

(Total No. of printed pages : 14)

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CPG-EE-2017

(CHEMISTRY)

SET-'C'

Time : 1 1/2 Hours

Total Questions : 100

Max. Marks : 100

Roll No. .... (in figure) ..... (in words)

Name : ..... Date of Birth : .....

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1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let 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 book-let itself. Answers **MUST NOT** be ticked in the Question book-let.
5. Use only **Black or Blue BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. There will be **Negative marking**. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get 1/4 discredit. **Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

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1. If kinetic energy of a proton is increased nine times, the wavelength of the de-Broglie wave associated with it would become :

- (1) 3 times
- (2) 9 times
- (3)  $\frac{1}{3}$  times
- (4)  $\frac{1}{9}$  times

2. For which one of the following set of quantum numbers an electron will have the highest energy ?

- (1) 3, 2, 1,  $\frac{1}{2}$
- (2) 4, 2, -1,  $\frac{1}{2}$
- (3) 4, 1, 0,  $-\frac{1}{2}$
- (4) 5, 0, 0,  $\frac{1}{2}$

3. When an electron is added to a gaseous atom

- (1) its size decreases
- (2) energy is released
- (3) it changes to positive ion
- (4) its tendency to accept electron increases

4. Which of the following is arranged in order of increasing second ionization energy ?

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

5. The crystal showing Frenkel defect :

- (1) cannot show metal excess defect
- (2) shows increase in density
- (3) shows increase in dielectric constant
- (4) have high coordination number

6. A solution of sodium metal in liquid ammonia is blue and is a strong reducing agent, due to the presence of

- (1) sodium atoms
- (2) sodium hydride
- (3) sodium amide
- (4) solvated electrons and solvated metal ions

7. Hydrides as well as halides of alkaline earth metals tend to polymerize

- (1) Strontium
- (2) Calcium
- (3) Beryllium
- (4) Magnesium

8. On hydrolysis, diborane produces

- (1)  $H_3BO_2 + H_3O_2$
- (2)  $H_3BO_3 + H_2$
- (3)  $B_2O_3 + O_2$
- (4)  $H_3BO_3 + H_2O_2$

9. Which of the following pairs of ions represent cyclic and chain silicates ?

- (1)  $Si_2O_7^{2-}$  and  $(SiO_3)_n^{2n-}$
- (2)  $Si_3O_9^{6-}$  and  $(Si_4O_{11})_n^{6n-}$
- (3)  $Si_2O_7^{2-}$  and  $(SiO_5)_n^{2n-}$
- (4)  $Si_2O_7^{7-}$  and  $(SiO_3)_n^{2n-}$

10. White Phosphorous has :

- (1) Six P-P single bonds
- (2) Four P-P single bonds
- (3) Three lone pairs of electrons
- (4) PPP angle of  $90^\circ$

11. The structure of thiosulphuric acid is

- (1)  $HO-\overset{\overset{S}{\parallel}}{\underset{\underset{O}{\parallel}}{S}}-OH$
- (2)  $HO-\overset{\overset{O}{\parallel}}{S}-\overset{\overset{O}{\parallel}}{S}-OH$
- (3)  $HO-\overset{\overset{O}{\parallel}}{S}-OH$
- (4)  $\begin{matrix} HO \\ HO \end{matrix} \rangle S=S$

12. Among the following conjugate bases of oxoacids of chlorine, which arrangement shows the correct order of increasing hydration energy and basic character ?

- (1)  $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$
- (2)  $ClO_4^- < ClO_3^- < ClO_2^- < ClO^-$
- (3)  $ClO_3^- < ClO_4^- < ClO_2^- < ClO^-$
- (4)  $ClO_4^- < ClO_3^- < ClO^- < ClO_2^-$

13.  $XeO_3$  contains :

- (1) four  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair
- (2) Six electron pairs and two lone pairs
- (3) two  $\pi$ -bonds, and two corners of a tetrahedron occupied by a lone pair
- (4) three  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair

14. Which of the following transition metals exhibits the highest oxidation state ?

- |        |        |
|--------|--------|
| (1) Pt | (2) Os |
| (3) Cr | (4) Mn |

15. The coordination ratio of Titanium and Oxygen in rutile structure is :

- |           |           |
|-----------|-----------|
| (1) 6 : 4 | (2) 6 : 2 |
| (3) 6 : 3 | (4) 6 : 6 |

16.  $[Pt(NH_3)_2(NO_2)_2]$  can exhibit the following isomerism :

- (1) Linkage, Geometric
- (2) Ionisation, Geometric
- (3) Hydrate, linkage
- (4) Ionisation, linkage

17. The smallest ligand field stabilisation energy for octahedral complex is

- (1) high spin  $CO^{2+}$  complex
- (2) low spin  $CO^{2+}$  complex
- (3) high spin  $Cr^{2+}$  complex
- (4) low spin  $Cr^{2+}$  complex

18. Which is thermodynamically more stable complex ?
- (1)  $Ni^{2+}$
  - (2)  $Pt^{2+}$
  - (3)  $Co^{2+}$
  - (4) Both (1) and (2)
19. The magnetic moment of Bohr's magnetron (BM) of  $[Fe(CN)_6]^{4-}$  and  $[Fe(H_2O)_6]^{4+}$  respectively are :
- (1)  $\sqrt{24}$ , zero
  - (2)  $\sqrt{24}$ ,  $\sqrt{24}$
  - (3) zero,  $\sqrt{24}$
  - (4) zero, zero
20. An example of an ionic organometallic compound is :
- (1)  $Pb(C_2H_5)_4$
  - (2)  $(CH_3)_3Al$
  - (3)  $Mg(C_2H_5)_2$
  - (4)  $(C_6H_5)_2Cr$
21. Which of the following is Wilkinson catalyst ?
- (1)  $n^5(C_5H_5)_2Ni_2(PhC \equiv CPh)$
  - (2)  $RhCl(PPh_3)_3$
  - (3)  $R_4HCl(PPh_3)_3$
  - (4)  $IrCl(PPh_3)_3$
22. Which of the following has largest  $PK_b$  value ?
- (1)  $C_2H_5NH_2$
  - (2)  $CH_3NH_2$
  - (3)  $(CH_3)_2NH$
  - (4)  $(CH_3)_3N$
23. Which one of the following reaction will not proceed to the forward direction ?
- (1)  $BF_4^- + BH_4^- \rightarrow BF_3H^- + BH_3F^-$
  - (2)  $BeI_2 + HgF_2 \rightarrow BeF_2 + HgI_2$
  - (3)  $R_2SBF_3 + R_2O \rightarrow BF_3OR_2 + R_2S$
  - (4)  $CaS + H_2O \rightarrow CaO + H_2S$
24. Solubility of iodine in liquid  $SO_2$  is increased on the addition of KI. This is attributed to the formation of
- (1)  $KI_3$
  - (2)  $I_2SO_2$
  - (3)  $KI \cdot 4SO_2$
  - (4)  $SOI_2$
25. According to Bohr effect :
- (1) affinity of Hb for  $O_2$  increases with decreasing pH
  - (2) affinity of Hb for  $O_2$  decreases with decreasing pH
  - (3) affinity of Hb for Mb changes with pH
  - (4) affinity of Hb for  $CO_2$  does not change with pH.
26. A light of yellow precipitate is formed in the second group of the qualitative analysis on passing  $H_2S$  even when no radical of second group is present. This is due to the presence of :
- (1) Phosphate
  - (2) Acetate
  - (3) Oxalate
  - (4) Nitrate

27. Which of the following will not give positive chromyl chloride test ?

- (1) Copper Chloride,  $\text{CuCl}_2$
- (2) Zinc Chloride,  $\text{ZnCl}_2$
- (3) Mercuric Chloride,  $\text{HgCl}_2$
- (4) Anilinium chloride,  $\text{C}_6\text{H}_5\text{NH}_3\text{Cl}$

28. Which of the following molecules will have unequal bond lengths ?

- (1)  $\text{NF}_3$                       (2)  $\text{BF}_3$
- (3)  $\text{PF}_5$                       (4)  $\text{SF}_6$

✓ 29. Two ice cubes are pressed over each other until they unite to form one block. Which one of the following forces dominates for holding them together ?

- (1) Dipole-dipole
- (2) Vander Waal forces
- (3) Hydrogen bond formation
- (4) Covalent attraction

✓ 30. As per M.O. theory, bond order in co-molecule is :

- (1) one                      (2) two
- (3) three                    (4) four

✓ 31. Thorium element belongs to :

- (1) Alkali metal
- (2) Transition elements
- (3) Lanthanides
- (4) Actinides

✓ 32. Term symbol for ground state  $\text{V}^{3+}$  is

- (1)  ${}^3F_2$                       (2)  ${}^4S_{3/2}$
- (3)  ${}^3P_0$                       (4)  ${}^3P_2$

33. Which of the following trivalent lanthanide ion is coloured ?

- (1)  $\text{La}^{3+}$                       (2)  $\text{Gd}^{3+}$
- (3)  $\text{Eu}^{3+}$                       (4)  $\text{Lu}^{3+}$

34. The Boyle temperature,  $T_B$  may be defined as the temperature at which

- (1)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(PV)}{\partial P} \right] = 0$
- (2)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(PV)}{\partial V} \right] = 0$
- (3)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(v)}{\partial P} \right] = 0$
- (4)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(P)}{\partial V} \right] = 0$

35. Critical temperature,  $T_c$  has been expressed in terms of Vander Waal's constants 'a' and 'b'. Indicate the correct choice (R = gas constant)

- (1)  $T_c = \frac{a}{27b^2}$
- (2)  $T_c = 3b$
- (3)  $T_c = \frac{8a}{27Rb}$
- (4)  $T_c = \frac{a}{27Rb}$

36. The height to which water (surface tension =  $72.8 \text{ dynes cm}^{-1}$ ) will rise in a glass capillary of the tube possessing radius  $0.002 \text{ cm}$  be :

- (1)  $17.42 \text{ cm}$
- (2)  $7.42 \text{ cm}$
- (3)  $1.742 \text{ cm}$
- (4)  $0.742 \text{ cm}$

37. The fact that it is not always possible to distinguish between a liquid and a gas is due to

- (1) Principle of equipartition
- (2) Ideal gas law
- (3) Law of Corresponding states
- (4) Principle of continuity of states

38. The relations  $a \neq b \neq c$  and  $\alpha \neq \beta \neq \gamma = 90^\circ$ , belongs to crystal system :

- (1) triclinic
- (2) monoclinic
- (3) tetragonal
- (4) orthorhombic

39. The essential condition for a reaction to take place as per collision theory is :

- (1) Volume of the molecules should decrease
- (2) molecules should dissociate after collision
- (3) molecules should acquire activation energy
- (4) molecules should become deactivated

40. If activation energy,  $E_a$  for forward and backward reactions are  $40 \text{ kJ mol}^{-1}$  and  $70 \text{ kJ mol}^{-1}$  respectively, then reaction is

- (1) Spontaneous reaction
- (2) Chain reaction
- (3) Exothermic reaction
- (4) Endothermic reaction

41. In which of the following, the value of pH is 12 :

- (1) 1 M KOH
- (2) 1 M NaOH
- (3) 1M  $\text{Ca(OH)}_2$
- (4) 0.01 M NaOH

42. Which of the following is a buffer solution :

- (1)  $\text{NaOH} + \text{CH}_3\text{COONa}$
- (2)  $\text{NaOH} + \text{Na}_2\text{SO}_4$
- (3)  $\text{K}_2\text{SO}_4 + \text{H}_2\text{SO}_4$
- (4)  $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$

43. The molar ionic conductance at infinite dilution of silver ions is  $60.9 \times 10^{-4} \text{ Sm}^2 \text{ mol}^{-1}$  at  $25^\circ\text{C}$ . The ionic mobility of silver ions at  $25^\circ\text{C}$  at infinite dilution will be

- (1)  $6.331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (2)  $63.31 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (3)  $633.1 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (4)  $0.6331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$

44. Thermodynamic equilibrium involves :

- (1) Chemical equilibrium
- (2) Thermal equilibrium
- (3) Mechanical equilibrium
- (4) All of these

45. For an isentropic change of state :

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

46. Joule-Thomson coefficient  $\mu$  is expressed as :

$$(1) \mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_v$$

$$(2) \mu = -\frac{1}{c_p} \left[ \left( \frac{\partial H}{\partial P} \right) \right]_v$$

$$(3) \mu = -\frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$$

$$(4) \mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$$

where  $C_p$  refers to heat capacity at constant pressure.

47. Entropy is related to probability by relation :

$$(1) S = \ln w$$

$$(2) S = \frac{k}{\ln w}$$

$$(3) S = R \ln w$$

$$(4) S = k \ln w$$

where  $R$  is gas constant and  $k$  is Boltzmann's constant

48. Which of the following expressions represents the Clausius-Clayperon equation ?

$$(1) \frac{\partial \ln p}{\partial T} = \frac{\Delta H_{\text{vap}}^0}{RT^2}$$

$$(2) \left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{-\Delta H_{\text{vap}}^0}{T^2}$$

$$(3) \left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{\Delta H_{\text{vap}}^0}{RT^2}$$

$$(4) \left[ \frac{\partial(G/T)}{\partial(I/T)} \right]_P = 0$$

where all the symbols have their usual meanings

49. Residual entropy is :

(1) the entropy arising out of defects in crystalline substance

(2) the entropy possessed by crystalline substance at absolute zero

(3) the remaining entropy of the substance

(4) the entropy which is in excess over the normal value

50. If a solute undergoes dissociation in one of the solvents in which its concentration is  $C_2$  but not in the other in which its concentration is  $C_1$ , the partition coefficient,  $K_D$  can be expressed as :

$$(1) K_D = \frac{c_1}{c_2}$$

$$(2) K_D = \frac{c_1}{\sqrt[3]{c_2}}$$

$$(3) K_D = \frac{c_1}{c_2(1-\alpha)}$$

$$(4) K_D = \frac{c_2(1-\alpha)}{c_1}$$

where  $\alpha$  is the degree of dissociation of solute.

51. When succinic acid is shaken with water and ether, it

(1) dissociates into ions in water

(2) associates to form dimer in water

(3) associates to form trimer in water

(4) remains the same in water

52. Which of the following is an Irreversible cell ?

- (1)  $Zn/Zn^{2+} // AgCl/Ag$
- (2)  $Zn/Zn^{2+} // Cd^{2+}/Cd$
- (3)  $Cd/Cd^{2+} // KCl, Hg_2Cl_2(s)/Hg$
- (4)  $Zn/H_2SO_4/Ag$

53. The potential of a hydrogen electrode at pH = 10 is

- (1) -0.59 V
- (2) 0.59 V
- (3) 0.00V
- (4) -0.06V

54. The pH of an acidic buffer according to the Henderson equation is expressed as

- (1)  $pK_a - \log \frac{[salt]}{[acid]}$
- (2)  $pK_a + \log \frac{[salt]}{[acid]}$
- (3)  $pK_a + \log \frac{[acid]}{[salt]}$
- (4)  $-pK_a - \log \frac{[salt]}{[acid]}$

55. The relation between electrical energy and enthalpy of a cell reaction is :

- (1)  $E = -\Delta H/nF + (\partial E/\partial T)_P$
- (2)  $E = -\frac{\Delta H}{nF} - (\partial E/\partial T)_P$
- (3)  $E = -\frac{\Delta H}{nF} + T(\partial E/\partial T)_P$
- (4)  $E = -\frac{\Delta H}{nF} - T(\partial E/\partial T)_P$

56. If  $\hat{A}$  and  $\hat{B}$  are two operators such that  $[\hat{A}, \hat{B}] = 1$ , the value of  $[\hat{A}, \hat{B}^2]$  will then be equal to :

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

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

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

58. The vibrational frequency of HD is less than that of  $H_2$  because

- (1)  $H_2$  has higher force constant
- (2)  $H_2$  has lower force constant
- (3) HD has a higher mass and higher force constant
- (4) HD has a higher mass

59. In Raman spectroscopy, using mercury vapors lamp :

- (1) the stokes and anti-stokes lines are equally intense
- (2) the stokes lines are more intense than the anti-stokes lines
- (3) the anti-stokes lines are more intense than the stokes lines
- (4) none of the above

60. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

- (1) 0.5 B
- (2) B
- (3) 1.5 B
- (4) 2B

where B is a rotational constant



61. Hyperchromic shift refers to :

- (1) a shift of  $\lambda_{\max}$  to longer wavelengths
- (2) a shift of  $\lambda_{\max}$  to shorter wavelength
- (3) an increase in the intensity of an absorption band with reference to its molar extinction coefficient
- (4) a decrease in the intensity of an absorption band with reference to its molar extinction coefficient.

62. Which of the following statements is correct ?

- (1) A triple point is invariant
- (2) A triple point is monovariant
- (3) A triple point is also called as incongruent melting point
- (4) none of these

63. A racemic mixture has :

- (1) Positive optical rotation
- (2) Negative optical rotation
- (3) Infinite optical rotation
- (4) Zero optical rotation

64. Duhem-Margules equation is :

$$(1) \frac{l_n p_1}{l_n p_2} = \frac{l_n x_1}{l_n x_2}$$

$$(2) \frac{l_n p_1}{l_n x_1} = \frac{l_n p_2}{l_n x_2}$$

$$(3) \frac{dl_n p_1}{dl_n p_2} = \frac{dl_n x_1}{dl_n x_2}$$

$$(4) \frac{dl_n p_1}{dl_n x_1} = \frac{dl_n p_2}{dl_n x_2}$$

where all the terms have their usual meanings.

65. Solutions which have the same osmotic pressure at same temperature are called :

- (1) Isotonic solutions
- (2) Regular solutions
- (3) Ideal solutions
- (4) Non-ideal solutions

66. The complex compound  $K_4[Fe(CN)_6]$  is 45% dissociated in 0.1 M aqueous solution of the complex. The osmotic pressure of the solution will be :

- (1) 0.68 atm
- (2) 6.894 atm
- (3) 68.94 atm
- (4) None of these

67. Which of the following molecule shows hyper-conjugation ?

- (1) Benzophenone
- (2) 1,3-Butadiene
- (3) Toluene
- (4) 1,3-butadiyne

68. Which conformation of cyclohexane is least stable ?

- (1) Chair
- (2) Half-chair
- (3) Boat
- (4) Twist-boat

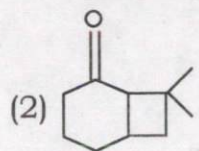
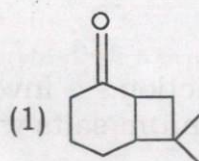
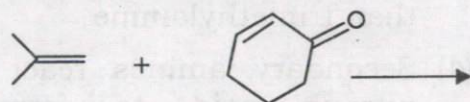
69. Which of the following methods are used for separation of pair of enantiomers ?

- (1) Conversion to diastereoisomers and mechanical separation
- (2) Differential absorption and deracemization
- (3) Chiral recognition and biochemical process
- (4) All of the above

70. Choose the correct statement

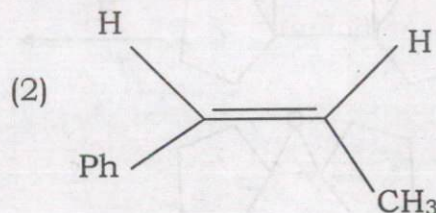
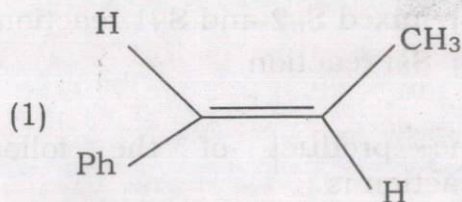
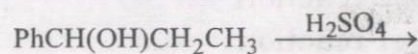
- (1) Cyclopropyl methyl cation is more stable than the benzylic cation
- (2) Methyl anion in gas phase is having tetrahedral structure
- (3) It is steric hindrance to dimerization and not the resonance that is the cause of stability in triphenyl methyl radical
- (4) Singlet methylene is bent with an angle of  $\sim 103^\circ$

71. What is(are) the product(s) of the following reaction under photochemical condition ?



- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

72. What is (are) the product(s) of the following reaction ?

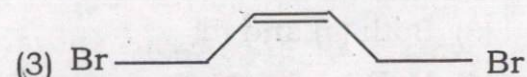
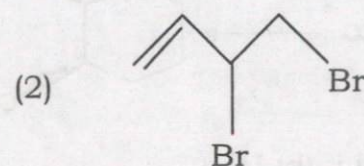
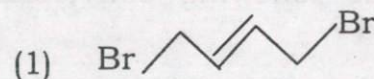


- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

73. Cyclopentadienyl cation is :

- (1) Aromatic
- (2) Non-aromatic
- (3) Antiaromatic
- (4) Both (2) and (3)

74. 1,3-Butadiene on reaction with bromine at low temperature produces :

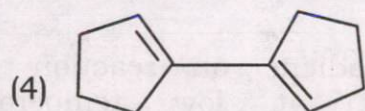
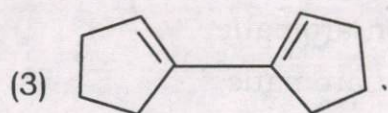
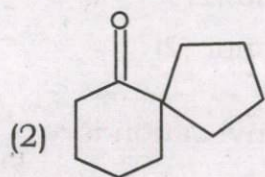
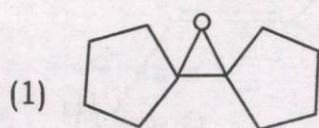
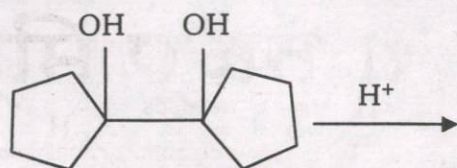


- (4) Both (1) and (2)

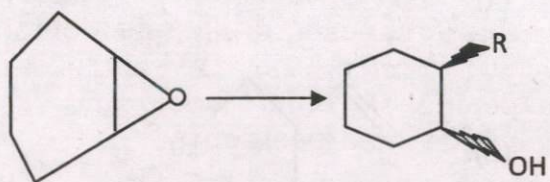
75. Treatment of  $\text{PhCH}=\text{CHCH}_2\text{Cl}$  with lithium aluminium hydride is :

- (1)  $\text{S}_{\text{N}}2$  reaction
- (2)  $\text{S}_{\text{N}}1$  reaction
- (3) mixed  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}1$  reaction
- (4)  $\text{S}_{\text{N}}\text{i}$  reaction

76. The product of the following reaction is :



77. How the following conversion is achieved ?



- (1) (a)  $\text{RLi}$ , (b)  $\text{H}^+$
- (2) (a)  $\text{RMgBr}$ , (b)  $\text{H}^+$
- (3) Both (a) and (b)
- (4)  $\text{MgBr}_2$

78. Phenol reacts with one equivalent of bromine at  $5^\circ\text{C}$  in  $\text{CS}_2$  to produce

- (1) 2-Bromophenol
- (2) 4-Bromophenol
- (3) 2-bromophenol (major amount) and 4-Bromophenol (minor amount)
- (4) 2-bromophenol (minor amount) and 4-Bromophenol (major amount)

79. The strongest acid among the following is :

- (1) Propionic acid
- (2) 2-Chlorobutanoic acid
- (3) 2-Nitroacetic acid
- (4) 2-Cyanoacetic acid

80. Choose the incorrect statement :

- (1) Trimethylamine shows less angle compression because the bulky methyl groups open the angle slightly
- (2) Boiling point of trimethylamine is more than the diisopropylamine
- (3) Dimethylamine is stronger base than trimethylamine
- (4) Secondary amines react with nitrous acid to form N-nitrosoamines

81. Sandmeyer reaction involves treatment of diazonium salts with :

- (1)  $\text{CuCl}_2$  or  $\text{CuBr}_2$
- (2)  $\text{CuCN}$
- (3)  $\text{CuI}_2$  or  $\text{CuCl}_2$
- (4) Both (1) and (2)

82. Anisole on nitration yields more amount of :

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

83. Choose the correct statement :

- (1) Formaldehyde is gas at room temperature
- (2) Paraformaldehyde is a linear polymer
- (3) Paraldehyde is used in medicine as sedative
- (4) All of these

84. Acid chloride ( $\text{RCOCl}$ ) on reaction with lithium aluminium tri(*t*-butoxy) hydride gives :

- (1)  $\text{RCHO}$
- (2)  $\text{RCH}_2\text{OH}$
- (3)  $\text{RCH}_3$
- (4) Both (1) and (2)

85. Treatment of ketones with peroxyacids in presence of acid catalyst gives carboxylic ester and carboxylic acid. The reaction is called :

- (1) Wittig reaction
- (2) Cannizzaro reaction
- (3) Baeyer-Villiger rearrangement
- (4) Favorskii rearrangement

86. (+)-Sucrose is made up of

- (1) D-(+)-Glucose and D-(+)-Glucose
- (2) D-(+)-Glucose and D-(-)-Fructose
- (3) D-(+)-Galactose and D-(+)-Glucose
- (4) D-(+)-Galactose and D-(-)-Fructose

87. Match the following :

- |                                |  |
|--------------------------------|--|
| (A) Killiani-Fischer synthesis | (p) opening and closing of hemiacetal of (D)-(+)-glucose                       |
| (B) Mutarotation               | (q) diastereoisomeric aldoses pair that differ only in configuration about C-2 |
| (C) Anomeric effect            | (r) lengthening of carbon chain of aldoses                                     |
| (D) Epimer                     | (s) repulsion between the dipoles associated with the oxygen of the ring       |

- (1) (A)-(r), (B)-(p), (C)-(s), (D)-(q)
- (2) (A)-(p), (B)-(r), (C)-(q), (D)-(s)
- (3) (A)-(r), (B)-(s), (C)-(p), (D)-(q)
- (4) (A)-(p), (B)-(r), (C)-(s), (D)-(q)

88. The potential side reaction(s) of hindered ketone with bulky Grignard reagent is(are) :

- (1) Enolization
- (2) Reduction
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

89. Choose the incorrect statement :

- (1) Pyrrole reacts with electrophiles at all positions but prefer the 2- and 5-positions, while indole much prefer the 3-position
- (2) Thiophene is very similar to benzene in reactivity
- (3) The lone pair of pyridine's nitrogen is delocalised
- (4) Amination of pyridine with lithium amide is called Chichibabin reaction

90. Reaction of phenylhydrazine in acidic solution with an aldehyde or ketone is called

- (1) Fischer indole synthesis
- (2) Skraup synthesis
- (3) Bischler Napieralski synthesis
- (4) None of these

91. The salts of alkyl hydrogen sulphates normally have a large non-polar hydrocarbon end of :

- (1) C<sub>5</sub> to C<sub>11</sub> carbons
- (2) C<sub>12</sub> to C<sub>18</sub> carbons
- (3) C<sub>19</sub> to C<sub>25</sub> carbons
- (4) None of these

92. Ethylacetoacetate on reaction with sodium ethoxide followed by methyl iodide produces

- (1) CH<sub>3</sub>CH<sub>2</sub>COCH<sub>2</sub>COOCH<sub>2</sub>CH<sub>3</sub>
- (2) CH<sub>3</sub>COCH(CH<sub>3</sub>)COOCH<sub>2</sub>CH<sub>3</sub>
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

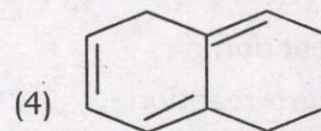
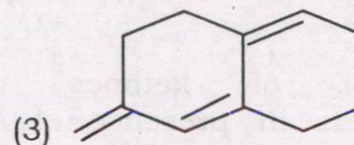
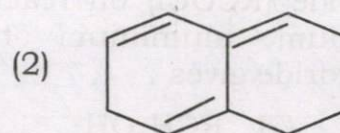
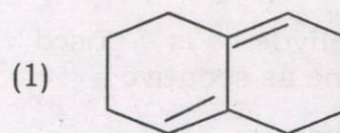
93. Which of the following stereochemical arrangement if polypropylene is highly crystalline ?

- (1) Atactic
- (2) Isotactic
- (3) Syndiotactic
- (4) Both (2) and (3)

94. Choose the pair of amino acids having aromatic character.

- (1) Histidine and Tyrosine
- (2) Cysteine and Alanine
- (3) Tryptophan and Proline
- (4) Valine and Tyrosine

95. Which of the following will show higher  $\lambda_{\max}$  in UV spectroscopy ?



96. The highest  $\lambda_{\max}$  observed in the UV spectrum of acetone is due to :

- (1) n- $\pi^*$  transition
- (2)  $\pi$ - $\pi^*$  transition
- (3) n- $\sigma^*$  transition
- (4)  $\sigma$ - $\sigma^*$  transition

97. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

- (1) C-O
- (2) C-N
- (3) C-C
- (4) C-H

98. In primary amide, the amide-I and amide-II bands are due to :

- (1) C = O str. and N-H str.
- (2) N-H asym. str. and N-H-sym.str.
- (3) C = O str. and N-H bending
- (4) N-H str. and N-H bending

99. How many signals will be observed in the  $^1\text{H}$  NMR spectrum of 1,2,2-tribromoethane and pure ethanol, respectively ?

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

100. What is the multiplicity of signals in acetaldehyde ?

- (1) both singlets
- (2) singlet and triplet
- (3) both doublets
- (4) doublet and quartet

99. How many signals will be observed in the <sup>1</sup>H NMR spectrum of 1,2-dibromoethane and pent-2-ene, respectively?

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

100. What is the multiplicity of signals in acetaldehyde?

- (1) both singlets
- (2) singlet and triplet
- (3) both doublets
- (4) doublet and quartet

97. Which of the following bonds in a molecule will have relatively more stretching frequency in IR spectrum?

- (1) C-O
- (2) C-N
- (3) C=C
- (4) C-H

98. In primary amide, the amide I and amide II bands are due to

- (1) C=O str. and N-H str.
- (2) N-H asym. str. and N-H str.
- (3) C=O str. and N-H bending
- (4) N-H str. and N-H bending

AL

(Total No. of printed pages : 14)

Sr. No. ....

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**B**

**CPG-EE-2017**  
**(CHEMISTRY)**

**SET-'C'**

**Time : 1½ Hours**

**Total Questions : 100**

**Max. Marks : 100**

Roll No. .... (in figure) ..... (in words)

Name : ..... Date of Birth : .....

Father's Name : ..... Mother's Name : .....

Date of Examination .....

(Signature of the Candidate)

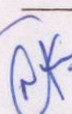
(Signature of the Invigilator)

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

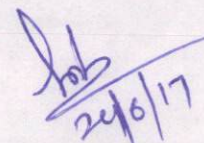
**SE**

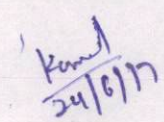
1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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 book-let itself. Answers **MUST NOT** be ticked in the Question book-let.
5. Use only **Black or Blue BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. There will be **Negative** marking. Each correct answer will be awarded one full mark and each incorrect answer will be **negatively** marked for which the candidate will get 1/4 discredit. **Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.



 24.1.2018

 24/1/18

 24/6/17

 24/6/17



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CPRE 2011

(CHEMISTRY)



SET - C

Max. Marks: 100

Total Questions: 100

Time: 1 1/2 Hours

Use of Calculator is not permitted.

All the questions are compulsory.

The candidate must read the following instructions carefully before attempting the questions.

The candidate must write the answers in the spaces provided.

The candidate must use blue or black ink for writing the answers.

The candidate must not use a pen or pencil for writing the answers.

The candidate must not use a ruler or compass for drawing the diagrams.

The candidate must not use a calculator for the calculations.

The candidate must not use a mobile phone or any other electronic device during the examination.

The candidate must not discuss the questions with any other candidate during the examination.

The candidate must not leave the examination hall before the time specified.

The candidate must not use any unfair means during the examination.

The candidate must not use any prohibited material during the examination.

The candidate must not use any prohibited language during the examination.

The candidate must not use any prohibited action during the examination.

The candidate must not use any prohibited object during the examination.

The candidate must not use any prohibited method during the examination.

The candidate must not use any prohibited technique during the examination.

Handwritten signatures and marks in blue ink at the bottom of the page.

1. In which of the following, the value of pH is 12 :

- (1) 1 M KOH
- (2) 1 M NaOH
- (3) 1M Ca(OH)<sub>2</sub>
- (4) 0.01 M NaOH

2. Which of the following is a buffer solution :

- (1) NaOH + CH<sub>3</sub>COONa
- (2) NaOH + Na<sub>2</sub>SO<sub>4</sub>
- (3) K<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>SO<sub>4</sub>
- (4) NH<sub>4</sub>OH + NH<sub>4</sub>Cl

3. The molar ionic conductance at infinite dilution of silver ions is  $60.9 \times 10^{-4} \text{ Sm}^2 \text{ mol}^{-1}$  at 25°C. The ionic mobility of silver ions at 25°C at infinite dilution will be

- (1)  $6.331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (2)  $63.31 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (3)  $633.1 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (4)  $0.6331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$

4. Thermodynamic equilibrium involves :

- (1) Chemical equilibrium
- (2) Thermal equilibrium
- (3) Mechanical equilibrium
- (4) All of these

5. For an isentropic change of state :

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

6. Joule-Thomson coefficient  $\mu$  is expressed as :

$$(1) \mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_v$$

$$(2) \mu = -\frac{1}{c_p} \left[ \left( \frac{\partial H}{\partial P} \right) \right]_v$$

$$(3) \mu = -\frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$$

$$(4) \mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$$

where  $C_p$  refers to heat capacity at constant pressure.

7. Entropy is related to probability by relation :

$$(1) S = \ln w$$

$$(2) S = \frac{k}{\ln w}$$

$$(3) S = R \ln w$$

$$(4) S = k \ln w$$

where  $R$  is gas constant and  $k$  is Boltzmann's constant

8. Which of the following expressions represents the Clausius-Clayperon equation ?

$$(1) \frac{\partial \ln p}{\partial T} = \frac{\Delta H_{\text{vap}}^{\circ}}{RT^2}$$

$$(2) \left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{-\Delta H_{\text{vap}}^{\circ}}{T^2}$$

$$(3) \left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{\Delta H_{\text{vap}}^{\circ}}{RT^2}$$

$$(4) \left[ \frac{\partial(G/T)}{\partial(I/T)} \right]_P = 0$$

where all the symbols have their usual meanings

9. Residual entropy is :

- (1) the entropy arising out of defects in crystalline substance
- (2) the entropy possessed by crystalline substance at absolute zero
- (3) the remaining entropy of the substance
- (4) the entropy which is in excess over the normal value

10. If a solute undergoes dissociation in one of the solvents in which its concentration is  $C_2$  but not in the other in which its concentration is  $C_1$ , the partition coefficient,  $K_D$  can be expressed as :

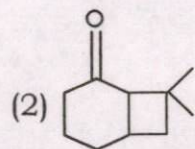
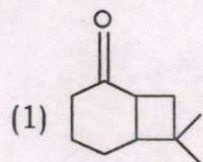
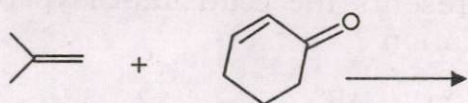
(1)  $K_D = \frac{c_1}{c_2}$                       (2)  $K_D = \frac{c_1}{\sqrt[n]{c_2}}$

(3)  $K_D = \frac{c_1}{c_2(1-\alpha)}$

(4)  $K_D = \frac{c_2(1-\alpha)}{c_1}$

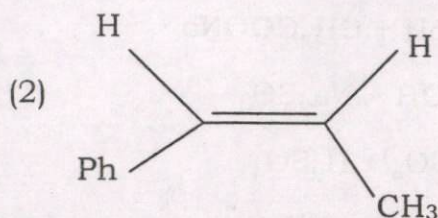
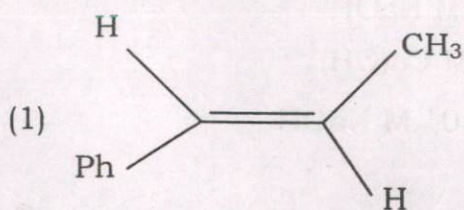
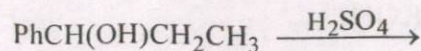
where  $\alpha$  is the degree of dissociation of solute.

11. What is(are) the product(s) of the following reaction under photochemical condition ?



- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

12. What is (are) the product(s) of the following reaction ?

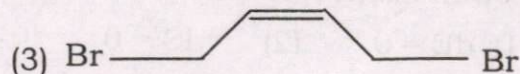
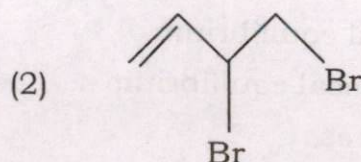
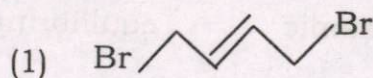


- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

13. Cyclopentadienyl cation is :

- (1) Aromatic
- (2) Non-aromatic
- (3) Antiaromatic
- (4) Both (2) and (3)

14. 1,3-Butadiene on reaction with bromine at low temperature produces :

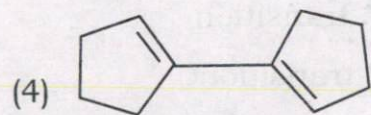
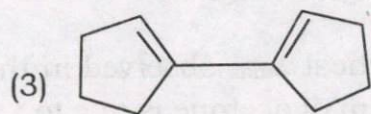
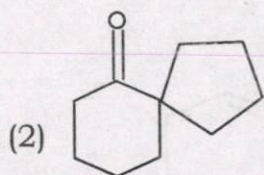
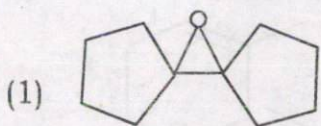
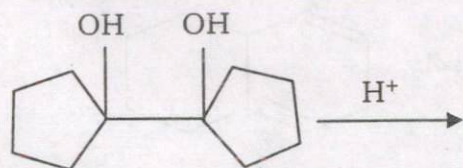


- (4) Both (1) and (2)

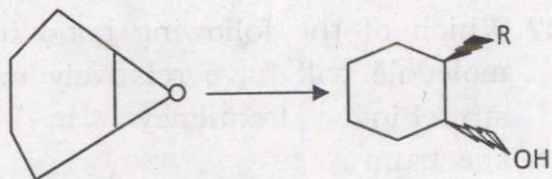
15. Treatment of  $\text{PhCH} = \text{CHCH}_2\text{Cl}$  with lithium aluminium hydride is :

- (1)  $\text{S}_{\text{N}}2$  reaction
- (2)  $\text{S}_{\text{N}}1$  reaction
- (3) mixed  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}1$  reaction
- (4)  $\text{S}_{\text{N}}\text{i}$  reaction

16. The product of the following reaction is :



17. How the following conversion is achieved ?



- (1) (a)  $\text{RLi}$ , (b)  $\text{H}^+$
- (2) (a)  $\text{RMgBr}$ , (b)  $\text{H}^+$
- (3) Both (a) and (b)
- (4)  $\text{MgBr}_2$

18. Phenol reacts with one equivalent of bromine at  $5^\circ\text{C}$  in  $\text{CS}_2$  to produce

- (1) 2-Bromophenol
- (2) 4-Bromophenol
- (3) 2-bromophenol (major amount) and 4-Bromophenol (minor amount)
- (4) 2-bromophenol (minor amount) and 4-Bromophenol (major amount)

19. The strongest acid among the following is :

- (1) Propionic acid
- (2) 2-Chlorobutanoic acid
- (3) 2-Nitroacetic acid
- (4) 2-Cyanoacetic acid

20. Choose the incorrect statement :

- (1) Trimethylamine shows less angle compression because the bulky methyl groups open the angle slightly
- (2) Boiling point of trimethylamine is more than the diisopropylamine
- (3) Dimethylamine is stronger base than trimethylamine
- (4) Secondary amines react with nitrous acid to form N-nitrosoamines

21. The salts of alkyl hydrogen sulphates normally have a large non-polar hydrocarbon end of :

- (1)  $\text{C}_5$  to  $\text{C}_{11}$  carbons
- (2)  $\text{C}_{12}$  to  $\text{C}_{18}$  carbons
- (3)  $\text{C}_{19}$  to  $\text{C}_{25}$  carbons
- (4) None of these

22. Ethylacetoacetate on reaction with sodium ethoxide followed by methyl iodide produces

- (1)  $\text{CH}_3\text{CH}_2\text{COCH}_2\text{COOCH}_2\text{CH}_3$
- (2)  $\text{CH}_3\text{COCH}(\text{CH}_3)\text{COOCH}_2\text{CH}_3$
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

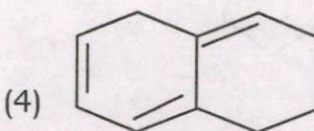
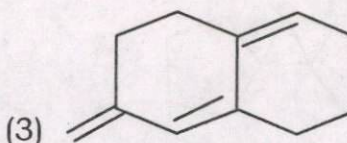
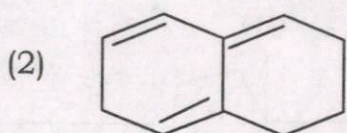
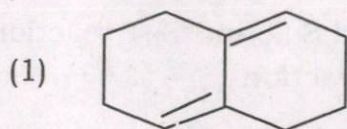
23. Which of the following stereochemical arrangement if polypropylene is highly crystalline ?

- (1) Atactic
- (2) Isotactic
- (3) Syndiotactic
- (4) Both (2) and (3)

24. Choose the pair of amino acids having aromatic character.

- (1) Histodine and Tyrosine
- (2) Crysteine and Alanine
- (3) Tryptophane and Proline
- (4) Valine and Tyrosine

25. Which of the following will show higher  $\lambda_{\text{max}}$  in UV spectroscopy ?



26. The highest  $\lambda_{\text{max}}$  observed in the UV spectrum of acetone is due to :

- (1)  $n-\pi^*$  transition
- (2)  $\pi-\pi^*$  transition
- (3)  $n-\sigma^*$  transition
- (4)  $\sigma-\sigma^*$  transition

27. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

- (1) C-O
- (2) C-N
- (3) C-C
- (4) C-H

28. In primary amide, the amide-I and amide-II bands are due to :

- (1) C = O str. and N-H str.
- (2) N-H asym. str. and N-H-sym.str.
- (3) C = O str. and N-H bending
- (4) N-H str. and N-H bending

29. How many signals will be observed in the  $^1\text{H}$  NMR spectrum of 1,2,2-tribromoethane and pure ethanol, respectively ?

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

30. What is the multiplicity of signals in acetaldehyde ?

- (1) both singlets
- (2) singlet and triplet
- (3) both doublets
- (4) doublet and quartet

31. If kinetic energy of a proton is increased nine times, the wavelength of the de-Broglie wave associated with it would become :

- (1) 3 times
- (2) 9 times
- (3)  $\frac{1}{3}$  times
- (4)  $\frac{1}{9}$  times

32. For which one of the following set of quantum numbers an electron will have the highest energy ?

- (1) 3, 2, 1,  $\frac{1}{2}$
- (2) 4, 2, -1,  $\frac{1}{2}$
- (3) 4, 1, 0,  $-\frac{1}{2}$
- (4) 5, 0, 0,  $\frac{1}{2}$

33. When an electron is added to a gaseous atom

- (1) its size decreases
- (2) energy is released
- (3) it changes to positive ion
- (4) its tendency to accept electron increases

34. Which of the following is arranged in order of increasing second ionization energy ?

- (1) C < N < O < F
- (2) F < C < N < O
- (3) C < N < F < O
- (4) F < O < N < C

35. The crystal showing Frenkel defect :

- (1) cannot show metal excess defect
- (2) shows increase in density
- (3) shows increase in dielectric constant
- (4) have high coordination number

**36.** A solution of sodium metal in liquid ammonia is blue and is a strong reducing agent, due to the presence of

- (1) sodium atoms
- (2) sodium hydride
- (3) sodium amide
- (4) solvated electrons and solvated metal ions

**37.** Hydrides as well as halides of alkaline earth metals tend to polymerize

- (1) Strontium
- (2) Calcium
- (3) Beryllium
- (4) Magnesium

**38.** On hydrolysis, diborane produces

- (1)  $\text{H}_3\text{BO}_2 + \text{H}_3\text{O}_2$
- (2)  $\text{H}_3\text{BO}_3 + \text{H}_2$
- (3)  $\text{B}_2\text{O}_3 + \text{O}_2$
- (4)  $\text{H}_3\text{BO}_3 + \text{H}_2\text{O}_2$

**39.** Which of the following pairs of ions represent cyclic and chain silicates ?

- (1)  $\text{Si}_2\text{O}_7^{2-}$  and  $(\text{SiO}_3)_n^{2n-}$
- (2)  $\text{Si}_3\text{O}_9^{6-}$  and  $(\text{Si}_4\text{O}_{11})_n^{6n-}$
- (3)  $\text{Si}_2\text{O}_7^{2-}$  and  $(\text{SiO}_5)_n^{2n-}$
- (4)  $\text{Si}_2\text{O}_7^{7-}$  and  $(\text{SiO}_3)_n^{2n-}$

**40.** White Phosphorous has :

- (1) Six P-P single bonds
- (2) Four P-P single bonds
- (3) Three lone pairs of electrons
- (4) PPP angle of  $90^\circ$

**41.** When succinic acid is shaken with water and ether, it

- (1) dissociates into ions in water
- (2) associates to form dimer in water
- (3) associates to form trimer in water
- (4) remains the same in water

**42.** Which of the following is an Irreversible cell ?

- (1)  $\text{Zn}/\text{Zn}^{2+} // \text{AgCl}/\text{Ag}$
- (2)  $\text{Zn}/\text{Zn}^{2+} // \text{Cd}^{2+}/\text{Cd}$
- (3)  $\text{cd}/\text{cd}^{2+} // \text{kcl}, \text{Hg}_2\text{Cl}_2(\text{s})/\text{Hg}$
- (4)  $\text{Zn}/\text{H}_2\text{SO}_4/\text{Ag}$

**43.** The potential of a hydrogen electrode at pH = 10 is

- (1)  $-0.59 \text{ V}$
- (2)  $0.59 \text{ V}$
- (3)  $0.00 \text{ V}$
- (4)  $-0.06 \text{ V}$

44. The pH of an acidic buffer according to the Henderson equation is expressed as

(1)  $\text{p}k_a - \log \frac{[\text{salt}]}{[\text{acid}]}$

(2)  $\text{p}k_a + \log \frac{[\text{salt}]}{[\text{acid}]}$

(3)  $\text{p}k_a + \log \frac{[\text{acid}]}{[\text{salt}]}$

(4)  $-\text{p}k_a - \log \frac{[\text{salt}]}{[\text{acid}]}$

45. The relation between electrical energy and enthalpy of a cell reaction is :

(1)  $E = -\Delta H / nF + (\partial E / \partial T)_p$

(2)  $E = -\frac{\Delta H}{nF} - (\partial E / \partial T)_p$

(3)  $E = -\frac{\Delta H}{nF} + T(\partial E / \partial T)_p$

(4)  $E = -\frac{\Delta H}{nF} - T(\partial E / \partial T)_p$

46. If  $\hat{A}$  and  $\hat{B}$  are two operators such that  $[\hat{A}, \hat{B}] = 1$ , the value of  $[\hat{A}, \hat{B}^2]$  will then be equal to :

(1)  $\hat{A}$                       (2)  $2\hat{A}$

(3)  $\hat{B}$                       (4)  $2\hat{B}$

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

(1)  $\hat{A}\hat{B} = \hat{B}\hat{A}$             (2)  $\hat{A}\hat{B} \neq \hat{B}\hat{A}$

(3)  $\frac{\hat{A}\hat{B}}{\hat{B}\hat{A}} = 0$             (4)  $\hat{A}\hat{B} = 0$

48. The vibrational frequency of HD is less than that of  $\text{H}_2$  because

(1)  $\text{H}_2$  has higher force constant

(2)  $\text{H}_2$  has lower force constant

(3) HD has a higher mass and higher force constant

(4) HD has a higher mass

49. In Raman spectroscopy, using mercury vapors lamp :

(1) the stokes and anti-stokes lines are equally intense

(2) the stokes lines are more intense than the anti-stokes lines

(3) the anti-stokes lines are more intense than the stokes lines

(4) none of the above

50. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

(1)  $0.5 B$                       (2)  $B$

(3)  $1.5 B$                       (4)  $2B$

where  $B$  is a rotational constant

51. Hyperchromic shift refers to :

(1) a shift of  $\lambda_{\text{max}}$  to longer wavelengths

(2) a shift of  $\lambda_{\text{max}}$  to shorter wavelength

(3) an increase in the intensity of an absorption band with reference to its molar extinction coefficient

(4) a decrease in the intensity of an absorption band with reference to its molar extinction coefficient.



52. Which of the following statements is correct ?

- (1) A triple point is invariant
- (2) A triple point is monovariant
- (3) A triple point is also called as incongruent melting point
- (4) none of these

53. A racemic mixture has :

- (1) Positive optical rotation
- (2) Negative optical rotation
- (3) Infinite optical rotation
- (4) Zero optical rotation

54. Duhem-Margules equation is :

$$(1) \frac{l_n p_1}{l_n p_2} = \frac{l_n x_1}{l_n x_2}$$

$$(2) \frac{l_n p_1}{l_n x_1} = \frac{l_n p_2}{l_n x_2}$$

$$(3) \frac{dl_n p_1}{dl_n p_2} = \frac{dl_n x_1}{dl_n x_2}$$

$$(4) \frac{dl_n p_1}{dl_n x_1} = \frac{dl_n p_2}{dl_n x_2}$$

where all the terms have their usual meanings.

55. Solutions which have the same osmotic pressure at same temperature are called :

- (1) Isotonic solutions
- (2) Regular solutions
- (3) Ideal solutions
- (4) Non-ideal solutions

56. The complex compound  $K_4[Fe(CN)_6]$  is 45% dissociated in 0.1 M aqueous solution of the complex. The osmotic pressure of the solution will be :

- (1) 0.68 atm
- (2) 6.894 atm
- (3) 68.94 atm
- (4) None of these

57. Which of the following molecule shows hyper-conjugation ?

- (1) Benzophenone
- (2) 1,3-Butadiene
- (3) Toluene
- (4) 1,3-butadiyne

58. Which conformation of cyclohexane is least stable ?

- (1) Chair
- (2) Half-chair
- (3) Boat
- (4) Twist-boat

59. Which of the following methods are used for separation of pair of enantiomers ?

- (1) Conversion to diastereoisomers and mechanical separation
- (2) Differential absorption and deracemization
- (3) Chiral recognition and biochemical process
- (4) All of the above

60. Choose the correct statement

- (1) Cyclopropyl methyl cation is more stable than the benzylic cation
- (2) Methyl anion in gas phase is having tetrahedral structure
- (3) It is steric hindrance to dimerization and not the resonance that is the cause of stability in triphenyl methyl radical
- (4) Singlet methylene is bent with an angle of  $\sim 103^\circ$

61. Which of the following is Wilkinson catalyst ?

- (1)  $n^5(C_5H_5)_2Ni_2(PhC\equiv CPh)$
- (2)  $RhCl(PPh_3)_3$
- (3)  $R_4HCl(PPh_3)_3$
- (4)  $IrCl(PPh_3)_3$

62. Which of the following has largest  $PK_b$  value ?

- (1)  $C_2H_5NH_2$
- (2)  $CH_2NH_2$
- (3)  $(CH_3)_2NH$
- (4)  $(CH_3)_3N$

63. Which one of the following reaction will not proceed to the forward direction ?

- (1)  $BF_4^- + BH_4^- \rightarrow BF_3H^- + BH_3F^-$
- (2)  $BeI_2 + HgF_2 \rightarrow BeF_2 + HgI_2$
- (3)  $R_2SBF_3 + R_2O \rightarrow BF_3OR_2 + R_2S$
- (4)  $CaS + H_2O \rightarrow CaO + H_2S$

64. Solubility of iodine in liquid  $SO_2$  is increased on the addition of KI. This is attributed to the formation of

- (1)  $KI_3$
- (2)  $I_2SO_2$
- (3)  $KI \cdot 4SO_2$
- (4)  $SOI_2$

65. According to Bohr effect :

- (1) affinity of Hb for  $O_2$  increases with decreasing pH
- (2) affinity of Hb for  $O_2$  decreases with decreasing pH
- (3) affinity of Hb for Mb changes with pH
- (4) affinity of Hb for  $CO_2$  does not change with pH.

66. A light of yellow precipitate is formed in the second group of the qualitative analysis on passing  $H_2S$  even when no radical of second group is present. This is due to the presence of :

- (1) Phosphate
- (2) Acetate
- (3) Oxalate
- (4) Nitrate

67. Which of the following will not give positive chromyl chloride test ?

- (1) Copper Chloride,  $CuCl_2$
- (2) Zinc Chloride,  $ZnCl_2$
- (3) Mercuric Chloride,  $HgCl_2$
- (4) Anilinium chloride,  $C_6H_5NH_3Cl$

68. Which of the following molecules will have unequal bond lengths ?

- (1)  $\text{NF}_3$
- (2)  $\text{BF}_3$
- (3)  $\text{PF}_5$
- (4)  $\text{SF}_6$

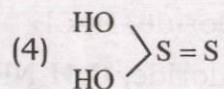
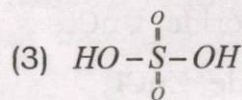
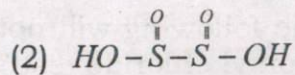
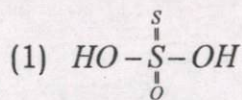
69. Two ice cubes are pressed over each other until they unite to form one block. Which one of the following forces dominates for holding them together ?

- (1) Dipole-dipole
- (2) Vander Waal forces
- (3) Hydrogen bond formation
- (4) Covalent attraction

70. As per M.O. theory, bond order in co-molecule is :

- (1) one
- (2) two
- (3) three
- (4) four

71. The structure of thiosulphuric acid is



72. Among the following conjugate bases of oxoacids of chlorine, which arrangement shows the correct order of increasing hydration energy and basic character ?

- (1)  $\text{ClO}^- < \text{ClO}_2^- < \text{ClO}_3^- < \text{ClO}_4^-$
- (2)  $\text{ClO}_4^- < \text{ClO}_3^- < \text{ClO}_2^- < \text{ClO}^-$
- (3)  $\text{ClO}_3^- < \text{ClO}_4^- < \text{ClO}_2^- < \text{ClO}^-$
- (4)  $\text{ClO}_4^- < \text{ClO}_3^- < \text{ClO}^- < \text{ClO}_2^-$

73.  $\text{XeO}_3$  contains :

- (1) four  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair
- (2) Six electron pairs and two lone pairs
- (3) two  $\pi$ -bonds, and two corners of a tetrahedron occupied by a lone pair
- (4) three  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair

74. Which of the following transition metals exhibits the highest oxidation state ?

- (1) Pt
- (2) Os
- (3) Cr
- (4) Mn

75. The coordination ratio of Titanium and Oxygen in rutile structure is :

- (1) 6 : 4
- (2) 6 : 2
- (3) 6 : 3
- (4) 6 : 6

76.  $[\text{Pt}(\text{NH}_3)_2(\text{NO}_2)_2]$  can exhibit the following isomerism :

- (1) Linkage, Geometric
- (2) Ionisation, Geometric
- (3) Hydrate, linkage
- (4) Ionisation, linkage

77. The smallest ligand field stabilisation energy for octahedral complex is

- (1) high spin  $\text{CO}^{2+}$  complex
- (2) low spin  $\text{CO}^{2+}$  complex
- (3) high spin  $\text{Cr}^{2+}$  complex
- (4) low spin  $\text{Cr}^{2+}$  complex

78. Which is thermodynamically more stable complex ?

- (1)  $\text{Ni}^{2+}$
- (2)  $\text{Pt}^{2+}$
- (3)  $\text{Co}^{2+}$
- (4) Both (1) and (2)

79. The magnetic moment of Bohr's magnetron (BM) of  $[\text{Fe}(\text{CN})_6]^{4-}$  and  $[\text{Fe}(\text{H}_2\text{O})_6]^{4+}$  respectively are :

- (1)  $\sqrt{24}$ , zero
- (2)  $\sqrt{24}$ ,  $\sqrt{24}$
- (3) zero,  $\sqrt{24}$
- (4) zero, zero

80. An example of an ionic organometallic compound is :

- (1)  $\text{Pb}(\text{C}_2\text{H}_5)_4$
- (2)  $(\text{CH}_3)_3\text{Al}$
- (3)  $\text{Mg}(\text{C}_2\text{H}_5)_2$
- (4)  $(\text{C}_6\text{H}_5)_2\text{Cr}$

81. Sandmeyer reaction involves treatment of diazonium salts with :

- (1)  $\text{CuCl}_2$  or  $\text{CuBr}_2$
- (2)  $\text{CuCN}$
- (3)  $\text{CuI}_2$  or  $\text{CuCl}_2$
- (4) Both (1) and (2)

82. Anisole on nitration yields more amount of :

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

83. Choose the correct statement :

- (1) Formaldehyde is gas at room temperature
- (2) Paraformaldehyde is a linear polymer
- (3) Paraldehyde is used in medicine as sedative
- (4) All of these

84. Acid chloride ( $\text{RCOCl}$ ) on reaction with lithium aluminium tri(*t*-butoxy) hydride gives :

- (1)  $\text{RCHO}$
- (2)  $\text{RCH}_2\text{OH}$
- (3)  $\text{RCH}_3$
- (4) Both (1) and (2)

85. Treatment of ketones with peroxyacids in presence of acid catalyst gives carboxylic ester and carboxylic acid. The reaction is called :

- (1) Wittig reaction
- (2) Cannizzaro reaction
- (3) Baeyer-Villiger rearrangement
- (4) Favorskii rearrangement

- 86.** (+)-Sucrose is made up of
- (1) D-(+)-Glucose and D-(+)-Glucose
  - (2) D-(+)-Glucose and D-(-)-Fructose
  - (3) D-(+)-Galactose and D-(+)-Glucose
  - (4) D-(+)-Galactose and D-(-)-Fructose

**87.** Match the following :

- |                                |  |
|--------------------------------|--|
| (A) Killiani-Fischer synthesis | (p) opening and closing of hemiacetal of (D)-(+)-glucose                       |
| (B) Mutarotation               | (q) diastereoisomeric aldoses pair that differ only in configuration about C-2 |
| (C) Anomeric effect            | (r) lengthening of carbon chain of aldoses                                     |
| (D) Epimer                     | (s) repulsion between the dipoles associated with the oxygen of the ring       |

- (1) (A)-(r), (B)-(p), (C)-(s), (D)-(q)
- (2) (A)-(p), (B)-(r), (C)-(q), (D)-(s)
- (3) (A)-(r), (B)-(s), (C)-(p), (D)-(q)
- (4) (A)-(p), (B)-(r), (C)-(s), (D)-(q)

**88.** The potential side reaction(s) of hindered ketone with bulky Grignard reagent is(are) :

- (1) Enolization
- (2) Reduction
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

**89.** Choose the incorrect statement :

- (1) Pyrrole reacts with electrophiles at all positions but prefer the 2- and 5-positions, while indole much prefer the 3-position
- (2) Thiophene is very similar to benzene in reactivity
- (3) The lone pair of pyridine's nitrogen is delocalised
- (4) Amination of pyridine with lithium amide is called Chichibabin reaction

**90.** Reaction of phenylhydrazine in acidic solution with an aldehyde or ketone is called

- (1) Fischer indole synthesis
- (2) Skraup synthesis
- (3) Bischler Napieralski synthesis
- (4) None of these

**91.** Thorium element belongs to :

- (1) Alkali metal
- (2) Transition elements
- (3) Lanthanides
- (4) Actinides

**92.** Term symbol for ground state  $V^{3+}$  is

- |             |                 |
|-------------|-----------------|
| (1) $^3F_2$ | (2) $^4S_{3/2}$ |
| (3) $^3P_0$ | (4) $^3P_2$     |

**93.** Which of the following trivalent lanthanide ion is coloured ?

- |               |               |
|---------------|---------------|
| (1) $La^{3+}$ | (2) $Gd^{3+}$ |
| (3) $Eu^{3+}$ | (4) $Lu^{3+}$ |

94. The Boyle temperature,  $T_B$  may be defined as the temperature at which

$$(1) \lim_{P \rightarrow 0} \left[ \frac{\partial(Pv)}{\partial P} \right] = 0$$

$$(2) \lim_{P \rightarrow 0} \left[ \frac{\partial(Pv)}{\partial V} \right] = 0$$

$$(3) \lim_{P \rightarrow 0} \left[ \frac{\partial(v)}{\partial P} \right] = 0$$

$$(4) \lim_{P \rightarrow 0} \left[ \frac{\partial(P)}{\partial V} \right] = 0$$

95. Critical temperature,  $T_c$  has been expressed in terms of Vander Waal's constants 'a' and 'b'. Indicate the correct choice (R = gas constant)

$$(1) T_c = \frac{a}{27b^2}$$

$$(2) T_c = 3b$$

$$(3) T_c = \frac{8a}{27Rb}$$

$$(4) T_c = \frac{a}{27Rb}$$

96. The height to which water (surface tension =  $72.8 \text{ dynes cm}^{-1}$ ) will rise in a glass capillary of the tube possessing radius  $0.002 \text{ cm}$  be :

$$(1) 17.42 \text{ cm}$$

$$(2) 7.42 \text{ cm}$$

$$(3) 1.742 \text{ cm}$$

$$(4) 0.742 \text{ cm}$$

97. The fact that it is not always possible to distinguish between a liquid and a gas is due to

(1) Principle of equipartition

(2) Ideal gas law

(3) Law of Corresponding states

(4) Principle of continuity of states

98. The relations  $a \neq b \neq c$  and  $\alpha \neq \beta \neq \gamma = 90^\circ$ , belongs to crystal system :

(1) triclinic

(2) monoclinic

(3) tetragonal

(4) orthorhombic

99. The essential condition for a reaction to take place as per collision theory is :

(1) Volume of the molecules should decrease

(2) molecules should dissociate after collision

(3) molecules should acquire activation energy

(4) molecules should become deactivated

100. If activation energy,  $E_a$  for forward and backward reactions are  $40 \text{ kJ mol}^{-1}$  and  $70 \text{ kJ mol}^{-1}$  respectively, then reaction is

(1) Spontaneous reaction

(2) Chain reaction

(3) Exothermic reaction

(4) Endothermic reaction

97. The fact that it is not always possible to distinguish between liquid and solid is due to

- (1) Principle of superposition
- (2) Heisenberg law
- (3) Law of corresponding states
- (4) Principle of continuity of states

98. The relations  $\alpha$ ,  $\beta$  and  $\gamma$  belong to crystal system

- (1) hexagonal
- (2) monoclinic
- (3) tetragonal
- (4) orthorhombic

99. The essential condition for a reaction to take place as per collision theory is

- (1) Volume of the molecules should decrease
- (2) molecules should dissociate after collision
- (3) molecules should require activation energy
- (4) molecules should become deactivated

100. If activation energy  $E_a$  for forward and backward reactions are 40 kJ mol<sup>-1</sup> and 0 kJ mol<sup>-1</sup> respectively, then reaction is

- (1) Spontaneous reaction
- (2) Chain reaction
- (3) Exothermic reaction
- (4) Endothermic reaction

94. The Boyle temperature is not defined as the temperature at which

- (1)  $\lim_{P \rightarrow 0} \left( \frac{PV}{RT} - 1 \right) = 0$
- (2)  $\lim_{P \rightarrow 0} \left( \frac{PV}{RT} - 1 \right) = b$
- (3)  $\lim_{P \rightarrow 0} \left( \frac{PV}{RT} - 1 \right) = a$
- (4)  $\lim_{P \rightarrow 0} \left( \frac{PV}{RT} - 1 \right) = -a$

95. Critical temperature  $T_c$  has been expressed in terms of Van der Waals constants  $a$  and  $b$ . Indicate the correct choice. It is

- (1)  $T_c = \frac{27a}{8b}$
- (2)  $T_c = \frac{8a}{27b}$
- (3)  $T_c = \frac{27a}{8b}$
- (4)  $T_c = \frac{8a}{27b}$

96. The height to which water (surface tension = 72.8 dyne cm<sup>-1</sup>) will rise in a glass capillary of the tube possessing radius 0.05 cm is

- (1) 1.43 cm
- (2) 1.42 cm
- (3) 1.44 cm
- (4) 1.45 cm

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**C****CPG-EE-2017****(CHEMISTRY)****SET-'C'****Time : 1<sup>1</sup>/<sub>2</sub> Hours****Total Questions : 100****Max. Marks : 100**

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1. All<sup>o</sup> questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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CPE-EE-2011

SET-C

(CHEMISTRY)



Max. Marks - 100

Total Questions - 100

Time - 1 1/2 Hours

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1. The test is for... 2. The test is for... 3. The test is for... 4. The test is for... 5. The test is for... 6. The test is for... 7. The test is for... 8. The test is for... 9. The test is for... 10. The test is for...

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- Which of the following is Wilkinson catalyst ?
  - $n^5(C_5H_5)_2Ni_2(PhC\equiv CPh)$
  - $RhCl(PPh_3)_3$
  - $R_4HCl(PPh_3)_3$
  - $IrCl(PPh_3)_3$
- Which of the following has largest  $PK_b$  value ?
  - $C_2H_5NH_2$
  - $CH_2NH_2$
  - $(CH_3)_2NH$
  - $(CH_3)_3N$
- Which one of the following reaction will not proceed to the forward direction ?
  - $BF_4^- + BH_4^- \rightarrow BF_3H^- + BH_3F^-$
  - $BeI_2 + HgF_2 \rightarrow BeF_2 + HgI_2$
  - $R_2SBF_3 + R_2O \rightarrow BF_3OR_2 + R_2S$
  - $CaS + H_2O \rightarrow CaO + H_2S$
- Solubility of iodine in liquid  $SO_2$  is increased on the addition of KI. This is attributed to the formation of
  - $KI_3$
  - $I_2SO_2$
  - $KI \cdot 4SO_2$
  - $SOI_2$
- According to Bohr effect :
  - affinity of Hb for  $O_2$  increases with decreasing pH
  - affinity of Hb for  $O_2$  decreases with decreasing pH
  - affinity of Hb for Mb changes with pH
  - affinity of Hb for  $CO_2$  does not change with pH.
- A light of yellow precipitate is formed in the second group of the qualitative analysis on passing  $H_2S$  even when no radical of second group is present. This is due to the presence of :
  - Phosphate
  - Acetate
  - Oxalate
  - Nitrate
- Which of the following will not give positive chromyl chloride test ?
  - Copper Chloride,  $CuCl_2$
  - Zinc Chloride,  $ZnCl_2$
  - Mercuric Chloride,  $HgCl_2$
  - Anilinium chloride,  $C_6H_5NH_3Cl$
- Which of the following molecules will have unequal bond lengths ?
  - $NF_3$
  - $BF_3$
  - $PF_5$
  - $SF_6$
- Two ice cubes are pressed over each other until they unite to form one block. Which one of the following forces dominates for holding them together ?
  - Dipole-dipole
  - Vander Waal forces
  - Hydrogen bond formation
  - Covalent attraction
- As per M.O. theory, bond order in co-molecule is :
  - one
  - two
  - three
  - four

11. When succinic acid is shaken with water and ether, it

- (1) dissociates into ions in water
- (2) associates to form dimer in water
- (3) associates to form trimer in water
- (4) remains the same in water

12. Which of the following is an Irreversible cell ?

- (1)  $\text{Zn}/\text{Zn}^{2+} // \text{AgCl}/\text{Ag}$
- (2)  $\text{Zn}/\text{Zn}^{2+} // \text{Cd}^{2+}/\text{Cd}$
- (3)  $\text{cd}/\text{cd}^{2+} // \text{kcl}, \text{Hg}_2\text{Cl}_2(\text{s})/\text{Hg}$
- (4)  $\text{Zn}/\text{H}_2\text{SO}_4/\text{Ag}$

13. The potential of a hydrogen electrode at  $\text{pH} = 10$  is

- (1)  $-0.59 \text{ V}$
- (2)  $0.59 \text{ V}$
- (3)  $0.00 \text{ V}$
- (4)  $-0.06 \text{ V}$

14. The  $\text{pH}$  of an acidic buffer according to the Henderson equation is expressed as

- (1)  $\text{pk}_a - \log \frac{[\text{salt}]}{[\text{acid}]}$
- (2)  $\text{pk}_a + \log \frac{[\text{salt}]}{[\text{acid}]}$
- (3)  $\text{pk}_a + \log \frac{[\text{acid}]}{[\text{salt}]}$
- (4)  $-\text{pk}_a - \log \frac{[\text{salt}]}{[\text{acid}]}$

15. The relation between electrical energy and enthalpy of a cell reaction is :

- (1)  $E = -\Delta H/nF + (\partial E/\partial T)_p$
- (2)  $E = -\frac{\Delta H}{nF} - (\partial E/\partial T)_p$
- (3)  $E = -\frac{\Delta H}{nF} + T(\partial E/\partial T)_p$
- (4)  $E = -\frac{\Delta H}{nF} - T(\partial E/\partial T)_p$

16. If  $\hat{A}$  and  $\hat{B}$  are two operators such that  $[\hat{A}, \hat{B}] = 1$ , the value of  $[\hat{A}, \hat{B}^2]$  will then be equal to :

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

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

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

18. The vibrational frequency of HD is less than that of  $\text{H}_2$  because

- (1)  $\text{H}_2$  has higher force constant
- (2)  $\text{H}_2$  has lower force constant
- (3) HD has a higher mass and higher force constant
- (4) HD has a higher mass

19. In Raman spectroscopy, using mercury vapors lamp :

- (1) the stokes and anti-stokes lines are equally intense
- (2) the stokes lines are more intense than the anti-stokes lines
- (3) the anti-stokes lines are more intense than the stokes lines
- (4) none of the above

20. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

- (1)  $0.5 B$
  - (2)  $B$
  - (3)  $1.5 B$
  - (4)  $2B$
- where  $B$  is a rotational constant

21. Sandmeyer reaction involves treatment of diazonium salts with :

- (1)  $\text{CuCl}_2$  or  $\text{CuBr}_2$
- (2)  $\text{CuCN}$
- (3)  $\text{CuI}_2$  or  $\text{CuCl}_2$
- (4) Both (1) and (2)

22. Anisole on nitration yields more amount of :

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

23. Choose the correct statement :

- (1) Formaldehyde is gas at room temperature
- (2) Paraformaldehyde is a linear polymer
- (3) Paraldehyde is used in medicine as sedative
- (4) All of these

24. Acid chloride ( $\text{RCOCl}$ ) on reaction with lithium aluminium tri(t-butoxy) hydride gives :

- (1)  $\text{RCHO}$
- (2)  $\text{RCH}_2\text{OH}$
- (3)  $\text{RCH}_3$
- (4) Both (1) and (2)

25. Treatment of ketones with peroxyacids in presence of acid catalyst gives carboxylic ester and carboxylic acid. The reaction is called :

- (1) Wittig reaction
- (2) Cannizzaro reaction
- (3) Baeyer-Villiger rearrangement
- (4) Favorskii rearrangement

26. (+)-Sucrose is made up of

- (1) D-(+)-Glucose and D-(+)-Glucose
- (2) D-(+)-Glucose and D-(-)-Fructose
- (3) D-(+)-Galactose and D-(+)-Glucose
- (4) D-(+)-Galactose and D-(-)-Fructose

27. Match the following :

- |                                |     |  |
|--------------------------------|-----|--|
| (A) Killiani-Fischer synthesis | (p) | opening and closing of hemiacetal of (D)-(+)-glucose                       |
| (B) Mutarotation               | (q) | diastereoisomeric aldoses pair that differ only in configuration about C-2 |
| (C) Anomeric effect            | (r) | lengthening of carbon chain of aldoses                                     |
| (D) Epimer                     | (s) | repulsion between the dipoles associated with the oxygen of the ring       |

- (1) (A)-(r), (B)-(p), (C)-(s), (D)-(q)
- (2) (A)-(p), (B)-(r), (C)-(q), (D)-(s)
- (3) (A)-(r), (B)-(s), (C)-(p), (D)-(q)
- (4) (A)-(p), (B)-(r), (C)-(s), (D)-(q)

28. The potential side reaction(s) of hindered ketone with bulky Grignard reagent is(are) :

- (1) Enolization
- (2) Reduction
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

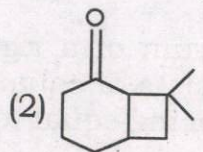
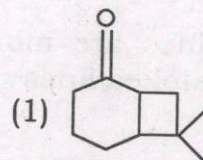
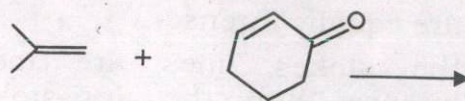
29. Choose the incorrect statement :

- (1) Pyrrole reacts with electrophiles at all positions but prefer the 2- and 5-positions, while indole much prefer the 3-position
- (2) Thiophene is very similar to benzene in reactivity
- (3) The lone pair of pyridine's nitrogen is delocalised
- (4) Amination of pyridine with lithium amide is called Chichibabin reaction

30. Reaction of phenylhydrazine in acidic solution with an aldehyde or ketone is called

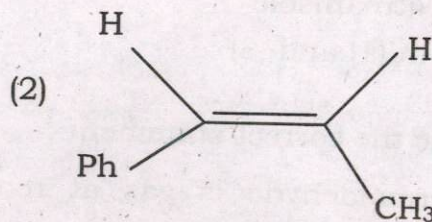
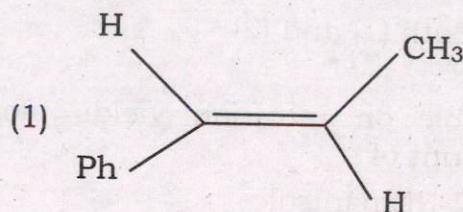
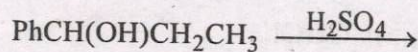
- (1) Fischer indole synthesis
- (2) Skraup synthesis
- (3) Bischler Napieralski synthesis
- (4) None of these

31. What is(are) the product(s) of the following reaction under photochemical condition ?



- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

32. What is (are) the product(s) of the following reaction ?

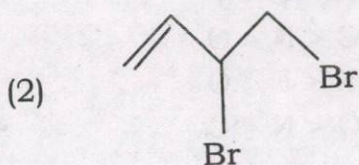
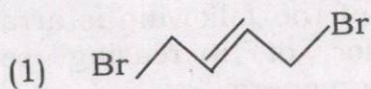


- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

33. Cyclopentadienyl cation is :

- (1) Aromatic
- (2) Non-aromatic
- (3) Antiaromatic
- (4) Both (2) and (3)

34. 1,3-Butadiene on reaction with bromine at low temperature produces :

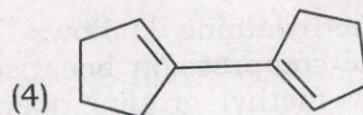
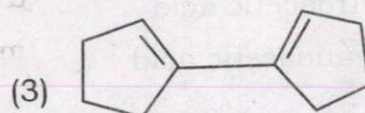
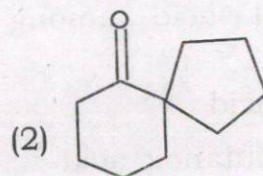
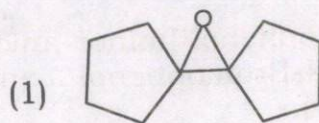
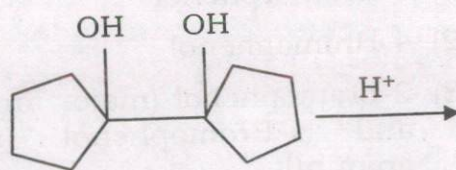


- (4) Both (1) and (2)

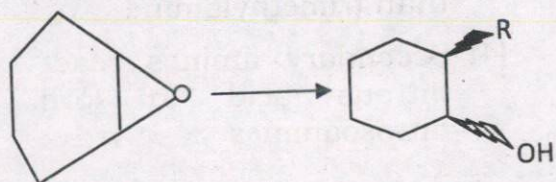
35. Treatment of  $\text{PhCH}=\text{CHCH}_2\text{Cl}$  with lithium aluminium hydride is :

- (1)  $\text{S}_{\text{N}}2$  reaction
- (2)  $\text{S}_{\text{N}}1$  reaction
- (3) mixed  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}1$  reaction
- (4)  $\text{S}_{\text{N}}\text{i}$  reaction

36. The product of the following reaction is :



37. How the following conversion is achieved ?



- (1) (a)  $\text{RLi}$ , (b)  $\text{H}^+$
- (2) (a)  $\text{RMgBr}$ , (b)  $\text{H}^+$
- (3) Both (a) and (b)
- (4)  $\text{MgBr}_2$

38. Phenol reacts with one equivalent of bromine at 5°C in CS<sub>2</sub> to produce
- (1) 2-Bromophenol
  - (2) 4-Bromophenol
  - (3) 2-bromophenol (major amount) and 4-Bromophenol (minor amount)
  - (4) 2-bromophenol (minor amount) and 4-Bromophenol (major amount)
39. The strongest acid among the following is :
- (1) Propionic acid
  - (2) 2-Chlorobutanoic acid
  - (3) 2-Nitroacetic acid
  - (4) 2-Cyanoacetic acid
40. Choose the incorrect statement :
- (1) Trimethylamine shows less angle compression because the bulky methyl groups open the angle slightly
  - (2) Boiling point of trimethylamine is more than the diisopropylamine
  - (3) Dimethylamine is stronger base than trimethylamine
  - (4) Secondary amines react with nitrous acid to form N-nitrosoamines
41. If kinetic energy of a proton is increased nine times, the wavelength of the de-Broglie wave associated with it would become :
- (1) 3 times
  - (2) 9 times
  - (3)  $\frac{1}{3}$  times
  - (4)  $\frac{1}{9}$  times
42. For which one of the following set of quantum numbers an electron will have the highest energy ?
- (1) 3, 2, 1,  $\frac{1}{2}$
  - (2) 4, 2, -1,  $\frac{1}{2}$
  - (3) 4, 1, 0,  $-\frac{1}{2}$
  - (4) 5, 0, 0,  $\frac{1}{2}$
43. When an electron is added to a gaseous atom
- (1) its size decreases
  - (2) energy is released
  - (3) it changes to positive ion
  - (4) its tendency to accept electron increases
44. Which of the following is arranged in order of increasing second ionization energy ?
- (1) C < N < O < F
  - (2) F < C < N < O
  - (3) C < N < F < O
  - (4) F < O < N < C
45. The crystal showing Frenkel defect :
- (1) cannot show metal excess defect
  - (2) shows increase in density
  - (3) shows increase in dielectric constant
  - (4) have high coordination number
46. A solution of sodium metal in liquid ammonia is blue and is a strong reducing agent, due to the presence of
- (1) sodium atoms
  - (2) sodium hydride
  - (3) sodium amide
  - (4) solvated electrons and solvated metal ions

47. Hydrides as well as halides of alkaline earth metals tend to polymerize

- (1) Strontium
- (2) Calcium
- (3) Beryllium
- (4) Magnesium

48. On hydrolysis, diborane produces

- (1)  $H_3BO_2 + H_3O_2$
- (2)  $H_3BO_3 + H_2$
- (3)  $B_2O_3 + O_2$
- (4)  $H_3BO_3 + H_2O_2$

49. Which of the following pairs of ions represent cyclic and chain silicates ?

- (1)  $Si_2O_7^{2-}$  and  $(SiO_3)_n^{2n-}$
- (2)  $Si_3O_9^{6-}$  and  $(Si_4O_{11})_n^{6n-}$
- (3)  $Si_2O_7^{2-}$  and  $(SiO_5)_n^{2n-}$
- (4)  $Si_2O_7^{7-}$  and  $(SiO_3)_n^{2n-}$

50. White Phosphorous has :

- (1) Six P-P single bonds
- (2) Four P-P single bonds
- (3) Three lone pairs of electrons
- (4) PPP angle of  $90^\circ$

51. Thorium element belongs to :

- (1) Alkali metal
- (2) Transition elements
- (3) Lanthanides
- (4) Actinides

52. Term symbol for ground state  $V^{3+}$  is

- (1)  $^3F_2$
- (2)  $^4S_{3/2}$
- (3)  $^3P_0$
- (4)  $^3P_2$

53. Which of the following trivalent lanthanide ion is coloured ?

- (1)  $La^{3+}$
- (2)  $Gd^{3+}$
- (3)  $Eu^{3+}$
- (4)  $Lu^{3+}$

54. The Boyle temperature,  $T_B$  may be defined as the temperature at which

- (1)  $\lim_{P \rightarrow 0} \left[ \frac{\partial(Pv)}{\partial P} \right] = 0$
- (2)  $\lim_{P \rightarrow 0} \left[ \frac{\partial(Pv)}{\partial V} \right] = 0$
- (3)  $\lim_{P \rightarrow 0} \left[ \frac{\partial(v)}{\partial P} \right] = 0$
- (4)  $\lim_{P \rightarrow 0} \left[ \frac{\partial(P)}{\partial V} \right] = 0$

55. Critical temperature,  $T_c$  has been expressed in terms of Vander Waal's constants 'a' and 'b'. Indicate the correct choice (R = gas constant)

- (1)  $T_c = \frac{a}{27b^2}$
- (2)  $T_c = 3b$
- (3)  $T_c = \frac{8a}{27Rb}$
- (4)  $T_c = \frac{a}{27Rb}$



56. The height to which water (surface tension =  $72.8 \text{ dynes cm}^{-1}$ ) will rise in a glass capillary of the tube possessing radius  $0.002 \text{ cm}$  be :

- (1) 17.42 cm
- (2) 7.42 cm
- (3) 1.742 cm
- (4) 0.742 cm

57. The fact that it is not always possible to distinguish between a liquid and a gas is due to

- (1) Principle of equipartition
- (2) Ideal gas law
- (3) Law of Corresponding states
- (4) Principle of continuity of states

58. The relations  $a \neq b \neq c$  and  $\alpha \neq \beta \neq \gamma = 90^\circ$ , belongs to crystal system :

- (1) triclinic
- (2) monoclinic
- (3) tetragonal
- (4) orthorhombic

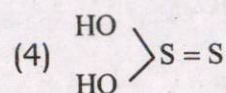
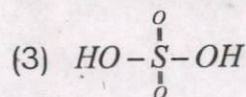
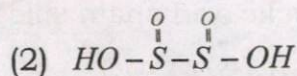
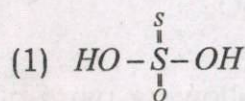
59. The essential condition for a reaction to take place as per collision theory is :

- (1) Volume of the molecules should decrease
- (2) molecules should dissociate after collision
- (3) molecules should acquire activation energy
- (4) molecules should become deactivated

60. If activation energy,  $E_a$  for forward and backward reactions are  $40 \text{ kJ mol}^{-1}$  and  $70 \text{ kJ mol}^{-1}$  respectively, then reaction is

- (1) Spontaneous reaction
- (2) Chain reaction
- (3) Exothermic reaction
- (4) Endothermic reaction

61. The structure of thiosulphuric acid is



62. Among the following conjugate bases of oxoacids of chlorine, which arrangement shows the correct order of increasing hydration energy and basic character ?

- (1)  $\text{ClO}^- < \text{ClO}_2^- < \text{ClO}_3^- < \text{ClO}_4^-$
- (2)  $\text{ClO}_4^- < \text{ClO}_3^- < \text{ClO}_2^- < \text{ClO}^-$
- (3)  $\text{ClO}_3^- < \text{ClO}_4^- < \text{ClO}_2^- < \text{ClO}^-$
- (4)  $\text{ClO}_4^- < \text{ClO}_3^- < \text{ClO}^- < \text{ClO}_2^-$

63.  $\text{XeO}_3$  contains :

- (1) four  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair
- (2) Six electron pairs and two lone pairs
- (3) two  $\pi$ -bonds, and two corners of a tetrahedron occupied by a lone pair
- (4) three  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair

64. Which of the following transition metals exhibits the highest oxidation state ?

- |        |        |
|--------|--------|
| (1) Pt | (2) Os |
| (3) Cr | (4) Mn |

65. The coordination ratio of Titanium and Oxygen in rutile structure is :

- |           |           |
|-----------|-----------|
| (1) 6 : 4 | (2) 6 : 2 |
| (3) 6 : 3 | (4) 6 : 6 |

66.  $[\text{Pt}(\text{NH}_3)_2(\text{NO}_2)_2]$  can exhibit the following isomerism :

- (1) Linkage, Geometric
- (2) Ionisation, Geometric
- (3) Hydrate, linkage
- (4) Ionisation, linkage

67. The smallest ligand field stabilisation energy for octahedral complex is

- (1) high spin  $\text{CO}^{2+}$  complex
- (2) low spin  $\text{CO}^{2+}$  complex
- (3) high spin  $\text{Cr}^{2+}$  complex
- (4) low spin  $\text{Cr}^{2+}$  complex

68. Which is thermodynamically more stable complex ?

- (1)  $\text{Ni}^{2+}$
- (2)  $\text{Pt}^{2+}$
- (3)  $\text{Co}^{2+}$
- (4) Both (1) and (2)

69. The magnetic moment of Bohr's magnetron (BM) of  $[\text{Fe}(\text{CN})_6]^{4-}$  and  $[\text{Fe}(\text{H}_2\text{O})_6]^{4+}$  respectively are :

- (1)  $\sqrt{24}$ , zero
- (2)  $\sqrt{24}$ ,  $\sqrt{24}$
- (3) zero,  $\sqrt{24}$
- (4) zero, zero

70. An example of an ionic organometallic compound is :

- (1)  $\text{Pb}(\text{C}_2\text{H}_5)_4$
- (2)  $(\text{CH}_3)_3\text{Al}$
- (3)  $\text{Mg}(\text{C}_2\text{H}_5)_2$
- (4)  $(\text{C}_6\text{H}_5)_2\text{Cr}$

71. In which of the following, the value of pH is 12 :

- (1) 1 M KOH
- (2) 1 M NaOH
- (3) 1M  $\text{Ca}(\text{OH})_2$
- (4) 0.01 M NaOH

72. Which of the following is a buffer solution :

- (1)  $\text{NaOH} + \text{CH}_3\text{COONa}$
- (2)  $\text{NaOH} + \text{Na}_2\text{SO}_4$
- (3)  $\text{K}_2\text{SO}_4 + \text{H}_2\text{SO}_4$
- (4)  $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$

**73.** The molar ionic conductance at infinite dilution of silver ions is  $60.9 \times 10^{-4} \text{ Sm}^2 \text{ mol}^{-1}$  at  $25^\circ\text{C}$ . The ionic mobility of silver ions at  $25^\circ\text{C}$  at infinite dilution will be

- (1)  $6.331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (2)  $63.31 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (3)  $633.1 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (4)  $0.6331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$

**74.** Thermodynamic equilibrium involves :

- (1) Chemical equilibrium
- (2) Thermal equilibrium
- (3) Mechanical equilibrium
- (4) All of these

**75.** For an isentropic change of state :

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

**76.** Joule-Thomson coefficient  $\mu$  is expressed as :

- (1)  $\mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_v$
- (2)  $\mu = -\frac{1}{c_p} \left[ \left( \frac{\partial H}{\partial P} \right) \right]_v$
- (3)  $\mu = -\frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$
- (4)  $\mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$

where  $C_p$  refers to heat capacity at constant pressure.

**77.** Entropy is related to probability by relation :

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

where  $R$  is gas constant and  $k$  is Boltzmann's constant

**78.** Which of the following expressions represents the Clausius-Clayperon equation ?

- (1)  $\frac{\partial \ln p}{\partial T} = \frac{\Delta H_{\text{vap}}^0}{RT^2}$
- (2)  $\left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{-\Delta H_{\text{vap}}^0}{T^2}$
- (3)  $\left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{\Delta H_{\text{vap}}^0}{RT^2}$
- (4)  $\left[ \frac{\partial(G/T)}{\partial(I/T)} \right]_P = 0$

where all the symbols have their usual meanings

**79.** Residual entropy is :

- (1) the entropy arising out of defects in crystalline substance
- (2) the entropy possessed by crystalline substance at absolute zero
- (3) the remaining entropy of the substance
- (4) the entropy which is in excess over the normal value

80. If a solute undergoes dissociation in one of the solvents in which its concentration is  $C_2$  but not in the other in which its concentration is  $C_1$ , the partition coefficient,  $K_D$  can be expressed as :

(1)  $K_D = \frac{c_1}{c_2}$

(2)  $K_D = \frac{c_1}{\sqrt{c_2}}$

(3)  $K_D = \frac{c_1}{c_2(1-\alpha)}$

(4)  $K_D = \frac{c_2(1-\alpha)}{c_1}$

where  $\alpha$  is the degree of dissociation of solute.

81. The salts of alkyl hydrogen sulphates normally have a large non-polar hydrocarbon end of :

- (1)  $C_5$  to  $C_{11}$  carbons
- (2)  $C_{12}$  to  $C_{18}$  carbons
- (3)  $C_{19}$  to  $C_{25}$  carbons
- (4) None of these

82. Ethylacetoacetate on reaction with sodium ethoxide followed by methyl iodide produces

- (1)  $CH_3CH_2COCH_2COOCH_2CH_3$
- (2)  $CH_3COCH(CH_3)COOCH_2CH_3$
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

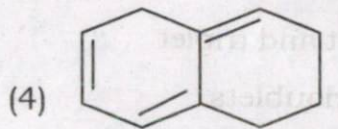
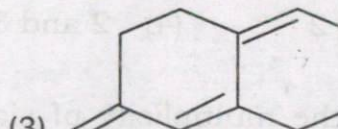
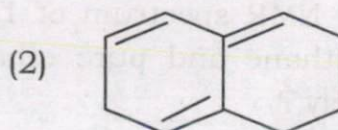
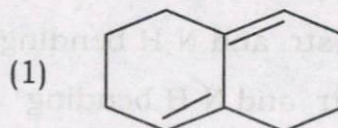
83. Which of the following stereochemical arrangement if polypropylene is highly crystalline ?

- (1) Atactic
- (2) Isotactic
- (3) Syndiotactic
- (4) Both (2) & (3)

84. Choose the pair of amino acids having aromatic character.

- (1) Histidine and Tyrosine
- (2) Cysteine and Alanine
- (3) Tryptophane and Proline
- (4) Valine and Tyrosine

85. Which of the following will show higher  $\lambda_{max}$  in UV spectroscopy ?



86. The highest  $\lambda_{\max}$  observed in the UV spectrum of acetone is due to :

- (1)  $n-\pi^*$  transition
- (2)  $\pi-\pi^*$  transition
- (3)  $n-\sigma^*$  transition
- (4)  $\sigma-\sigma^*$  transition

87. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

- |         |         |
|---------|---------|
| (1) C-O | (2) C-N |
| (3) C-C | (4) C-H |

88. In primary amide, the amide-I and amide-II bands are due to :

- (1) C = O str. and N-H str.
- (2) N-H asym. str. and N-H-sym.str.
- (3) C = O str. and N-H bending
- (4) N-H str. and N-H bending

89. How many signals will be observed in the  $^1\text{H}$  NMR spectrum of 1,2,2-tribromoethane and pure ethanol, respectively ?

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

90. What is the multiplicity of signals in acetaldehyde ?

- (1) both singlets
- (2) singlet and triplet
- (3) both doublets
- (4) doublet and quartet

91. Hyperchromic shift refers to :

- (1) a shift of  $\lambda_{\max}$  to longer wavelengths
- (2) a shift of  $\lambda_{\max}$  to shorter wavelength
- (3) an increase in the intensity of an absorption band with reference to its molar extinction coefficient
- (4) a decrease in the intensity of an absorption band with reference to its molar extinction coefficient.

92. Which of the following statements is correct ?

- (1) A triple point is invariant
- (2) A triple point is monovariant
- (3) A triple point is also called as incongruent melting point
- (4) none of these

93. A racemic mixture has :

- (1) Positive optical rotation
- (2) Negative optical rotation
- (3) Infinite optical rotation
- (4) Zero optical rotation

94. Duhem-Margules equation is :

- (1)  $\frac{l_n p_1}{l_n p_2} = \frac{l_n x_1}{l_n x_2}$
- (2)  $\frac{l_n p_1}{l_n x_1} = \frac{l_n p_2}{l_n x_2}$
- (3)  $\frac{dl_n p_1}{dl_n p_2} = \frac{dl_n x_1}{dl_n x_2}$
- (4)  $\frac{dl_n p_1}{dl_n x_1} = \frac{dl_n p_2}{dl_n x_2}$

where all the terms have their usual meanings.

95. Solutions which have the same osmotic pressure at same temperature are called :

- (1) Isotonic solutions
- (2) Regular solutions
- (3) Ideal solutions
- (4) Non-ideal solutions

96. The complex compound  $K_4[Fe(CN)_6]$  is 45% dissociated in 0.1 M aqueous solution of the complex. The osmotic pressure of the solution will be :

- (1) 0.68 atm
- (2) 6.894 atm
- (3) 68.94 atm
- (4) None of these

97. Which of the following molecule shows hyper-conjugation ?

- (1) Benzophenone
- (2) 1,3-Butadiene
- (3) Toluene
- (4) 1,3-butadiyne

98. Which conformation of cyclohexane is least stable ?

- (1) Chair
- (2) Half-chair
- (3) Boat
- (4) Twist-boat

99. Which of the following methods are used for separation of pair of enantiomers ?

- (1) Conversion to diastereoisomers and mechanical separation
- (2) Differential absorption and deracemization
- (3) Chiral recognition and biochemical process
- (4) All of the above

100. Choose the correct statement

- (1) Cyclopropyl methyl cation is more stable than the benzylic cation
- (2) Methyl anion in gas phase is having tetrahedral structure
- (3) It is steric hindrance to dimerization and not the resonance that is the cause of stability in triphenyl methyl radical
- (4) Singlet methylene is bent with an angle of  $\sim 103^\circ$

95. Which of the following methods are used for separation of part of enantiomers?
- Chiral recognition and biochemical process
  - Chiral recognition and biochemical process
  - Differential absorption and detection
  - Conversion to diastereomers and mechanical separation

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  - It is steric hindrance to dimerization and not the resonance that is the cause of stability in phenyl methyl radical
  - Quinoid methylene is bent with an angle of  $103^\circ$

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CPG-EE-2017

(CHEMISTRY)

SET-"C"

Time : 1<sup>1</sup>/<sub>2</sub> Hours

Total Questions : 100

Max. Marks : 100

Roll No. .... (in figure) ..... (in words)

Name : ..... Date of Birth : .....

Father's Name : ..... Mother's Name : .....

Date of Examination .....

(Signature of the Candidate)

(Signature of the Invigilator)

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

1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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 book-let itself. Answers **MUST NOT** be ticked in the Question book-let.
5. Use only **Black or Blue BALL POINT PEN** of good quality in the OMR Answer-Sheet.
6. There will be **Negative marking**. Each correct answer will be awarded one full mark and each incorrect answer will be **negatively marked for which the candidate will get 1/4 discredit**. **Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

*(Handwritten signatures and dates)*  
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5

1. The salts of alkyl hydrogen sulphates normally have a large non-polar hydrocarbon end of :

- (1) C<sub>5</sub> to C<sub>11</sub> carbons
- (2) C<sub>12</sub> to C<sub>18</sub> carbons
- (3) C<sub>19</sub> to C<sub>25</sub> carbons
- (4) None of these

2. Ethylacetoacetate on reaction with sodium ethoxide followed by methyl iodide produces

- (1) CH<sub>3</sub>CH<sub>2</sub>COCH<sub>2</sub>COOCH<sub>2</sub>CH<sub>3</sub>
- (2) CH<sub>3</sub>COCH(CH<sub>3</sub>)COOCH<sub>2</sub>CH<sub>3</sub>
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

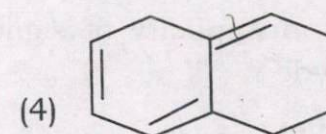
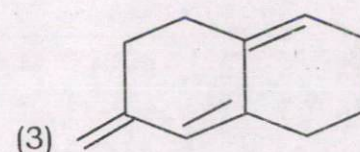
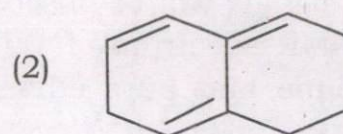
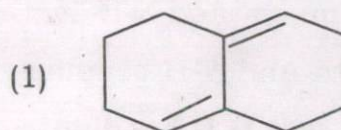
3. Which of the following stereochemical arrangement if polypropylene is highly crystalline ?

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

4. Choose the pair of amino acids having aromatic character.

- (1) Histidine and Tyrosine
- (2) Cysteine and Alanine
- (3) Tryptophan and Proline
- (4) Valine and Tyrosine

5. Which of the following will show higher  $\lambda_{\max}$  in UV spectroscopy ?



6. The highest  $\lambda_{\max}$  observed in the UV spectrum of acetone is due to :

- (1) n- $\pi^*$  transition
- (2)  $\pi$ - $\pi^*$  transition
- (3) n- $\sigma^*$  transition
- (4)  $\sigma$ - $\sigma^*$  transition

7. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

- (1) C-O
- (2) C-N
- (3) C-C
- (4) C-H

8. In primary amide, the amide-I and amide-II bands are due to :
- (1) C = O str. and N-H str.
  - (2) N-H asym. str. and N-H-sym.str.
  - (3) C = O str. and N-H bending
  - (4) N-H str. and N-H bending
9. How many signals will be observed in the  $^1\text{H}$  NMR spectrum of 1,2,2-tribromoethane and pure ethanol, respectively ?
- (1) 2 and 2
  - (2) 3 and 3
  - (3) 3 and 2
  - (4) 2 and 3
10. What is the multiplicity of signals in acetaldehyde ?
- (1) both singlets
  - (2) singlet and triplet
  - (3) both doublets
  - (4) doublet and quartet
11. Thorium element belongs to :
- (1) Alkali metal
  - (2) Transition elements
  - (3) Lanthanides
  - (4) Actinides
12. Term symbol for ground state  $\text{V}^{3+}$  is
- (1)  $^3F_2$
  - (2)  $^4S_{3/2}$
  - (3)  $^3P_0$
  - (4)  $^3P_2$
13. Which of the following trivalent lanthanide ion is coloured ?
- (1)  $\text{La}^{3+}$
  - (2)  $\text{Gd}^{3+}$
  - (3)  $\text{Eu}^{3+}$
  - (4)  $\text{Lu}^{3+}$
14. The Boyle temperature,  $T_B$  may be defined as the temperature at which
- (1)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(PV)}{\partial P} \right] = 0$
  - (2)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(PV)}{\partial V} \right] = 0$
  - (3)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(v)}{\partial P} \right] = 0$
  - (4)  $\text{Limit}_{P \rightarrow 0} \left[ \frac{\partial(P)}{\partial V} \right] = 0$
15. Critical temperature,  $T_c$  has been expressed in terms of Vander Waal's constants 'a' and 'b'. Indicate the correct choice (R = gas constant)
- (1)  $T_c = \frac{a}{27b^2}$
  - (2)  $T_c = 3b$
  - (3)  $T_c = \frac{8a}{27Rb}$
  - (4)  $T_c = \frac{a}{27Rb}$
16. The height to which water (surface tension =  $72.8 \text{ dynes cm}^{-1}$ ) will rise in a glass capillary of the tube possessing radius  $0.002 \text{ cm}$  be :
- (1)  $17.42 \text{ cm}$
  - (2)  $7.42 \text{ cm}$
  - (3)  $1.742 \text{ cm}$
  - (4)  $0.742 \text{ cm}$

17. The fact that it is not always possible to distinguish between a liquid and a gas is due to

- (1) Principle of equipartition
- (2) Ideal gas law
- (3) Law of Corresponding states
- (4) Principle of continuity of states

18. The relations  $a \neq b \neq c$  and  $\alpha \neq \beta \neq \gamma = 90^\circ$ , belongs to crystal system :

- (1) triclinic
- (2) monoclinic
- (3) tetragonal
- (4) orthorhombic

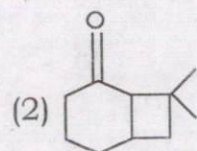
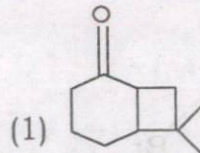
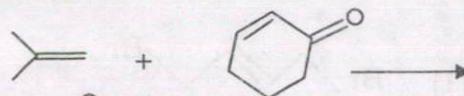
19. The essential condition for a reaction to take place as per collision theory is :

- (1) Volume of the molecules should decrease
- (2) molecules should dissociate after collision
- (3) molecules should acquire activation energy
- (4) molecules should become deactivated

20. If activation energy,  $E_a$  for forward and backward reactions are  $40 \text{ kJ mol}^{-1}$  and  $70 \text{ kJ mol}^{-1}$  respectively, then reaction is

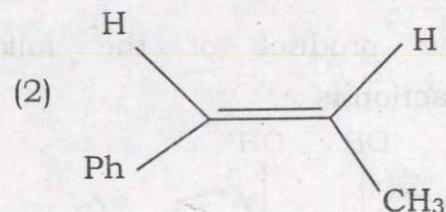
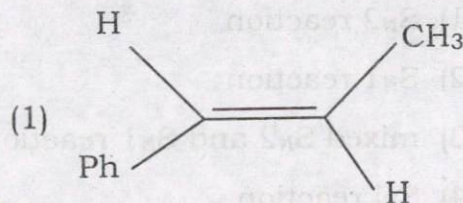
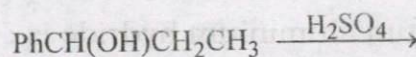
- (1) Spontaneous reaction
- (2) Chain reaction
- (3) Exothermic reaction
- (4) Endothermic reaction

21. What is(are) the product(s) of the following reaction under photochemical condition ?



- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

22. What is (are) the product(s) of the following reaction ?

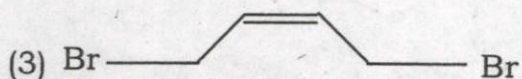
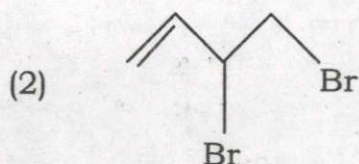
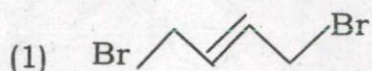


- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

23. Cyclopentadienyl cation is :

- (1) Aromatic
- (2) Non-aromatic
- (3) Antiaromatic
- (4) Both (2) and (3)

24. 1,3-Butadiene on reaction with bromine at low temperature produces :

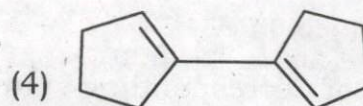
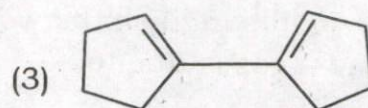
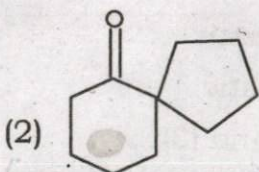
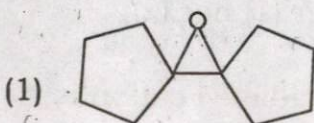
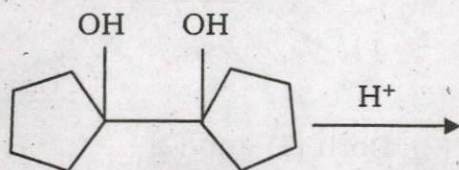


(4) Both (1) and (2)

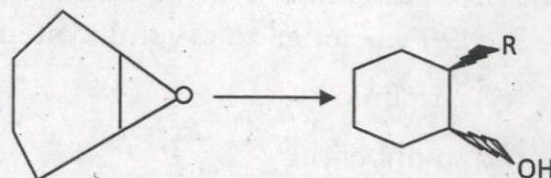
25. Treatment of  $\text{PhCH}=\text{CHCH}_2\text{Cl}$  with lithium aluminium hydride is :

- (1)  $\text{S}_{\text{N}}2$  reaction
- (2)  $\text{S}_{\text{N}}1$  reaction
- (3) mixed  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}1$  reaction
- (4)  $\text{S}_{\text{N}}\text{i}$  reaction

26. The product of the following reaction is :



27. How the following conversion is achieved ?



- (1) (a)  $\text{RLi}$ , (b)  $\text{H}^+$
- (2) (a)  $\text{RMgBr}$ , (b)  $\text{H}^+$
- (3) Both (a) and (b)
- (4)  $\text{MgBr}_2$

28. Phenol reacts with one equivalent of bromine at  $5^\circ\text{C}$  in  $\text{CS}_2$  to produce

- (1) 2-Bromophenol
- (2) 4-Bromophenol
- (3) 2-bromophenol (major amount) and 4-Bromophenol (minor amount)
- (4) 2-bromophenol (minor amount) and 4-Bromophenol (major amount)

29. The strongest acid among the following is :

- (1) Propionic acid
- (2) 2-Chlorobutanoic acid
- (3) 2-Nitroacetic acid
- (4) 2-Cyanoacetic acid

30. Choose the incorrect statement :

- (1) Trimethylamine shows less angle compression because the bulky methyl groups open the angle slightly
- (2) Boiling point of trimethylamine is more than the diisopropylamine
- (3) Dimethylamine is stronger base than trimethylamine
- (4) Secondary amines react with nitrous acid to form N-nitrosoamines

31. Which of the following is Wilkinson catalyst ?

- (1)  $n^5(C_5H_5)_2Ni_2(PhC\equiv CPh)$
- (2)  $RhCl(PPh_3)_3$
- (3)  $R_4HCl(PPh_3)_3$
- (4)  $IrCl(PPh_3)_3$

32. Which of the following has largest  $PK_b$  value ?

- (1)  $C_2H_5NH_2$
- (2)  $CH_2NH_2$
- (3)  $(CH_3)_2NH$
- (4)  $(CH_3)_3N$

33. Which one of the following reaction will not proceed to the forward direction ?

- (1)  $BF_4^- + BH_4^- \rightarrow BF_3H^- + BH_3F^-$
- (2)  $BeI_2 + HgF_2 \rightarrow BeF_2 + HgI_2$
- (3)  $R_2SBF_3 + R_2O \rightarrow BF_3OR_2 + R_2S$
- (4)  $CaS + H_2O \rightarrow CaO + H_2S$

34. Solubility of iodine in liquid  $SO_2$  is increased on the addition of KI. This is attributed to the formation of

- (1)  $KI_3$
- (2)  $I_2SO_2$
- (3)  $KI \cdot 4SO_2$
- (4)  $SOI_2$

35. According to Bohr effect :

- (1) affinity of Hb for  $O_2$  increases with decreasing pH
- (2) affinity of Hb for  $O_2$  decreases with decreasing pH
- (3) affinity of Hb for Mb changes with pH
- (4) affinity of Hb for  $CO_2$  does not change with pH.

36. A light of yellow precipitate is formed in the second group of the qualitative analysis on passing  $H_2S$  even when no radical of second group is present. This is due to the presence of :

- (1) Phosphate
- (2) Acetate
- (3) Oxalate
- (4) Nitrate

37. Which of the following will not give positive chromyl chloride test ?

- (1) Copper Chloride,  $CuCl_2$
- (2) Zinc Chloride,  $ZnCl_2$
- (3) Mercuric Chloride,  $HgCl_2$
- (4) Anilinium chloride,  $C_6H_5NH_3Cl$

38. Which of the following molecules will have unequal bond lengths ?

- (1)  $\text{NF}_3$             (2)  $\text{BF}_3$   
(3)  $\text{PF}_5$             (4)  $\text{SF}_6$

39. Two ice cubes are pressed over each other until they unite to form one block. Which one of the following forces dominates for holding them together ?

- (1) Dipole-dipole  
(2) Vander Waal forces  
(3) Hydrogen bond formation  
(4) Covalent attraction

40. As per M.O. theory, bond order in co-molecule is :

- (1) one            (2) two  
(3) three        (4) four

41. Hyperchromic shift refers to :

- (1) a shift of  $\lambda_{\text{max}}$  to longer wavelengths  
(2) a shift of  $\lambda_{\text{max}}$  to shorter wavelength  
(3) an increase in the intensity of an absorption band with reference to its molar extinction coefficient  
(4) a decrease in the intensity of an absorption band with reference to its molar extinction coefficient.

42. Which of the following statements is correct ?

- (1) A triple point is invariant  
(2) A triple point is monovariant  
(3) A triple point is also called as incongruent melting point  
(4) none of these

43. A racemic mixture has :

- (1) Positive optical rotation  
(2) Negative optical rotation  
(3) Infinite optical rotation  
(4) Zero optical rotation

44. Duhem-Margules equation is :

$$(1) \frac{l_n p_1}{l_n p_2} = \frac{l_n x_1}{l_n x_2}$$

$$(2) \frac{l_n p_1}{l_n x_1} = \frac{l_n p_2}{l_n x_2}$$

$$(3) \frac{dl_n p_1}{dl_n p_2} = \frac{dl_n x_1}{dl_n x_2}$$

$$(4) \frac{dl_n p_1}{dl_n x_1} = \frac{dl_n p_2}{dl_n x_2}$$

where all the terms have their usual meanings.

45. Solutions which have the same osmotic pressure at same temperature are called :

- (1) Isotonic solutions  
(2) Regular solutions  
(3) Ideal solutions  
(4) Non-ideal solutions

46. The complex compound  $\text{K}_4[\text{Fe}(\text{CN})_6]$  is 45% dissociated in 0.1 M aqueous solution of the complex. The osmotic pressure of the solution will be :

- (1) 0.68 atm    (2) 6.894 atm  
(3) 68.94 atm    (4) None of these

47. Which of the following molecule shows hyper-conjugation ?

- (1) Benzophenone
- (2) 1,3-Butadiene
- (3) Toluene
- (4) 1,3-butadiyne

48. Which conformation of cyclohexane is least stable ?

- (1) Chair
- (2) Half-chair
- (3) Boat
- (4) Twist-boat

49. Which of the following methods are used for separation of pair of enantiomers ?

- (1) Conversion to diastereoisomers and mechanical separation
- (2) Differential absorption and deracemization
- (3) Chiral recognition and biochemical process
- (4) All of the above

50. Choose the correct statement

- (1) Cyclopropyl methyl cation is more stable than the benzylic cation
- (2) Methyl anion in gas phase is having tetrahedral structure
- (3) It is steric hindrance to dimerization and not the resonance that is the cause of stability in triphenyl methyl radical
- (4) Singlet methylene is bent with an angle of  $\sim 103^\circ$

51. Sandmeyer reaction involves treatment of diazonium salts with :

- (1)  $\text{CuCl}_2$  or  $\text{CuBr}_2$
- (2)  $\text{CuCN}$
- (3)  $\text{CuI}_2$  or  $\text{CuCl}_2$
- (4) Both (1) and (2)

52. Anisole on nitration yields more amount of :

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

53. Choose the correct statement :

- (1) Formaldehyde is gas at room temperature
- (2) Paraformaldehyde is a linear polymer
- (3) Paraldehyde is used in medicine as sedative
- (4) All of these

54. Acid chloride ( $\text{RCOCl}$ ) on reaction with lithium aluminium tri(*t*-butoxy) hydride gives :

- (1)  $\text{RCHO}$
- (2)  $\text{RCH}_2\text{OH}$
- (3)  $\text{RCH}_3$
- (4) Both (1) and (2)

55. Treatment of ketones with peroxyacids in presence of acid catalyst gives carboxylic ester and carboxylic acid. The reaction is called :

- (1) Wittig reaction
- (2) Cannizzaro reaction
- (3) Baeyer-Villiger rearrangement
- (4) Favorskii rearrangement



56. (+)-Sucrose is made up of

- (1) D-(+)-Glucose and D-(+)-Glucose
- (2) D-(+)-Glucose and D-(-)-Fructose
- (3) D-(+)-Galactose and D-(+)-Glucose
- (4) D-(+)-Galactose and D-(-)-Fructose

57. Match the following :

- |                                |     |  |
|--------------------------------|-----|--|
| (A) Killiani-Fischer synthesis | (p) | opening and closing of hemiacetal of (D)-(+)-glucose                       |
| (B) Mutarotation               | (q) | diastereoisomeric aldoses pair that differ only in configuration about C-2 |
| (C) Anomeric effect            | (r) | lengthening of carbon chain of aldoses                                     |
| (D) Epimer                     | (s) | repulsion between the dipoles associated with the oxygen of the ring       |

- (1) (A)-(r), (B)-(p), (C)-(s), (D)-(q)
- (2) (A)-(p), (B)-(r), (C)-(q), (D)-(s)
- (3) (A)-(r), (B)-(s), (C)-(p), (D)-(q)
- (4) (A)-(p), (B)-(r), (C)-(s), (D)-(q)

58. The potential side reaction(s) of hindered ketone with bulky Grignard reagent is(are) :

- (1) Enolization
- (2) Reduction
- (3) Both (1) and (2)
- (4) Neither (1) nor (2)

59. Choose the incorrect statement :

- (1) Pyrrole reacts with electrophiles at all positions but prefer the 2- and 5-positions, while indole much prefer the 3-position
- (2) Thiophene is very similar to benzene in reactivity
- (3) The lone pair of pyridine's nitrogen is delocalised
- (4) Amination of pyridine with lithium amide is called Chichibabin reaction

60. Reaction of phenylhydrazine in acidic solution with an aldehyde or ketone is called

- (1) Fischer indole synthesis
- (2) Skraup synthesis
- (3) Bischler Napieralski synthesis
- (4) None of these

61. In which of the following, the value of pH is 12 :

- (1) 1 M KOH
- (2) 1 M NaOH
- (3) 1M Ca(OH)<sub>2</sub>
- (4) 0.01 M NaOH

62. Which of the following is a buffer solution :

- (1) NaOH + CH<sub>3</sub>COONa
- (2) NaOH + Na<sub>2</sub>SO<sub>4</sub>
- (3) K<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>SO<sub>4</sub>
- (4) NH<sub>4</sub>OH + NH<sub>4</sub>Cl

63. The molar ionic conductance at infinite dilution of silver ions is  $60.9 \times 10^{-4} \text{ Sm}^2 \text{ mol}^{-1}$  at  $25^\circ\text{C}$ . The ionic mobility of silver ions at  $25^\circ\text{C}$  at infinite dilution will be

- (1)  $6.331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (2)  $63.31 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (3)  $633.1 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$
- (4)  $0.6331 \times 10^{-8} \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$

64. Thermodynamic equilibrium involves :

- (1) Chemical equilibrium
- (2) Thermal equilibrium
- (3) Mechanical equilibrium
- (4) All of these

65. For an isentropic change of state :

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

66. Joule-Thomson coefficient  $\mu$  is expressed as :

- (1)  $\mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_v$
- (2)  $\mu = -\frac{1}{c_p} \left[ \left( \frac{\partial H}{\partial P} \right) \right]_v$
- (3)  $\mu = -\frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$
- (4)  $\mu = \frac{1}{c_p} \left( \frac{\partial H}{\partial P} \right)_T$

where  $C_p$  refers to heat capacity at constant pressure.

67. Entropy is related to probability by relation :

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

where  $R$  is gas constant and  $k$  is Boltzmann's constant

68. Which of the following expressions represents the Clausius-Clayperon equation ?

- (1)  $\frac{\partial \ln p}{\partial T} = \frac{\Delta H_{\text{vap}}^0}{RT^2}$
- (2)  $\left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{-\Delta H_{\text{vap}}^0}{T^2}$
- (3)  $\left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{\Delta H_{\text{vap}}^0}{RT^2}$
- (4)  $\left[ \frac{\partial(G/T)}{\partial(I/T)} \right]_P = 0$

where all the symbols have their usual meanings

69. Residual entropy is :

- (1) the entropy arising out of defects in crystalline substance
- (2) the entropy possessed by crystalline substance at absolute zero
- (3) the remaining entropy of the substance
- (4) the entropy which is in excess over the normal value

70. If a solute undergoes dissociation in one of the solvents in which its concentration is  $C_2$  but not in the other in which its concentration is  $C_1$ , the partition coefficient,  $K_D$  can be expressed as :

$$(1) K_D = \frac{c_1}{c_2}$$

$$(2) K_D = \frac{c_1}{\sqrt[3]{c_2}}$$

$$(3) K_D = \frac{c_1}{c_2(1-\alpha)}$$

$$(4) K_D = \frac{c_2(1-\alpha)}{c_1}$$

where  $\alpha$  is the degree of dissociation of solute.

71. When succinic acid is shaken with water and ether, it

- (1) dissociates into ions in water
- (2) associates to form dimer in water
- (3) associates to form trimer in water
- (4) remains the same in water

72. Which of the following is an Irreversible cell ?

- (1)  $Zn/Zn^{2+} // AgCl/Ag$
- (2)  $Zn/Zn^{2+} // Cd^{2+}/Cd$
- (3)  $cd/cd^{2+} // kcl, Hg_2Cl_2(s)/Hg$
- (4)  $Zn/H_2SO_4/Ag$

73. The potential of a hydrogen electrode at pH = 10 is

- (1) -0.59 V      (2) 0.59 V
- (3) 0.00V      (4) -0.06V

74. The pH of an acidic buffer according to the Henderson equation is expressed as

$$(1) \text{p}K_a - \log \frac{[\text{salt}]}{[\text{acid}]}$$

$$(2) \text{p}K_a + \log \frac{[\text{salt}]}{[\text{acid}]}$$

$$(3) \text{p}K_a + \log \frac{[\text{acid}]}{[\text{salt}]}$$

$$(4) -\text{p}K_a - \log \frac{[\text{salt}]}{[\text{acid}]}$$

75. The relation between electrical energy and enthalpy of a cell reaction is :

$$(1) E = -\Delta H/nF + (\partial E/\partial T)_P$$

$$(2) E = -\frac{\Delta H}{nF} - (\partial E/\partial T)_P$$

$$(3) E = -\frac{\Delta H}{nF} + T(\partial E/\partial T)_P$$

$$(4) E = -\frac{\Delta H}{nF} - T(\partial E/\partial T)_P$$

76. If  $\hat{A}$  and  $\hat{B}$  are two operators such that  $[\hat{A}, \hat{B}] = 1$ , the value of  $[\hat{A}, \hat{B}^2]$  will then be equal to :

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

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

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

78. The vibrational frequency of HD is less than that of H<sub>2</sub> because

- (1) H<sub>2</sub> has higher force constant
- (2) H<sub>2</sub> has lower force constant
- (3) HD has a higher mass and higher force constant
- (4) HD has a higher mass

79. In Raman spectroscopy, using mercury vapors lamp :

- (1) the stokes and anti-stokes lines are equally intense
- (2) the stokes lines are more intense than the anti-stokes lines
- (3) the anti-stokes lines are more intense than the stokes lines
- (4) none of the above

80. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

- |           |        |
|-----------|--------|
| (1) 0.5 B | (2) B  |
| (3) 1.5 B | (4) 2B |

where B is a rotational constant

81. If kinetic energy of a proton is increased nine times, the wavelength of the de-Broglie wave associated with it would become :

- (1) 3 times
- (2) 9 times
- (3)  $\frac{1}{3}$  times
- (4)  $\frac{1}{9}$  times

82. For which one of the following set of quantum numbers an electron will have the highest energy ?

- (1) 3, 2, 1,  $\frac{1}{2}$
- (2) 4, 2, -1,  $\frac{1}{2}$
- (3) 4, 1, 0,  $-\frac{1}{2}$
- (4) 5, 0, 0,  $\frac{1}{2}$

83. When an electron is added to a gaseous atom

- (1) its size decreases
- (2) energy is released
- (3) it changes to positive ion
- (4) its tendency to accept electron increases

84. Which of the following is arranged in order of increasing second ionization energy ?

- (1) C < N < O < F
- (2) F < C < N < O
- (3) C < N < F < O
- (4) F < O < N < C

85. The crystal showing Frenkel defect :

- (1) cannot show metal excess defect
- (2) shows increase in density
- (3) shows increase in dielectric constant
- (4) have high coordination number

86. A solution of sodium metal in liquid ammonia is blue and is a strong reducing agent, due to the presence of

- (1) sodium atoms
- (2) sodium hydride
- (3) sodium amide
- (4) solvated electrons and solvated metal ions

87. Hydrides as well as halides of alkaline earth metals tend to polymerize

- (1) Strontium
- (2) Calcium
- (3) Beryllium
- (4) Magnesium

88. On hydrolysis, diborane produces

- (1)  $H_3BO_2 + H_3O_2$
- (2)  $H_3BO_3 + H_2$
- (3)  $B_2O_3 + O_2$
- (4)  $H_3BO_3 + H_2O_2$

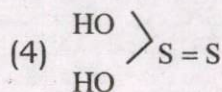
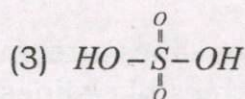
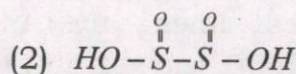
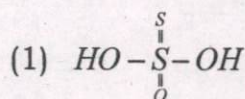
89. Which of the following pairs of ions represent cyclic and chain silicates ?

- (1)  $Si_2O_7^{2-}$  and  $(SiO_3)_n^{2n-}$
- (2)  $Si_3O_9^{6-}$  and  $(Si_4O_{11})_n^{6n-}$
- (3)  $Si_2O_7^{2-}$  and  $(SiO_5)_n^{2n-}$
- (4)  $Si_2O_7^{2-}$  and  $(SiO_3)_n^{2n-}$

90. White Phosphorous has :

- (1) Six P-P single bonds
- (2) Four P-P single bonds
- (3) Three lone pairs of electrons
- (4) PPP angle of  $90^\circ$

91. The structure of thiosulphuric acid is



92. Among the following conjugate bases of oxoacids of chlorine, which arrangement shows the correct order of increasing hydration energy and basic character ?

- (1)  $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$
- (2)  $ClO_4^- < ClO_3^- < ClO_2^- < ClO^-$
- (3)  $ClO_3^- < ClO_4^- < ClO_2^- < ClO^-$
- (4)  $ClO_4^- < ClO_3^- < ClO^- < ClO_2^-$

93. XeO<sub>3</sub> contains :

- (1) four  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair
- (2) Six electron pairs and two lone pairs
- (3) two  $\pi$ -bonds, and two corners of a tetrahedron occupied by a lone pair
- (4) three  $\pi$ -bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair

94. Which of the following transition metals exhibits the highest oxidation state ?

- |        |        |
|--------|--------|
| (1) Pt | (2) Os |
| (3) Cr | (4) Mn |

95. The coordination ratio of Titanium and Oxygen in rutile structure is :

- |           |           |
|-----------|-----------|
| (1) 6 : 4 | (2) 6 : 2 |
| (3) 6 : 3 | (4) 6 : 6 |

96. [Pt(NH<sub>3</sub>)<sub>2</sub>(NO<sub>2</sub>)<sub>2</sub>] can exhibit the following isomerism :

- (1) Linkage, Geometric
- (2) Ionisation, Geometric
- (3) Hydrate, linkage
- (4) Ionisation, linkage

97. The smallest ligand field stabilisation energy for octahedral complex is

- (1) high spin CO<sup>2+</sup> complex
- (2) low spin CO<sup>2+</sup> complex
- (3) high spin Cr<sup>2+</sup> complex
- (4) low spin Cr<sup>2+</sup> complex

98. Which is thermodynamically more stable complex ?

- (1) Ni<sup>2+</sup>
- (2) Pt<sup>2+</sup>
- (3) Co<sup>2+</sup>
- (4) Both (1) and (2)

99. The magnetic moment of Bohr's magnetron (BM) of [Fe(CN)<sub>6</sub>]<sup>4-</sup> and [Fe(H<sub>2</sub>O)<sub>6</sub>]<sup>4+</sup> respectively are :

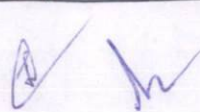
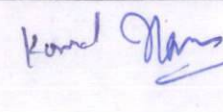
- (1)  $\sqrt{24}$ , zero
- (2)  $\sqrt{24}$ ,  $\sqrt{24}$
- (3) zero,  $\sqrt{24}$
- (4) zero, zero

100. An example of an ionic organometallic compound is :

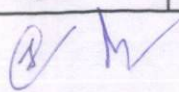
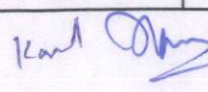

- (1) Pb(C<sub>2</sub>H<sub>5</sub>)<sub>4</sub>
- (2) (CH<sub>3</sub>)<sub>3</sub>Al
- (3) Mg(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>
- (4) (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>Cr

**CENTRALIZED ENTRANCE EXAM CHEMISTRY ANSWER KEY-2017**

SRL NO.	A	B	C	D
1	3	4	2	2
2	2	4	4	2
3	2	1	1	4
4	3	4	1	1
5	3	2	2	4
6	4	3	1	1
7	3	4	3	4
8	2	1	3	3
9	2	2	3	2
10	1	3	3	4
11	1	1	2	4
12	2	3	4	1
13	4	4	1	3
14	2	2	2	1
15	3	1	3	3
16	1	2	4	2
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32	1	2	3	4
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 Kunal Hans

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