^2 - C_2H_4)]^-$

57. The asymmetry in the electronic absorption spectrum in the visible region of  $[Ti(H_2O)_6]^{3+}$  is caused by :

- (1) charge transfer      (2)  $t_2 \rightarrow e$   
 (3)  $e \rightarrow t$       (4) John-Teller effect

58. Which of the following is correct ?

- (1)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + [\hat{A}, \hat{B}] \hat{A}$       (2)  $[A^2, B] = \hat{A}[\hat{B}, \hat{A}] + [\hat{A}, \hat{B}] \hat{A}$   
 (3)  $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + \hat{A}[\hat{A}, \hat{B}]$       (4) None of the above

59. The operator for square of linear momentum,  $\hat{p}^2$  is given by :

- (1)  $\hat{p}^2 = \hbar^2 \nabla^2$       (2)  $\hbar^2 \nabla^2$       (3)  $\hat{p}^2 = -\hbar^2 \nabla^2$       (4)  $i\hbar \nabla^2$

60. Eigen value is always a :

- (1) zero value      (2) infinite value      (3) positive value      (4) negative value

61. The Miller indices of crystal planes which cut through the crystal axis at  $(2a, -3b, -3c)$  are :

- (1)  $(\bar{2} \bar{2} 3)$       (2)  $(\bar{2} 3 \bar{2})$       (3)  $(3 \bar{2} \bar{2})$       (4)  $(2 3 2)$

62. A tetragonal crystal possesses the following axis of symmetry :

- (1) two-fold      (2) six-fold      (3) four-fold      (4) three-fold

63. The temperature below which a gas becomes cooler on expansion is called :

- (1) Boyle temperature      (2) Inversion temperature  
 (3) Critical temperature      (4) Boiling point

64. For one mole of the gaseous mixture, the entropy of mixing is given by :

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

where  $r_i, x_i$  represent activity coefficient and mole fraction of components in the mixture.

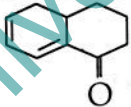
65. Which of the followings is correct ?

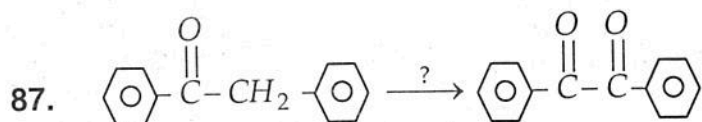
- (1)  $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$       (2)  $\left(\frac{\partial S}{\partial P}\right)_T = \left(\frac{\partial V}{\partial S}\right)_P$   
 (3)  $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$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



66. The standard state for a solid is the pure state of solid at :
- (1) one atmospheric pressure and  $273^{\circ}\text{C}$
  - (2) one atmospheric pressure and given temperature
  - (3)  $273\text{ K}$
  - (4) one atmospheric pressure and  $273\text{ K}$
67. In the limit  $T \rightarrow 0$ , for a crystal :
- (1)  $S_T = C_P$
  - (2)  $S_T = C_V$
  - (3)  $S_T = C_P/3$
  - (4)  $S_T = C_V/T$
- where  $C_P, C_V$  are heat capacity at constant pressure and volume respectively.
68. Which aqueous solution of urea freezes at  $-0.93^{\circ}\text{C}$  ( $k_f = 1.86$ ) ?
- (1) 30 gm in one litre of solution
  - (2) 150 gm in 5 litre of water
  - (3) 30 gm in 500 ml of water
  - (4) 150 gm in five litre of solution
69. The parameters of an orthorhombic unit cell is  $a = 50\text{ pm}$ ,  $b = 100\text{ pm}$ ,  $c = 150\text{ pm}$ . The spacing between (123) planes will be :
- (1) 29 pm
  - (2) 0.029 pm
  - (3) 0.29 pm
  - (4) 2.9 pm
70. Milk is a/an :
- (1) Gel
  - (2) Emulsion
  - (3) Suspension
  - (4) Pure solution
71. A hybrid orbital formed from  $s$  and  $p$  orbital can contribute to :
- (1) a  $\sigma$  bond only
  - (2)  $\pi$ -bond only
  - (3) either a  $\sigma$  or  $\pi$  bond
  - (4) cannot be predicted
72. During change of  $\text{NO}^+$  to  $\text{NO}$ , the electron is added to :
- (1)  $\sigma$ -orbital
  - (2)  $\pi$ -orbital
  - (3)  $\sigma^*$ -orbital
  - (4)  $\pi^*$ -orbital
73. Intramolecular H-bonding is present in :
- (1) meta nitrophenol
  - (2) salicylaldehyde
  - (3) hydrogen chloride
  - (4) benzophenone
74. Which forces are strongest amongst the following ?
- (1) Ion-ion interaction
  - (2) Ion-dipole forces
  - (3) Dipole-dipole forces
  - (4) Dipole induced dipole forces
75. The product obtained in the reaction of diborane with excess of ammonia is :
- (1)  $\text{B}_2\text{H}_6 \cdot \text{NH}_3$
  - (2)  $\text{B}_2\text{H}_6 \cdot 2\text{NH}_3$
  - (3)  $(\text{BN})_x$
  - (4) Borazine
76. Pyrophosphoric acid is :
- (1) monobasic
  - (2) dibasic
  - (3) tribasic
  - (4) tetrabasic

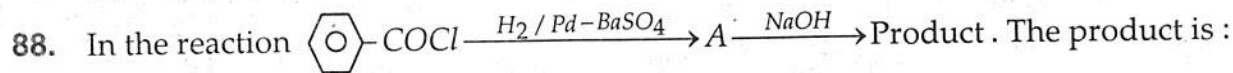


77. The basic unit in layer and sheet silicates is :  
 (1)  $SiO_4^{4-}$  (2)  $Si_2O_7^{6-}$  (3)  $(SiO_3)_n^{2n-}$  (4)  $(Si_2O_5)_n^{2n-}$
78. Which of the following bonds is the strongest ?  
 (1) F-F (2) Cl-Cl (3) I-I (4) Br-Br
79. Hybridization and structure of  $XeF_4$  is :  
 (1)  $sp^3d$ , trigonal bipyramidal (2)  $sp^3$ , tetrahedral  
 (3)  $sp^3d^2$ , square planar (4)  $sp^3d^2$ , hexagonal
80. Which of the following transition element shows the highest oxidation state ?  
 (1) Mn (2) Fe (3) V (4) Cr
81. A nitrogenous substance X is treated with  $HNO_2$  and the product so formed is further treated with  $NaOH$  solution, which produces blue colouration. X can be :  
 (1)  $CH_3CH_2NH_2$  (2)  $CH_3CH_2NO_2$  (3)  $CH_3CH_2ONO$  (4)  $(CH_3)_2CHNO_2$
82. The monomeric unit present in natural rubber is :  
 (1) Butadiene (2) Terephthalic acid  
 (3) Hexamethylenetetramine (4) Isoprene
83. Ethylacetoacetate reacts with hydroxylamine and product formed immediately loses a molecule of ethanol to form :  
 (1) Methyl phenyl pyrazolone (2) 4-methylcoumarin  
 (3) Methyl oxazolone (4) Methyl isoxazolone
84. In UV the following compound would show absorption at :  
  
 (1) 280 nm (2) 259 nm (3) 304 nm (4) 317 nm
85. Which of following reaction involves rearrangement of nitrogen yields ?  
 (1) Wittig reaction (2) Von-Richter reaction  
 (3) Sommler-Hauser rearrangement (4) Pinacol-Pinacolone rearrangement
86. Absolute configuration of  $\begin{array}{c} \text{COOH} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{COOH} \end{array}$  is :  
 (1) 2S, 3S (2) 2R, 3R (3) 2S, 3R (4) 2R, 3S



Reagent used for above reaction is :

- (1)  $\text{NaBH}_4 / \text{CH}_3\text{OH}$  (2)  $\text{MnO}_2$   
 (3)  $\text{SeO}_2$  (4)  $\text{Br}_2$  followed by reaction with  $\text{KOH}$



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

89. Heterocyclic  $\beta$ -ketoesters can be prepared by which one of following reactions ?

- (1) Aldol condensation  
 (2) Micheal addition followed by Dieckmann condensation  
 (3) Claisen ester condensation  
 (4) Micheal addition

90. The artificial sweetner used in soft drinks is :

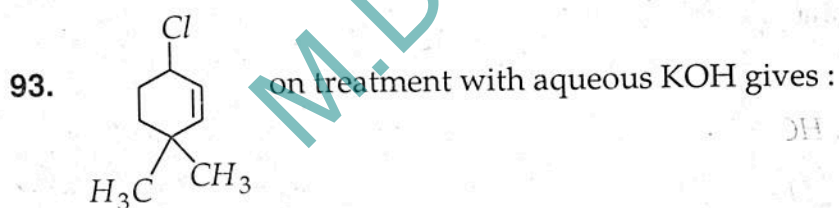
- (1) Glucose (2) Fructose (3) Aspartin (4) Glycerol

91. The number of optically active isomers of  $\text{HOCH}_2(\text{CHOH})_4\text{CHO}$  is :


- (1) 4 (2) 8 (3) 16 (4) 24

92. Geometry of trifluoromethyl free radical is :

- (1) Planar (2) Pyramidal (3) V-shaped (4) Tetrahedral



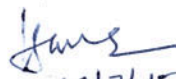
- (1) (2)   
 (3) (4)

94. Chloroform easily gets converted to poisonous phosgene in presence of air and sunlight. Which of the following substances is added to prevent formation of phosgene ?
- (1) Ethanol (2) Sodium carbonate  
(3) Diethyl carbonate (4) Sodium hydroxide
95. n-Butane reacts with  $Br_2$  at  $130^\circ$  to give more amount of :
- (1)  $CH_3 - CH_2 - \underset{\text{Br}}{\text{CH}} - CH_3$  (2)  $CH_3CH_2CH_2CH_2Br$
- (3)  $H_3C - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - Br$  (4) All in equal amounts
96. The reaction of  $CH_3CH = CH - \text{C}_6\text{H}_4 - OH$  with  $HBr$  gives :
- (1)  $CH_3CH_2CHBr - \text{C}_6\text{H}_4 - OH$  (2)  $CH_3CH_2CHBr - \text{C}_6\text{H}_4 - Br$   
(3)  $CH_3\underset{\text{Br}}{\text{CH}} - CH_2 - \text{C}_6\text{H}_4 - OH$  (4)  $CH_3\underset{\text{Br}}{\text{CH}} - CH_2 - \text{C}_6\text{H}_4 - Br$
97. Preparation of alkyl halides in laboratory is least preferred by :
- (1) Halide exchange (2) Direct halogenation of alkanes  
(3) Treatment of alcohols (4) Addition of hydrogen halides to alkenes
98. Allyl alcohol is obtained when glycerol reacts with following at  $260^\circ\text{C}$  :
- (1) Formic acid (2) Oxalic acid (3) Both (4) None
99. Predict the major product :
-  + excess HI  $\rightarrow$
- (1)  $HO - CH_2 - CH_2 - CH_2 - CH_2 - I$  (2)  $HOCH_2CH_2CH_2CH_2OH$   
(3)  $I - CH_2CH_2CH_2 - CH_2 - I$  (4) No reaction
100. Conversion of chlorobenzene into phenol of Dow's process is an example of :
- (1) Free radical substitution (2) Nucleophilic substitution  
(3) Electrophilic substitution (4) Rearrangement



S.No.	A	B	C	D
1	3	4	1	3
2	2	1	4	2
3	3	1	2	1
4	2	4	1	4
5	1	2	3	1
6	3	4	4	2
7	2	3	4	3
8	3	3	2	4
9	3	3	3	1
10	2	3	1	2
11	4	2	4	4
12	1	3	4	1
13	1	2	4	3
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34	4	3	4	4
35	1	1	1	2
36	1	3	4	4


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 P1 P1

37	3	4	3	3
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72	2	2	3	4
73	1	1	2	2

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74	4	2 ✓	4	1
75	1	1 ✓	1	3
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99	2	1 ✓	1	3
100	4	2 ✓	1	2

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