Prepp

Practice, Learn and Achieve
Your Goal with Prepp

# UP TGT PGT

## Chemistry Paper

Simplifying
**Government Exams**

SSC CHSL | IAS EXAM | RRB NTPC | NTSE | CDS
SSC CGL | CBSE UGC NET | IBPS PO | NDA
SBI PO | IBPS CLERK | AFCAT | SSC JE | CTET
CSIR UGC NET | CAPF | IBPS RRB

www.prepp.in

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet Series

Serial No. 196800

D

# SCREENING TEST – 2009

## SUBJECT : CHEMISTRY

*Time Allowed : **Two Hours***

*Maximum Marks : **120***

## INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE RESPONSE SHEET.
3. You have to enter your Roll Number on this Test Booklet in the Box provided alongside. *DO NOT* write *anything* else on the Test Booklet.

   Your Roll No. .....
4. This Booklet contains **120** items (questions). Each item comprises four response (answers). You will select one response which you want to mark on the Respons Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. In case you find any discrepency, in this test booklet in any question(s) or the Responses, a written representation explaining the details of such alleged discrepency, be submitted within three days, indicating the Question No(s) and the Test Booklet Series, in which the discrepency is alleged. Representation not received within time shall not be entertained at all.
6. You have to mark all your responses ***ONLY*** on the separate Response Sheet provided. See directions in the Response Sheet.
7. All items carry equal marks. Attempt ***ALL*** items. Your total marks will depend only on the number of correct responses marked by you in the Response Sheet.
8. Before you proceed to mark in the Response Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Response Sheet as per instructions sent to you with your Admit Card and Instructions.
9. While writing Centre, Subject, and Roll No. on the top of the Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.
10. After you have completed filling in all your response on the Response Sheet and the examination has concluded, you should hand over to the Invigilator only the Response Sheet. You are permitted to take away with you the Test Booklet.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

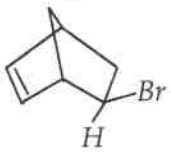
## (For Rough Work)

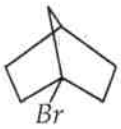
# Screening Test – 2009

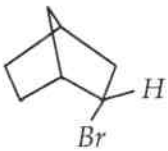
## Subject : CHEMISTRY

*Time Allowed : Two Hours ]* *[ Max. Marks : 120*

**1.** Which of the following compounds does ***not*** undergo nucleophilic substitution on reacting with aq. sodium hydroxide ?

(a) 

(b) 

(c) 

(d) $(CH_3)_3C-Br$

**2.** The reaction accompanied by inversion of configuration is :

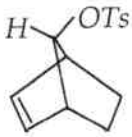
(a) $Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-OH + TsCl \xrightarrow{\text{Base}} Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-OTs$

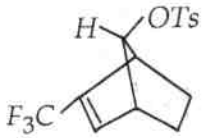
(b) $Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}\,OH \xrightarrow{K} Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-O^-K^+ + \frac{1}{2}H_2$

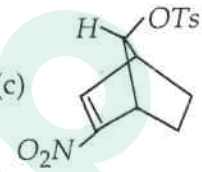
(c) $Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-OTs \xrightarrow[K_2CO_3]{EtOH} Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-OEt + TsO^-K^+$

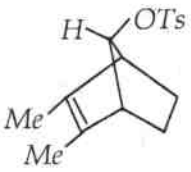
(d) $Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-O^-K^+ \xrightarrow{EtBr} Me-\underset{\displaystyle CH_2Ph}{\underset{|}{CH}}-OEt + KBr$

**3.** The compound that undergoes acetolysis most readily is :

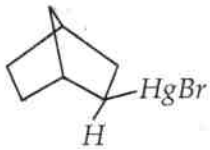
(a) 

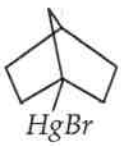
(b) 

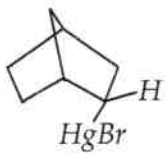
(c) 

(d) 

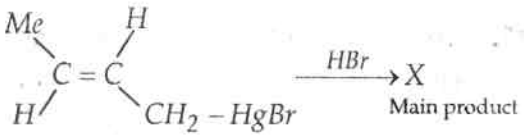
**4.** The compound which on reacting with bromine undergoes electrophilic substitution with retention of configuration is :

(a) 

(b) 

(c) 

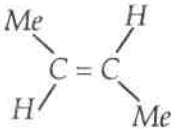
(d) Sec-BuHg *Br*

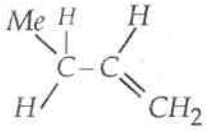
5. 


X is :

(a) $MeCH_2 - \underset{\underset{Br}{|}}{CH} - CH_2 - HgBr$

(b) $Me\underset{\underset{Br}{|}}{CH} - CH_2 - CH_2 - HgBr$

(c) 


(d) 


6. $CH_3CH_2CH_2Br \xrightarrow{AlBr_3} CH_3\underset{\underset{Br}{|}}{CH}CH_3$

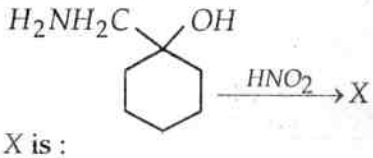
The rearrangement is :

(a) Wagner - Meerwein

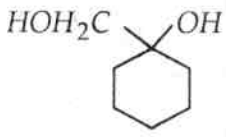
(b) Wittig

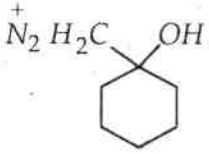
(c) Curtius

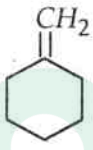
(d) Hofmann

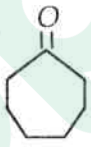
7. 

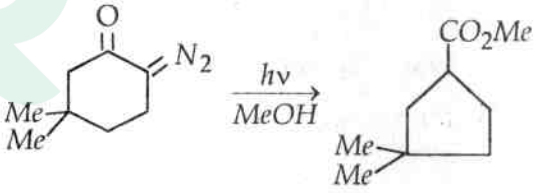

X is :

(a) 


(b) 


(c) 


(d) 


8. 


The reaction involves a :

(a) Nitrene intermediate

(b) Carbene intermediate

(c) Carbocation

(d) Carbanion

9. Which of the following is expected to undergo Wittig rearrangement most readily ?

(a) $CH_2 = CH - CH_2 - OMe$

(b) $CH_2 = CH - CH_2 - OEt$

(c) $CH_2 = CH - CH_2 - O\overset{i}{P}r$

(d) $CH_2 = CH - CH_2 - O - \overset{t}{B}u$

**10.** $PhCO-CH_2-\overset{\oplus}{S}(Me)-Ph \xrightarrow{NaNH_2} \underset{\text{Main product}}{X}$

X is :

(a) $PhCOCH_2-\overset{\oplus}{S}(CH_2^{\ominus})-Ph$

(b) $PhCOCH_2-S-CH_2Ph$

(c) $PhCOCH(Me)-S-Ph$

(d) $PhCOCH(Ph)-S-Me$

**11.** $Me_2C=CH\,Me \xrightarrow[(ii)\ H_2O_2+NaOH]{(i)\ (BH_3)_2} X$

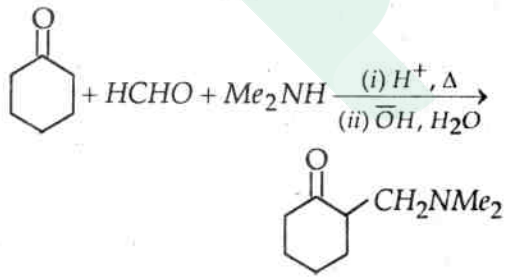
X is :

(a) $Me_2CH-CH(BH_2)-Me$

(b) $Me_2CH(BH_2)-CH_2Me$

(c) $Me_2CH(OH)-CH_2Me$

(d) $Me_2CH_2-CH(OH)-Me$

**12.** 

The reaction is called :

(a) Michael addition

(b) Mannich reaction

(c) Reformatsky reaction

(d) Aldol condensation

**13.** The carbonyl compounds can be changed into alkenes by the use of :

(a) Wittig reaction

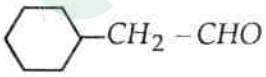
(b) Perkin reaction

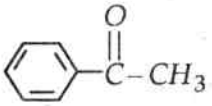
(c) Prins reaction

(d) Benzoin condensation

**14.** The aldol condensation is ***not*** given by :

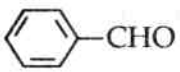
(a) 

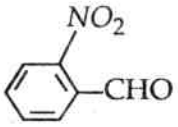
(b) 

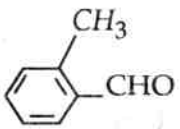
(c) 

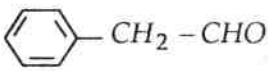
(d) $(CH_3)_3C-CHO$

**15.** Perkin reaction is ***not*** given by :

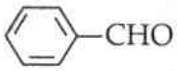
(a) 

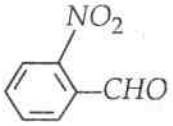
(b) 

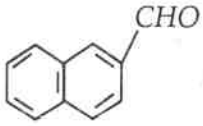
(c) 

(d) 

16. Which of the following does ***not*** undergo benzoin condensation ?

(a) 

(b) 

(c) 

(d) 

17. $Me_2C=CH_2 + HCHO \xrightarrow[H_2O]{H^+} X$

$X$ is :

(a) $Me_2C=CH-CH_2OH$

(b) $Me_2\underset{\displaystyle CH_2OH}{\overset{\displaystyle |}{C}}-CH_3$

(c) $Me_2CH-CH_2-CH_2OH$

(d) $Me_2C=CH-O-CH_3$

18. $CH_3CHO + HCHO \xrightarrow{^-OH} C(CH_2OH)_4$

The reaction is :

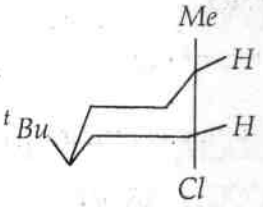
(a) Prins reaction

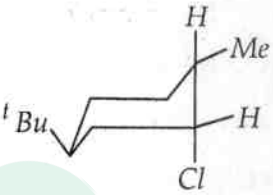
(b) Mannich reaction

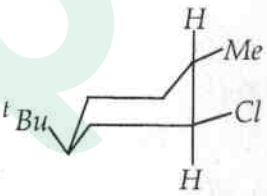
(c) Tollen's reaction

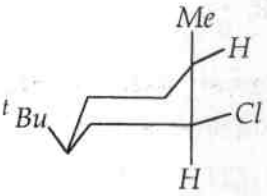
(d) Knoevenagel reaction

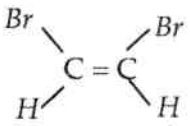
19. On heating with an alcoholic solution of sodium ethoxide, which of the following is expected to give cyclohexene derivative most readily ?

(a) 

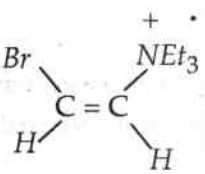
(b) 

(c) 

(d) 

20.  $+ Et_3N \xrightarrow{DMF} X + Y$

$X$ and $Y$ are :

(a)  and $Br^-$

(b) $H-C\equiv C-H$ and $Et_3\overset{+}{N}HBr^-$

(c) $H-C\equiv C-Br$ and $Et_3\overset{+}{N}HBr^-$

(d) $Br-C\equiv C-Br$ and $Et_2NH$

21. The molecule having $\sigma_h$ is :

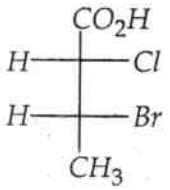
(a) Dimethylacetylene

(b) Acetonitrile

(c) Water

(d) Chloroform

22. The absolute configuration of




is :

(a) 2S, 3R

(b) 2R, 3S

(c) 2S, 3S

(d) 2R, 3R

23. The most stable conformation of cyclohexane is :

(a) Boat

(b) Half - chair

(c) Twisted chair

(d) Chair

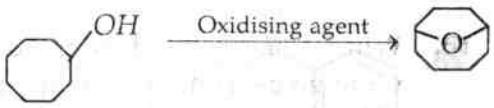
24. Sandmeyer reaction can be used for the conversion of aniline into :

(a) Fluorobenzene

(b) Bromobenzene

(c) Iodobenzene

(d) Nitrobenzene

25. 


For the above conversion, the most appropriate oxidising agent is :

(a) Osmium tetroxide

(b) Selenium oxide

(c) Acidic dichromate

(d) Lead tetraacetate

26. Picryl chloride on reacting with aqueous sodium hydroxide changes into picric acid. The reaction follows :

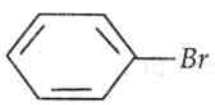
(a) Benzyne mechanism

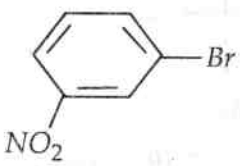
(b) SN2 mechanism

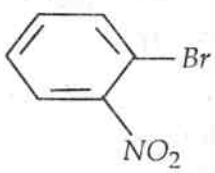
(c) SNAr mechanism

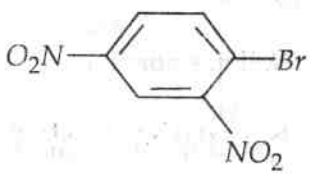
(d) SRN1 mechanism

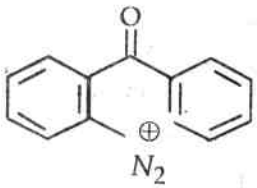
27. Which of the following compounds would react with an alcoholic solution of sodium methoxide most readily ?

(a) 

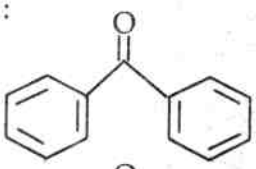

(b) 

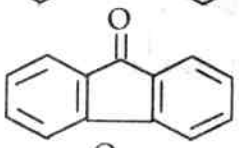

(c) 

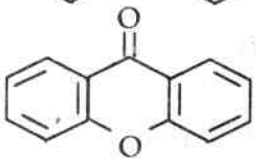

(d) 

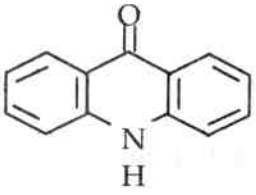
**28.**  $\xrightarrow{\bar{O}H}$ X

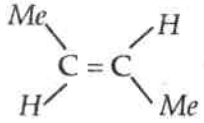
X is :

(a) 

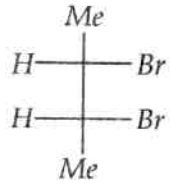
(b) 

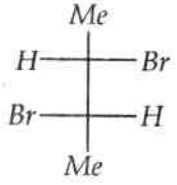
(c) 

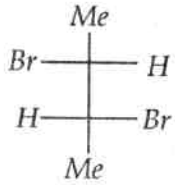
(d) 

**29.**  $+ Br_2 \longrightarrow X$

X is :

(a) 

(b)  alone

(c)  alone

(d) A mixture of (b) and (c)

**30.** $CH_2 = CH - \overset{O}{\overset{\|}{C}} - OEt + PhSH \xrightarrow{\bar{O}H} X$

X is :

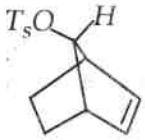
(a) $PhS - CH_2 - CH = \overset{OH}{\overset{|}{C}} - OEt$

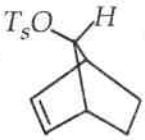
(b) $PhS - CH_2 - CH_2 - \overset{O}{\overset{\|}{C}} - OEt$

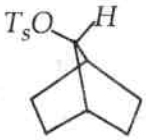
(c) $CH_3 - \underset{SPh}{\underset{|}{CH}} - \overset{O}{\overset{\|}{C}} - OEt$

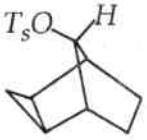
(d) $CH_3 - CH = \overset{O-S-Ph}{\overset{|}{C}} - OEt$

**31.** Which of the following undergoes acetolysis most readily?

(a) 

(b) 

(c) 

(d) 

**32.** Which of the following reactions involves a benzyne intermediate?

(a) Reaction of 1, 1-dichloroethene with sodium thiophenolate

(b) Reaction of 2, 4-dinitrochloro-benzene with sodium amide in liquid ammonia

(c) Reaction of chlorobenzene with sodium amide in liquid ammonia

(d) Reaction of tetrachloro-p-benzoquinone with aqueous sodium hydroxide

**33.** The most stable free radical is :

(a) $Ph\,CH_2\,\dot{C}H_2$

(b) $Ph\,\dot{C}H_2$

(c) $Ph\,\dot{C}H - CH_3$

(d) $Ph_3\,\dot{C}$

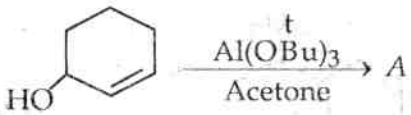
**34.** Which of the following reactions involves a carbanion intermediate ?

(a) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2OH + H_2SO_4 \xrightarrow{\Delta}$ Product

(b) $CH_3CHO \xrightarrow[\Delta]{\text{dilute alkali}}$ Product

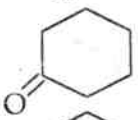
(c) $C_6H_5OH + CCl_4 \xrightarrow[\Delta]{\text{dil.alkali}}$ Product

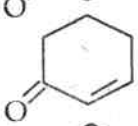
(d) $CH_3 - CH = CH_2 \xrightarrow[\text{Product}]{NBS}$

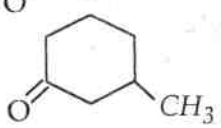
**35.** 

A is :

(a) 

(b) 

(c) 

(d) 

**36.** According to Hückel rule, a cyclic planar conjugated polyene is aromatic if it contains :

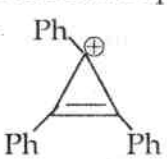
(a) $(4n + 1)\ \pi$ electrons

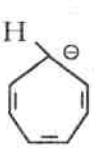
(b) $(4n + 2)\ \pi$ electrons

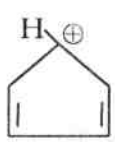
(c) $4n\ \pi$ electrons

(d) $(2n + 4)\ \pi$ electrons

**37.** The aromatic species is :

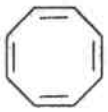
(a) 

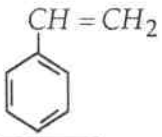
(b) 

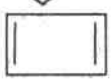
(c) 

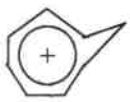
(d) 

**38.** The antiaromatic system is :

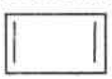
(a) 

(b) 

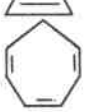

(c) 

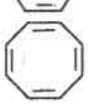
(d) 


**39.** The molecule which on mono-protonation gives homoaromatic cation is :

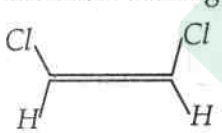
(a) 

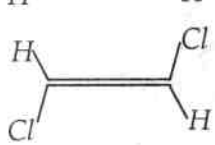
(b) 

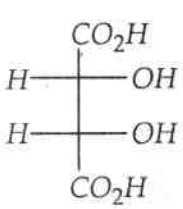
(c) 

(d) 

**40.** The molecule having $C_2$ symmetry is :

(a) 


(b) 


(c) 


(d) $H - C \equiv N$

**41.** Wilkinson's catalyst $(Ph_3P)_3RhCl$ is used for :

(a) Hydrogenation of aromatic rings

(b) Hydrogenation of alkynes

(c) Hydrogenation of alkenes

(d) Polymerisation of alkenes

**42.** In which there is outer orbital hybridization ?

(a) $[Zn(NH_3)_6]^{2+}$

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

(c) $[Cr(NH_3)_6]^{3+}$

(d) $[V(NH_3)_6]^{3+}$

**43.** Co-ordination number and oxidation number of $Cr$ in $K_3[Cr(C_2O_4)_3]$ are respectively :

(a) 4 and + 2

(b) 6 and + 3

(c) 3 and + 3

(d) 3 and 0

**44.** The zero point energy of an oscillating diatomic molecule is given by :

(a) $\frac{1}{2} h\ V_{osc}$

(b) $h\ V_{osc}$

(c) $\frac{3}{2} h\ V_{osc}$

(d) $2h\ V_{osc}$

**45.** The geometry of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are :

(a) both square planar

(b) tetrahedral & square planar

(c) both tetrahedral

(d) square planar and tetrahedral

46. Which of the following represents the correct order of decreasing energy for electronic transitions ?

(a) $\sigma - \sigma^* > \sigma - \pi^* > \pi - \pi^* > n - \pi^*$

(b) $\sigma - \pi^* > \sigma - \sigma^* > \pi - \pi^* > n - \pi^*$

(c) $\pi - \pi^* > n - \pi^* > \sigma - \sigma^* > \sigma - \pi^*$

(d) $n - \pi^* > \sigma - \sigma^* > \sigma - \pi^* > \pi - \pi^*$

47. The number of vibrational degrees of freedom for a non-linear molecule benzene are :

(a) 16

(b) 30

(c) 18

(d) 22

48. In the PMR spectrum, $n$ equivalent protons split a signal due to protons on a neighbouring carbon atom into :

(a) $n$ lines

(b) $n + 1$ lines

(c) $n + 2$ lines

(d) $n - 1$ lines

49. The emission of radiation which results due to transition of the molecule from an excited state to the ground state without a change in multiplicity is called :

(a) phosphorescence

(b) fluorescence

(c) inter-system crossing

(d) internal conversion

50. An auxochrome shifts the absorption band towards :

(a) shorter wavelength

(b) longer wavelength

(c) no change in wavelength

(d) higher frequency

51. When zeolite, which is a hydrated sodium aluminium silicate, is treated with hard water, the sodium ions are exchanged with :

(a) $H^+$

(b) $Ca^{2+}$

(c) $Mg^{2+}$

(d) $Ca^{2+}$ and $Mg^{2+}$

52. Which of the following complexes will be coloured ?

(a) $[Ti(H_2O)_6]^{3+}$

(b) $[Ti(H_2O)_6]^{4+}$

(c) $[Zn(NH_3)_6]^{2+}$

(d) $[Al(H_2O)_6]^{3+}$

53. In which of the following molecule/ ions, the central atom does ***not*** involve a d-orbital in the hybridization process ?

(a) $I_3^-$

(b) $SF_6$

(c) $[Cu(NH_3)_4]^{2+}$

(d) $MnO_4^-$

54. Which out of the following structures is expected to have three bond pairs and one lone pair ?

(a) Tetrahedral

(b) Octahedral

(c) Trigonal

(d) Pyramidal

55. Which of the following high spin aqua complexes exhibits Jahn-Teller distortion ?

(a) $[Cr(H_2O)_6]^{3+}$

(b) $[Cr(H_2O)_6]^{4+}$

(c) $[Fe(H_2O)_6]^{3+}$

(d) $[Ni(H_2O)_6]^{2+}$

56. The bond lengths in the species $O_2$, $O_2^+$ and $O_2^-$ are in the order :

(a) $O_2^+ > O_2 > O_2^-$

(b) $O_2^+ > O_2^- > O_2$

(c) $O_2 > O_2^+ > O_2^-$

(d) $O_2^- > O_2 > O_2^+$

57. Which of the following ions in a high spin octahedral complex will have the highest crystal field stabilization energy ?

(a) $Ti^{2+}$

(b) $V^{2+}$

(c) $Cr^{2+}$

(d) $Mn^{2+}$

58. Which of the following ligands produces highest crystal field splitting in a $Fe^{3+}$ octahedral complex ?

(a) $CN^-$

(b) $F^-$

(c) $H_2O$

(d) $NH_3$

59. Which of the following molecules will ***not*** exhibit rotational spectra ?

(a) $NO$

(b) $CO_2$

(c) $SO_2$

(d) $HF$

60. The spacing between successive spectral lines in the rotational spectra of a diatomic molecule is :

(a) B

(b) 2B

(c) 3B

(d) 4B

61. Which of the following is an example of a compound semiconductor ?

(a) $GaAs$

(b) $NaCl$

(c) $AlCl_3$

(d) $SiCl_4$

62. Which of the following has the lowest band gap ?

(a) carbon

(b) silicon

(c) germanium

(d) grey tin

63. $d^2sp^3$ hybridization leads to :

(a) hexagonal shape

(b) tetrahedral shape

(c) trigonal bipyramidal

(d) octahedral shape

64. Which of the following is ***not*** correct about the phosphazene molecule ?

(a) It's molecular formula is $P_3N_3Cl_6$

(b) In phosphazene $N$ is $sp^3$ and $P$ is $sp^2$ hybridised

(c) It has a planar ring structure

(d) Phosphazene involves $d\pi-p\pi$ bonding

65. In which of the following the 18-electron rule is ***not*** obeyed ?

(a) $Cr(CO)_6$

(b) $Fe(CO)_5$

(c) $Ni(CO)_4$

(d) $Cl\,Mn(CO)_5$

66. Which of the following molecules is paramagnetic ?

(a) $O_2$

(b) $CO$

(c) $H_2$

(d) $F_2$

67. Which of the following does ***not*** have a metal-carbon $\sigma$ bond ?

(a) $CH_3MgBr$

(b) $Cr(CO)_6$

(c) $Fe\left(\eta^5-C_5H_5\right)_2$

(d) $Mn_2(CO)_{10}$

68. The Zeise's salt is :

(a) $[Cr(C_6H_6)_2]$

(b) $[(Ph_3P)_2PtC_2H_4]$

(c) $[Pt(C_2H_4)Cl_3]$

(d) $[Cr(CO)_6]$

69. Which of the following diboranes does ***not*** exist ?

(a) $B_2H_4(CH_3)_2$

(b) $B_2H_3(CH_3)_3$

(c) $B_2H_2(CH_3)_4$

(d) $B_2H(CH_3)_5$

70. Which of the following is paramagnetic ?

(a) $[Fe(CN)_6]^{4-}$

(b) $[Ni(CO)_4]$

(c) $[Ni(CN)_4]^{2-}$

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

71. The species which has pyramidal shape is :

(a) $PCl_3$

(b) $SO_3$

(c) $CO_3^{2-}$

(d) $CO_2$

72. The relative overlap of orbitals decreases in the order :

(a) $sp > sp^2 > sp^3 > p$

(b) $sp^2 > sp^3 > sp > p$

(c) $sp^3 > sp^2 > sp > p$

(d) $p > sp > sp^2 > sp^3$

73. Which of the following has the smallest bond angle ?

(a) $PCl_3$

(b) $PBr_3$

(c) $PI_3$

(d) $PF_3$

74. Which of the following has a see-saw structure ?

(a) $Ni(CO)_4$

(b) $SF_4$

(c) $XeO_4$

(d) $SO_4^{2-}$

75. Which of the following molecules has a T-shaped structure ?

(a) $BF_3$

(b) $NH_3$

(c) $PF_3$

(d) $ClF_3$

76. The hybridization state of $Fe$ in $[Fe(H_2O)_5NO]SO_4$ is :

(a) $dsp^2$

(b) $sp^3d^2$

(c) $sp^3d$

(d) $d^2sp$

77. Which of the following molecules has a three centre electron pair (3c – 2e) bond ?

(a) $C_2H_6$

(b) $B_2H_6$

(c) $Al_2Cl_6$

(d) $Si_2H_6$

78. Which of the following exhibits intramolecular hydrogen bonding ?

(a) Ammonia

(b) Water

(c) Ortho-nitrophenol

(d) Para-nitrophenol

79. Which of the following has the highest bond order ?

(a) $O_2$

(b) $O_2^-$

(c) $O_2^{2-}$

(d) $O_2^+$

80. Which of the following is an example of elemental semiconductor ?

(a) tin

(b) germanium

(c) graphite

(d) copper

81. The unit of rate constant for a zero order reaction is :

(a) litre $sec^{-1}$

(b) litre $mol^{-1}sec^{-1}$

(c) mol $litre^{-1}$ $sec^{-1}$

(d) mol $sec^{-1}$

82. What is the order of a reaction which has a rate expression :

rate = $k[A]^{3/2}[B]^{-1}$ ?

(a) $\frac{3}{2}$

(b) $\frac{1}{2}$

(c) zero

(d) none of these

83. A reaction gets completed in a finite time. Its order is :
(a) one
(b) zero
(c) 1/2
(d) two

84. Which of the following cell is a secondary cell ?
(a) Mercury cell
(b) *Ni* cell
(c) Dry cell
(d) Fuel cell

85. If at absolute temperature T, the free energy and enthalpy change are ΔG and ΔH respectively, then the entropy change ΔS for the reaction becomes :
(a) $\frac{\Delta G - \Delta H}{T}$
(b) $\frac{\Delta H - \Delta G}{T}$
(c) $T(\Delta G - \Delta H)$
(d) $T(\Delta H - \Delta G)$

86. A biological catalyst is :
(a) a carbohydrate
(b) an enzyme
(c) an amino acid
(d) an nitrogenous base

87. A substance with initial concentration of 'a' mol $dm^{-3}$ reacts according to zero-order kinetics. The time it takes for the completion of the reaction is :
(a) $k/a$
(b) $a/2k$
(c) $a/k$
(d) $2k/a$
where $k$ is the rate constant.

88. The rotational energy levels of a rigid rotator are given by
$E_j = \frac{h^2}{8\pi^2 I} J(J+1)$. The rotational const. 'B' is :
(a) $h^2/8\pi^2 I$ (b) $h/8\pi^2 I.C$
(c) $h/8\pi^2 I$ (d) $h^2/8\pi^2 IC$

89. A catalyst in finely divided state is more efficient because in this state :
(a) It has larger activation energy
(b) It can react with one of the reactants more efficiently
(c) It has large surface area
(d) All the above

90. For a single step reaction 2A + B → products, the molecularity is :
(a) zero (b) one
(c) two (d) three

91. Which of the following does *not* show positive deviation from Raoult's law ?
(a) Benzene-Chloroform
(b) Benzene-Acetone
(c) Benzene-Ethanol
(d) Benzene-$CCl_4$

92. Free energy change of reversible reaction at equilibrium is :
(a) infinite (b) zero
(c) positive (d) negative

93. Ionic product of water is given by the relation :
(a) $k_w = [H_3O^+]\,[H_2O]$
(b) $k_w = [H_3O^+]\,[OH^-]$
(c) $k_w = [H^+]\,[H_2O]$
(d) $k_w = \frac{[H^+]\,[OH^-]}{[H_2O]}$

94. The half-life of trancium is 4.8 min. starting with 1 mg of the isotope, the amount left after 24 min. would be :

(a) 0.312 mg

(b) 0.0312 mg

(c) 0.156 mg

(d) 0.0156 mg

95. On diluting the solution of a strong electrolyte, its equivalent conductance :

(a) decreases

(b) increases

(c) remains constant

(d) first decreases and then increases

96. The correct expression for Ostwald's dilution law is :

(a) $k_a = \frac{\alpha^2}{V}$

(b) $k_a = \alpha^2 \times V$

(c) $k_a = \frac{\alpha^2}{(1-\alpha)V}$

(d) $\frac{\alpha^2}{(1-\alpha)C}$

97. *KCl* is used in salt bridge because :

(a) *KCl* is a strong electrolyte

(b) $K^+$ and $Cl^-$ have the same value of transport number

(c) $K^+$ and $Cl^-$ are isoelectronic

(d) Agar-Agar and *KCl* can form a fine gelly

98. The unit of specific conductivity is :

(a) $\text{ohms}^{-1}\text{cm}^{-1}$

(b) $\text{ohms cm}^{-2}$

(c) $\text{ohms}^{-1}\text{cm}$

(d) $\text{ohms cm}^{-1}$

99. Normal hydrogen electrode (NHE) has been assigned a potential of :

(a) 0 volt (b) 1 volt

(c) 10 volt (d) 100 volt

100. The standard free energy change ($\Delta G^\circ$) is related to equilibrium constant ($k$) as :

(a) $\Delta G^\circ = RT \log k$

(b) $-\Delta G^\circ = RT \log k$

(c) $-\Delta G^\circ = 2.303\ RT \log k$

(d) $-\Delta G^\circ = \frac{RT \log k}{2.303}$

101. The reaction taking place in a glow-worm (fire-flies) is most correctly called :

(a) A simple chemical reaction

(b) A photochemical reaction

(c) Phosphorescence

(d) Chemiluminescence

102. The following equation of state of a real gas $\ln \frac{f}{P} = \int_0^P \left( \frac{\overline{V}}{RT} - \frac{1}{P} \right) dP$ allows us to calculate the ratio of the fugacity ($f$) to the pressure ($P$) of a gas at any $P$ and $T$. If the gas behaves idealy, then $\ln f/P$ becomes :

(a) 0

(b) 1

(c) $\infty$

(d) None of the above

**103.** In any two electron system, $\overline{H}$ $(z = 1)$ and $He$ $(z = 2)$, with the position of the nucleus fixed, the number of spatial coordinates for both the electrons are :

(a) 2 (b) 3

(c) 4 (d) 6

**104.** The equilibrium constant (k) for the heterogeneous system (water-gas reaction) :

$C_{(s)} + H_2O_{(g)} \rightleftharpoons CO_{(g)} + H_{2(g)}$ is :

(a) ${}^{a}CO_{(g)} \cdot {}^{a}H_{2(g)} / {}^{a}C_{(s)} \cdot {}^{a}H_2O_{(g)}$

(b) ${}^{f}CO_{(g)} \cdot {}^{f}H_{2(g)} / {}^{a}C_{(s)} \cdot {}^{f}H_2O_{(g)}$

(c) ${}^{f}CO_{(g)} \cdot {}^{f}H_{2(g)} / {}^{f}H_2O_{(g)}$

(d) all are correct

**105.** For adsorption of a gas on a solid, the plot of log $x/m$ versus log $P$ is linear with slope equal to :

(a) $k$ (b) $n$

(c) $\log k$ (d) $1/n$

**106.** The standard reduction potential at 25°C of $Li^+/Li$; $Ba^{2+}/Ba$; $Na^+/Na$ and $Mg^{2+}/Mg$ are –3.05, –2.73, –2.71 and –2.37 volts respectively. Which one of the following is the strongest oxidising agent ?

(a) $Li^+$ (b) $Na^+$

(c) $Ba^{2+}$ (d) $Mg^{2+}$

**107.** The standard cell potential E° for the cell $Zn|Zn^{2+}(1M)\|Cu^{2+}(1M)|Cu$ is :

(a) – 0.42 V (b) – 1.10 V

(c) 0.42 V (d) 1.10 V

*Given :* $E°Zn^{2+}/Zn = -0.76\,V$, and

$E°Cu^{2+}/Cu = 0.34\,V$

**108.** All form ideal solution except :

(a) $C_6H_6$ and $C_6H_5CH_3$

(b) $C_2H_5Br$ and $C_2H_5I$

(c) $C_6H_5Cl$ and $C_6H_5Br$

(d) $C_2H_5I$ and $C_2H_5OH$

**109.** The pressure cooker reduces cooking time because :

(a) the heat is more evenly distributed

(b) the high pressure tenderizes the food

(c) a large flame is used

(d) the boiling point of water inside is elevated

**110.** According to variation theorem :

(a) the trial function (x) is used for the ground state

(b) an approximate energy is calculated using the average value theorem and true Hamiltonian

(c) both (a) & (b) are correct

(d) the approximate energy calculated is always less than the lowest eigen value of the Hamiltonian

**111.** The rate constant $k$ of a first order reaction is given by the equation :

(a) $k = \dfrac{2.303}{(t)\log_e \dfrac{a}{(a-x)}}$

(b) $k = \dfrac{2.303}{(t)\log_{10} \dfrac{(a-x)}{a}}$

(c) $k = \dfrac{2.303}{(t)\log_{10} \dfrac{a}{(a-x)}}$

(d) $k = \dfrac{2.303}{(t)\log_{10} \dfrac{a}{t(a-x)}}$

112. When more than one species is present in a system, the chemical potential of species 1 ($\mu_1$) is represented as :

(a) $(\partial G/\partial n_1)P, T$

(b) $(\partial G/\partial n_1)n_2 .....$

(c) $(\partial G/\partial n_1)P, T, n_2 .....$

(d) $(\partial G/\partial n_1)P, n_2 .....$

113. Nernst equation for single electrode potential may be written as :

(a) $E = E^\circ \frac{(RT \log_e c)}{\eta}$

(b) $E = E^\circ + (2.303RT)\log_{10} \frac{c}{\eta F}$

(c) $E = E^\circ + \frac{2.303RT}{(\eta F)\log_{10} c}$

(d) $E = E^\circ + (2.303)\eta F \frac{\log_e c}{RT}$

114. Freundlich adsorption isotherm gives straight line on plotting :

(a) $\frac{x}{m}$ V/S P

(b) $\log \frac{x}{m}$ V/S P

(c) $\log \frac{x}{m}$ V/S $\log P$

(d) $\frac{x}{m}$ V/S $\frac{1}{P}$

115. The magnitude of the Planck's constant ($h$) is :

(a) $6.62 \times 10^{-27}$ ergs sec.

(b) $6.62 \times 10^{-34}$ J. sec.

(c) $6.62 \times 10^{-34}$ kg $m^2 sec^{-1}$

(d) all are correct

116. The angular momentum ($mvr$) of an electron orbiting around the nucleus is represented by :

(a) $n . \frac{h}{2\pi}$ (b) $n \frac{h}{4\pi}$

(c) $n \frac{h}{2\pi^2}$ (d) $n . \frac{2\pi}{h}$

117. Schrödinger's wave equation :

(a) is a second degree differential equation

(b) has several solutions, some of these are not valid

(c) has wave functions which are always finite, single valued and continuous

(d) all the above are correct

118. The function $f(x) = 7e^{-3x}$ is an eigen function of the operator $\hat{d}$. Its eigen value is :

(a) 3 (b) $-3$

(c) 7 (d) $-7$

119. Energy of activation of an exothermic reaction is :

(a) zero

(b) negative

(c) positive

(d) cann't be predicted

120. According to collision theory of reaction rates, the rate of reaction depends :

(a) only upon the total number of collisions per second

(b) only upon the colliding molecules with energy greater than threshold energy

(c) upon the orientation of molecules at the time of collision

(d) both on (b) and (c)