

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

T.B.C. : BAC-30

Test Booklet Series

Serial No. **601212**

**D**

**TEST BOOKLET**  
**CHEMISTRY**

Time Allowed : 2 Hours

Maximum Marks : 300

**INSTRUCTIONS TO CANDIDATES**

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE YOUR OPTIONAL SUBJECT CODE AS MENTIONED ON THE BODY OF YOUR ADMISSION CERTIFICATE AND ADVERTISEMENT AT APPROPRIATE PLACES ON THE ANSWER SHEETS.
3. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACES IN THE ANSWER SHEET USING **HB PENCIL**.
4. You have to enter your **Roll No.** on the Test Booklet in the Box provided along side. **DO NOT** write anything else on the Test Booklet.
5. This Test Booklet contains **120** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case, you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
6. You have to mark all your responses **ONLY** on the **separate Answer Sheet** provided by using **HB pencil**. See instruction in the Answer Sheet.
7. All items carry equal marks. All items are compulsory. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. For each question for which a wrong answer is given by you, **one fifth (0.20) of the marks assigned to that question will be deducted as penalty.**
8. Before you proceed to mark in the Answer Sheet the responses to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your **Admission Certificate**.
9. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator the **Answer Sheet**, the Test Booklet issued to you.

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1. The distribution law is applicable
  - (a) When one solute is soluble in one phase only
  - (b) When solute dissociates in one phase
  - (c) When solute associate in other phase
  - (d) When ratio of mole fraction of solute in two phases remains constant
2. The metastable equilibrium is one
  - (a) Which has zero vapor pressure
  - (b) Which has low vapor pressure
  - (c) Which is super cooled state and will solidify on adding a piece of ice
  - (d) Which will not solidify if a piece of ice is added
3. Low temperature bath operating at  $-21^{\circ}\text{C}$  can be made by using
  - (a) Mixture of sulfur and water
  - (b) Mixture of sodium chloride and water
  - (c) Mixture of silver and lead solution
  - (d) Mixture of alcohol and water
4. Lower critical solution temperature for binary system is one
  - (a) Below which two phases will appear
  - (b) Above which only one phase will exit
  - (c) Below which only one phase will exit
  - (d) Below which no phase will exit
5. Henry's law states that
  - (a) Solubility of gas is proportional to partial pressure of gas
  - (b) Solubility of gas is inversely proportional to partial pressure of gas
  - (c) Solubility of gas is independent of partial pressure of gas
  - (d) Solubility of gas is zero, if partial pressure of gas is high
6. If vapor pressure of pure water at  $25^{\circ}\text{C}$  is 3170 Pa then predict the vapor pressure, when 0.2 mole fraction of solute is dissolved
  - (a) 634 Pa
  - (b) 2536 Pa
  - (c) 3170 Pa
  - (d) zero Pa
7. The vapor pressure of acetone-chloroform mixture is
  - (a) Higher than pure acetone
  - (b) Higher than pure chloroform
  - (c) Higher than both acetone and chloroform
  - (d) Below than both acetone and chloroform
8. The cryoscopic ( $K_p$ ) and ebullioscopic ( $K_b$ ) constants may be used to
  - (a) Determine the Mw of volatile solute
  - (b) Determine the Mw of insoluble solute
  - (c) Determine the Mw of non-volatile solute
  - (d) Determine the Mw of solute, which associates and dissociates
9. Van't Hoff equation is used to
  - (a) Estimate the enthalpy of vaporization
  - (b) Estimate the molecular weight of solute
  - (c) Estimate the partial pressure of mixture
  - (d) Estimate deviation in partial pressure of solution
10. The osmotic pressure of 0.2 molar urea at  $73^{\circ}\text{C}$  using  $R = 0.02\text{L.atm./K. mol}$ 
  - (a) 2.535 atm
  - (b) 5.071 atm
  - (c) zero atm
  - (d) 20.284 atm

11. A current of 6 A was passed through an aqueous acidic solution for 9650 seconds. The mass of decomposed water is
- 2.0 g
  - 5.4 g
  - 9.65 g
  - 10.2 g
12.  $E^0(\text{Zn}^{2+}/\text{Zn}) = -0.762 \text{ V}$ ,  $E^0(\text{Pb}^{2+}/\text{Pb}) = -0.126 \text{ V}$
- For the cell  
 $\text{Zn} | \text{Zn}^{2+}(a = 1) || \text{Pb}^{2+}(a = 1) | \text{Pb}$ ,  
 choose the correct statement :
- the overall emf will be  $-0.888 \text{ V}$  and lead will be deposited
  - the overall emf will be  $+0.888 \text{ V}$  and zinc will dissolve
  - the overall emf will be  $+0.636 \text{ V}$  and zinc will dissolve
  - the overall emf will be  $-0.636 \text{ V}$  and lead will be deposited
13. A weak acid was found to be 50% ionized at a pH of 4.8. The  $\text{pK}_a$  of the acid
- can not be determined with just this information
  - is 2.4
  - is 4.8
  - is 5.2
14. Identify the pair which will not form a buffer
- $\text{Na}_2\text{HPO}_4 + \text{Na}_3\text{PO}_4$
  - $\text{NaOAc} + \text{HOAc}$
  - $\text{NaCl} + \text{HCl}$
  - $\text{NaOH} + \text{glycine}$
15. If the volume of the reaction vessel is diminished to 1/3 of its initial value, the rate of the chemical reaction  
 $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) = 2\text{NO}_2(\text{g})$
- will decrease 1/3 times
  - will decrease 1/27 times
  - will increase 3 times
  - will increase 27 times
16. According to Arrhenius theory of reaction rate
- a reaction always becomes faster with increasing temperature
  - the rate of a reaction varies with temperature according to Le Chatelier's principle
  - the rate of an exothermic reaction decreases exponentially with temperature
  - the rate of an endothermic reaction decreases linearly with temperature
17. 75% of a first order reaction was completed in 40 min. When was 50% of the reaction complete ?
- 30 min
  - 25 min
  - 20 min
  - 10 min
18. On using a catalyst, the activation energy of a reaction decreases by half; the rate of the reaction would increase by a factor of
- 2
  - $\exp(-E_a/2RT)$
  - $\exp 2$
  - $\exp(E_a/2RT)$
19. The time scale of fluorescence emission is in the range of
- $10^{-6} \text{ s}$
  - $10^{-9} \text{ s}$
  - $10^{-12} \text{ s}$
  - $10^{-15} \text{ s}$

20. In condensed media, generally the same fluorescence is observed irrespective of excitation wavelength. This is known as
- Frank-Condon Principle
  - Kasha's rule
  - Born-Openheimer approximation
  - Stokes shift
21. The spontaneous decay of excited singlet state of a single molecule is usually considered
- mono-exponential
  - bi-exponential
  - linear with respect to time
  - Quadratic
22. The quantum yield of fluorescence is given by the expression
- $\Phi_f = k_f / (k_f + \sum k_{nr})$
  - $\Phi_f = 1 / (k_f + \sum k_{nr})$
  - $\Phi_f = \sum k_{nr} / (k_f + \sum k_{nr})$
  - $\Phi_f = (k_f + \sum k_{nr}) / k_f$
23. The presence of  $Mn^{2+}$  increases the rate of reaction between oxalic acid and acidified potassium permanganate. In this reaction,  $Mn^{2+}$  acts as
- a promoter
  - an agent that reduces the free energy of the reaction
  - an autocatalyst
  - an initiator of a second parallel reaction
24. Which of the following statements is true regarding a catalyst that is used for a reversible reaction ?
- It increases the rate of forward reaction
  - It increases the rate of backward reaction
  - It increases the equilibrium constant
  - It helps in the faster establishment of equilibrium condition
25. Hydrogenation of plant oils is carried out by using nickel as a heterogeneous catalyst. Which of the following statement is true regarding the form of the catalyst ?
- An alloy of nickel and iron is used for better catalytic efficiency
  - Spherical ball shaped nickel nuggets are used, as lesser surface area imparts better catalytic control
  - Finely divided nickel is used
  - Nickel is used in the form of a bio-compatible complex
26. An enzyme catalyzed reaction that obeys Michaelis-Menten mechanism was carried out under the condition that the substrate concentration is much greater than the Michaelis-Menten constant. Under this condition, the rate of the reaction is
- zero'th order with respect to the total concentration of the enzyme
  - first order with respect to the total concentration of the enzyme
  - second order with respect to the total concentration of the enzyme
  - zero'th order with respect to the concentration of the free enzyme
27. Which of the following method is used for purification of colloids ?
- Coagulation
  - Dialysis
  - Peptization
  - Bredig's arc method
28. Which of the following will have the highest coagulation power for  $As_2S_3$  colloid ?
- $Na^+$
  - $Al^{3+}$
  - $SO_4^{2-}$
  - $PO_4^{3-}$

29. Surface tension of lyophilic sols is  
 (a) equal to that of water  
 (b) equal to that of the dispersant  
 (c) lower than that of water  
 (d) higher than that of water
30. The migration of colloidal particles under the influence of an electric field is known as  
 (a) Brownian motion  
 (b) Dialysis  
 (c) Electro-osmosis  
 (d) Electrophoresis
31. The probability density of a particle in a one dimensional box of length  $L$  at the midpoint of the box in the ground state is  
 (a) 0  
 (b)  $2L$   
 (c)  $L/2$   
 (d)  $2/L$
32. The angular part of a  $p_x$  orbital is  
 (a)  $\sin\theta \cos\theta$   
 (b)  $\sin\phi \cos\phi$   
 (c)  $\sin\theta \cos\phi$   
 (d)  $\sin\theta \sin\phi$
33. The total number of orbitals possible in an atomic shell with principal quantum number  $n = 4$  is  
 (a) 4  
 (b) 9  
 (c) 16  
 (d) 8
34. The life time of a molecule in a certain electronic state is known to be  $10^{-10}$  second. The minimum uncertainty in the measurement of energy of this state in units of  $(h/4\pi) S^{-1}$  is  
 (a)  $10^{10}$   
 (b)  $10^{-10}$   
 (c) 10  
 (d) infinity
35. Some combinations of the quantum numbers  $n$ ,  $l$ ,  $m_l$  and  $m_s$  are given in the same order for an electron in an atom. Choose the correct possibility  
 (a) 2, 2, 0,  $\frac{1}{2}$   
 (b) 2, 0, 0,  $\frac{1}{2}$   
 (c) 2, 0, 1,  $-\frac{1}{2}$   
 (d) 2, 0, 1,  $\frac{1}{2}$
36. Which one of the following element has the highest electron affinity ?  
 (a) Mg  
 (b) F  
 (c) Cl  
 (d) Si
37. The valence electron configuration of  $As^{3+}$  ion is  
 (a)  $4s^2$   
 (b)  $4s^2 4p^3$   
 (c)  $3s^2$   
 (d)  $3s^2 3p^3$
38. Which one of the following elements has the highest electronegativity ?  
 (a) Ca  
 (b) Cu  
 (c) C  
 (d) Cs
39. The correct order of increasing size of the elements Li, C, F and Ne is  
 (a)  $Ne < F < C < Li$   
 (b)  $Li < C < Ne < F$   
 (c)  $F < Li < Ne < C$   
 (d)  $C < Li < Ne < F$

40. Which one of the following is the correct order of bond angles for the molecules  $\text{OF}_2$ ,  $\text{OCl}_2$  and  $\text{OH}_2$  ?
- $\text{OF}_2 < \text{OCl}_2 < \text{OH}_2$
  - $\text{OF}_2 < \text{OH}_2 < \text{OCl}_2$
  - $\text{OCl}_2 < \text{OH}_2 < \text{OF}_2$
  - $\text{OH}_2 < \text{OF}_2 < \text{OCl}_2$
41. The formal bond order of  $\text{O}_2^{2-}$  ion is
- 1
  - 2
  - 3
  - 1.5
42. Which one of the following is an 'electron precise' molecule ?
- $\text{Al}_2\text{H}_6$
  - $\text{SiH}_4$
  - $\text{H}_2\text{S}$
  - $\text{C}_2\text{H}_6$
43. The orbital hybridization of Fe in  $\text{Fe}(\text{CO})_5$  is
- $\text{sp}^3$
  - $\text{d}^2\text{sp}^3$
  - $\text{dsp}^3$
  - $\text{sp}^3\text{d}^2$
44. The oxidation state of Mn in  $[\text{Mn}(\text{H}_2\text{O})_4\text{Cl}_2]^+$  is
- 3
  - 1
  - 6
  - 2
45. The value of n in the redox reaction  $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + ne \rightleftharpoons 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$  is
- 3
  - 6
  - 1
  - 2
46. The formal oxidation numbers of sulphur in  $\text{S}_8$ ,  $\text{S}_2\text{F}_2$  and  $\text{H}_2\text{S}$  are respectively
- 0, +1 and -2
  - 0, +1 and +2
  - +2, +1 and -2
  - 2, +1 and -2
47. In the redox reaction  $\text{HAsO}_2 + \text{I}_3^- + 2\text{H}_2\text{O} \rightarrow \text{H}_3\text{AsO}_4 + 3\text{I}^- + 2\text{H}^+$ , the oxidising agent is
- $\text{HAsO}_2$
  - $\text{I}_3^-$
  - $\text{H}_3\text{AsO}_4$
  - $\text{I}^-$
48. Conjugate base of bicarbonate ion is
- carbonic acid
  - carbonate ion
  - proton
  - carbon dioxide
49. The basicities of the compounds : A, Aniline; B, 3-Nitroaniline; C, 4-Nitroaniline; D, 2-nitroaniline are in the order
- $A > B > C > D$
  - $D > A > B > C$
  - $D > B > C > A$
  - $D > C > B > A$
50. Among the chromium oxides  $\text{CrO}$ ,  $\text{CrO}_2$ ,  $\text{CrO}_3$  and  $\text{Cr}_2\text{O}_3$  the correct order of increasing acid strength is
- $\text{CrO}_3 < \text{CrO}_2 < \text{CrO} < \text{Cr}_2\text{O}_3$
  - $\text{CrO} < \text{Cr}_2\text{O}_3 < \text{CrO}_2 < \text{CrO}_3$
  - $\text{Cr}_2\text{O}_3 < \text{CrO}_3 < \text{CrO} < \text{CrO}_2$
  - $\text{CrO} < \text{CrO}_2 < \text{CrO}_3 < \text{Cr}_2\text{O}_3$

51. In the case of the Lewis acids,  $\text{Cu}^+$ ,  $\text{Au}^+$ ,  $\text{Ag}^+$  and  $\text{K}^+$  the increasing order of softness is
- $\text{Cu}^+ < \text{Au}^+ < \text{Ag}^+ < \text{K}^+$
  - $\text{K}^+ < \text{Cu}^+ < \text{Ag}^+ < \text{Au}^+$
  - $\text{Au}^+ < \text{K}^+ < \text{Ag}^+ < \text{Cu}^+$
  - $\text{Ag}^+ < \text{Cu}^+ < \text{K}^+ < \text{Au}^+$
52. Among three isotopes of hydrogen, which one is common ?
- symbol
  - stability
  - relative abundance
  - atomicity
53. The credit for the discovery of heavy hydrogen goes to
- Manzel
  - Urey
  - Birge
  - Allison
54. Number of unpaired electrons in  $\text{Cr}^{3+}$  ion is
- 2
  - 3
  - 5
  - 6
55. With  $\text{N}_2$ , Li gives a ruby-red crystalline compound as
- $\text{LiN}$
  - $\text{LiN}_2$
  - $\text{Li}_3\text{N}_2$
  - $\text{Li}_3\text{N}_3$
56. In dilute ammonia solution, metal gives blue colour due to
- solvated metal ion
  - metal-ammonia complex
  - solvated electrons
  - metal-water complex
57. In reference to lanthanides, in which one of the following configurations, there is no orbital angular momentum ?
- $f^7$
  - $f^3$
  - $f^5$
  - $f^8$
58. In context with metal extraction, thermite mixture is
- $\text{Cr}_2\text{O}_3$
  - $\text{Al}_2\text{O}_3$
  - Al-powder +  $\text{Cr}_2\text{O}_3$
  - Mg-powder +  $\text{Cr}_2\text{O}_3$
59. Which of the following is acidic flux in reference to metal extraction ?
- $\text{P}_2\text{O}_5$
  - $\text{CaO}$
  - $\text{MgO}$
  - $\text{Fe}_2\text{O}_3$
60. Copper-iron pyrite is
- $\text{Cu}_2\text{S}$
  - $\text{Cu}_2\text{SFes}_2$
  - $\text{CuFeS}_2$
  - $\text{FeSiO}_3$

61. Mond's process is used in the purification of
- Iron
  - Copper
  - Gold
  - Nickel
62. Which of the following occupy the position in box ?
- $${}^1_5\text{B} + {}^4_2\text{He} \rightarrow {}^{12}_6\text{C} + \boxed{\phantom{01\text{ electron}}}$$
- 01 electron
  - 01 proton
  - 01  $\beta$ -particle (01 Beta particle)
  - 01  $\alpha$ -particle (01 alpha particle)
63. Which one of the following is true ?
- Penetration power of  $\alpha$ -rays is more than  $\beta$ -rays
  - Kinetic energy of  $\alpha$ -rays is higher than  $\beta$ -rays
  - Ionisation power of  $\alpha$ -rays is least
  - Due to  $\beta$ -rays photographic plate becomes red
64. The atomic mass unit (01 amu) is equal to
- $0.17 \times 10^{20}$  g
  - $0.17 \times 10^{-23}$  g
  - $0.8 \times 10^{-20}$  g
  - $0.8 \times 10^{23}$  g
65. Which one of the following is used as fission material ?
- ${}^{238}_{92}\text{U}$
  - ${}^{232}_{90}\text{Th}$
  - ${}^{235}_{92}\text{U}$
  - ${}^{230}_{90}\text{Th}$
66. Tetracyanonickelate (II) ion is
- $[\text{Ni}(\text{CN})_6]^{4-}$
  - $[\text{Ni}(\text{CN})_4]^{2-}$
  - $[\text{Ni}(\text{CN})_4]^{-}$
  - $[\text{Ni}(\text{CN})_6]^{2-}$
67. Which one of the following shows optical isomers ?
- $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ ; en = 1, 2-diamino ethane
  - $[\text{Co}(\text{en})_3]^{3+}$
  - $[\text{Co}(\text{en})_2\text{F}_2]^+$
  - $[\text{Co}(\text{en})_2\text{Br}_2]^+$
68. Which one of the following is used in the medicine ?
- $[\text{Co}(\text{NH}_3)_6]^{3+}$
  - $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$
  - cis- $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
  - trans  $[\text{Ni}(\text{PY})_4(\text{NCS})_2]$ ; PY = Pyridine
69. Which one is used in Photosynthesis ?
- $\text{K}^+$
  - $\text{Ti}^{4+}$
  - $\text{In}^{3+}$
  - $\text{Mn}^{2+}$
70. Which is a pollutant ?
- $\text{Cl}_2$
  - $\text{FeSO}_4$
  - $\text{FeCl}_3$
  - $\text{NH}_3$
71. Which is not particulate ?
- Soot
  - Fly ash
  - Dust
  - $\text{CO}_2$



72. Minamata disease is associated with the toxicity of

- (a) cadmium
- (b) lead
- (c) arsenic
- (d) mercury

73. Which one is used in nuclear medicine ?

- (a)  $^{99m}\text{Tc}$
- (b)  $^{99}\text{Mo}$
- (c)  $^{285}\text{U}$
- (d)  $^{230}\text{Th}$

74. Which of the following compounds is strongest acid ?

- (a) Phenol
- (b) p-Nitrophenol
- (c) 2, 4-Dinitrophenol
- (d) m-Nitrophenol

75. The dissociation of acetic acid at  $25^\circ\text{C}$  shall be maximum in

- (a) 10% methanol—90% water
- (b) 20% methanol—80% water
- (c) 20% dioxan—80% water
- (d) 45% dioxan—55% water

76. Which of the following compounds will have smallest bond angle/angles ?

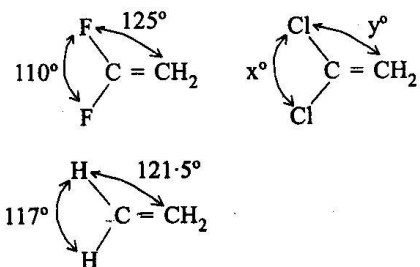
- (a)  $\text{CH}_4$
- (b)  $\text{H}_2\text{O}$
- (c)  $\text{H}_2\text{S}$
- (d)  $\text{NH}_3$

77. In the  $\text{SN}^2$  reactions, the order of nucleophilicity of

$\text{EtO}^\ominus$ ,  $\text{HO}^\ominus$ ,  $\text{PhO}^\ominus$  and  $\text{CH}_3\text{COO}^\ominus$  is

- (a)  $\text{EtO}^\ominus > \text{HO}^\ominus > \text{PhO}^\ominus > \text{CH}_3\text{CO}_2^\ominus$
- (b)  $\text{PhO}^\ominus > \text{EtO}^\ominus > \text{HO}^\ominus > \text{CH}_3\text{CO}_2^\ominus$
- (c)  $\text{CH}_3\text{CO}_2^\ominus > \text{PhO}^\ominus > \text{HO}^\ominus > \text{EtO}^\ominus$
- (d)  $\text{HO}^\ominus > \text{EtO}^\ominus > \text{PhO}^\ominus > \text{CH}_3\text{CO}_2^\ominus$

78. In the following series of compounds



the bond angles  $x$  and  $y$  shall be

- (a)  $x = 120^\circ$ ,  $y = 120^\circ$
- (b)  $x = 118^\circ$ ,  $y = 121^\circ$
- (c)  $x = 114^\circ$ ,  $y = 123^\circ$
- (d)  $x = 108^\circ$ ,  $y = 126^\circ$

79. The reaction of 2-methyl-2-butene with hydrogen bromide in presence of peroxide yields

- (a) 2-Bromo-3-methyl butane
- (b) 2-Bromo-2-methyl butane
- (c) 1-Bromo-2-methyl butane
- (d) 1-Bromo-3-methyl butane

80. Which of the following carboxylic acid derivatives is most reactive towards nucleophilic acyl substitution ?

- (a)  $\text{CH}_3\text{C}(=\text{O})\text{NH}_2$   
 (b)  $\text{CH}_3\text{C}(=\text{O})\text{Cl}$   
 (c)  $\text{CH}_3\text{C}(=\text{O})\text{OCH}_2\text{CH}_3$   
 (d)  $\text{CH}_3\text{C}(=\text{O})\text{OCCH}_3$

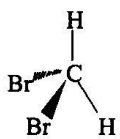
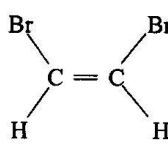
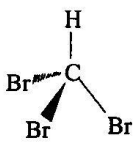
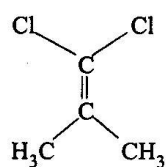
81. About 100% (E)-1, 2-Diphenylpropene can be obtained by the reaction of NaOEt/EtOH with

- (a) (2R)-2-chloro-1, 2-diphenyl propane  
 (b) (1R, 2S)-1-chloro-1, 2-diphenyl propane  
 (c) (1R, 2R)-1-chloro-1, 2-diphenyl propane  
 (d) (1S, 2S)-1-chloro-1, 2-diphenyl propane


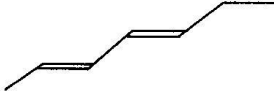


82. Which of the following ketones will be most reactive towards a nucleophilic addition reaction ?

- (a)  $\text{H}_3\text{C}-\text{C}(=\text{O})-\text{CH}_3$   
 (b)  $\text{H}_3\text{C}-\text{CH}_2-\text{C}(=\text{O})-\text{CH}_3$   
 (c)  $(\text{CH}_3)_3\text{C}-\text{C}(=\text{O})-\text{CH}_3$   
 (d)  $(\text{CH}_3)_3\text{C}-\text{C}(=\text{O})-\text{C}(\text{CH}_3)_3$

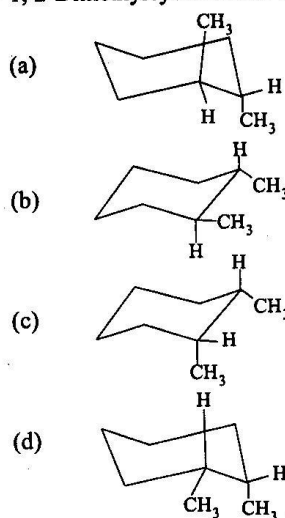
83. Which of the following molecules contains  $C_3$  axis of symmetry ?

- (a) 
- (b) 
- (c) 
- (d) 

84. Which of the following structures represents E, Z-2, 4-heptadiene ?

- (a) 
- (b) 
- (c) 
- (d) 

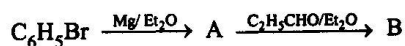
85. Which of the following isomers of 1, 2-Dimethylcyclohexane is more stable ?



86. Heating of R-2-Chlorobutane with bromine yields

- (a) (2R, 3R)-2-Bromo-3-Chlorobutane and (2S, 3R)-2-Bromo-3-Chlorobutane  
 (b) (2R, 3S) – and (2S, 3S)-2-Bromo-3-Chlorobutane  
 (c) (2R, 3S) – and (2R, 3R)-2-Bromo-3-Chlorobutane  
 (d) (2R, 3S)-2-Bromo –3-Chlorobutane

87. In the reaction sequence



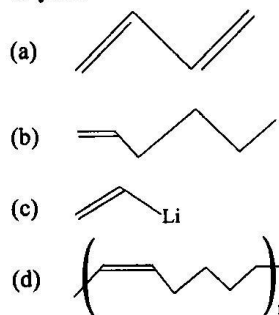
$\xrightarrow{H_3O^+}$  C, the product 'C' is

- (a) 1-phenyl-2-propanol  
 (b) 1-phenyl-1-propanol  
 (c) 2-phenyl-1-propanol  
 (d) 2-phenyl-2-propanol

88. The reaction of p-bromofluorobenzene with magnesium metal in presence of dry ether yields

- (a) p-fluorophenyl magnesium bromide  
 (b) p-bromophenyl magnesium fluoride  
 (c) fluorobenzene and magnesium bromide  
 (d) bromobenzene and magnesium fluoride

89. Vinyl bromide reacts with n-butyl lithium to yield



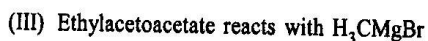
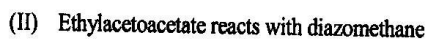
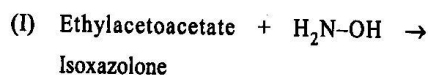
90. The reaction of lithium metal at low temperature with an alkyl halide in inert atmosphere gives alkyl lithium. The reactivity of alkyl halides follows the order

- (a)  $RCl > RBr > RI$   
 (b)  $RI > RBr > RCl$   
 (c)  $RI > RCl > RBr$   
 (d)  $RBr > RCl > RI$

91. Diethyl malonate is treated with urea in the presence of  $NaOC_2H_5$  in  $C_2H_5OH$  at  $110^\circ C$ , what is the product of reaction ?

- (a) Malonyl urea  
 (b) Seconal  
 (c) Veronal  
 (d) Barbitone

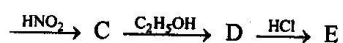
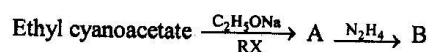
92. Consider the reactions :



In which of the above reactions keto-form is taking part ?

- (a) II and III  
(b) Only III  
(c) Only I  
(d) I and IV

93. Find out the product (E) in the following scheme of reactions :

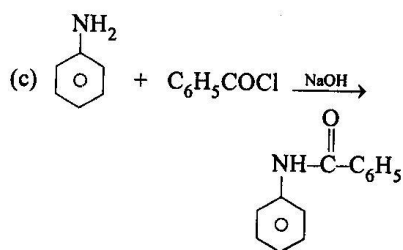
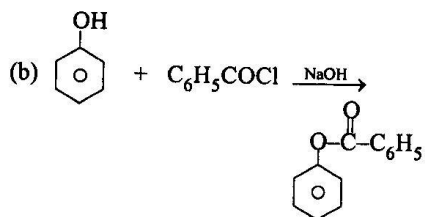
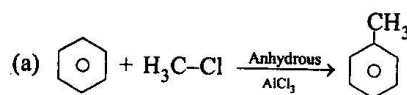


- (a)  $\text{RCH}(\text{CN})-\text{NH}_2$   
(b)  $\text{RCH}_2\text{CONH}_2$   
(c)  $\text{R}-\text{NH}-\text{CH}_2-\text{CO}_2\text{H}$   
(d)  $\text{R}-\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$

94. Which of the following structures has an enol group ?

- (a)  $\text{H}_3\text{C}-\text{COCH}_3$   
(b)  $\text{H}_3\text{C}-\text{C}(\text{OH})=\text{CH}-\text{COOCH}_3$   
(c)  $\text{H}_3\text{C}-\text{CH}=\text{CH}-\text{CH}_2\text{OH}$   
(d)  $\text{H}_2\text{C}=\text{CH}-\text{CH}_2\text{OH}$

95. Which of the following is Schotten-Baumann Reaction ?


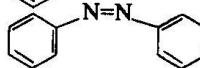

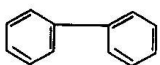


(d) Both at (b) and (c)

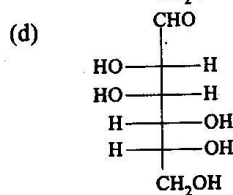
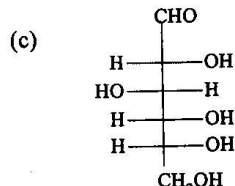
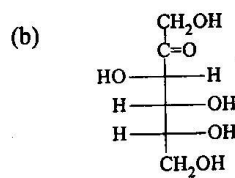
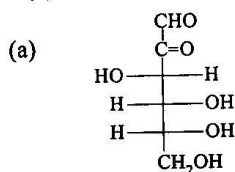
96. Which of the following possesses aromaticity ?

- (a) Furan  
(b) Tetrahydrofuran  
(c) Hexahydrobenzene  
(d) Piperidine

97. Diazotisation of aniline with  $\text{NaNO}_2$  and  $\text{HCl}$ , followed by reaction with hypophosphorus acid gives

- (a)   
(b)   
(c)   
(d) 

98. Reaction of benzenediazonium chloride with alkaline  $\beta$ -naphthol gives an azo-dye. This is an example of
- Electrophilic substitution
  - Nucleophilic substitution
  - Oxidative coupling
  - a free radical reaction
99. Linkage of glucose to fructose in sucrose is
- $\beta$ -glucose is linked to  $\alpha$ -fructose
  - $\alpha$ -glucose is linked to  $\alpha$ -fructose
  - $\alpha$ -glucose is linked to  $\beta$ -fructose
  - $\beta$ -glucose is linked to  $\beta$ -fructose
100. The configuration which represents D(-) fructose is



101. Consider the following pairs :

- |                    |   |                  |
|--------------------|---|------------------|
| I. Proteins        | — | Biuret test      |
| II. Oils           | — | Molisch's test   |
| III. Carbohydrates | — | Esters           |
| IV. Polypeptides   | — | Many-CONH-groups |

Which of these is (are) not correctly paired ?

- III and IV
  - II and III
  - I, II and IV
  - I only
102. The bond that determines the secondary structure of a protein is
- Co-ordinate bond
  - Covalent bond
  - Hydrogen bond
  - Ionic bond
103. Which of the following statements is incorrect ?
- Oils and fats can be referred as Lipids
  - Oils contain lesser proportion of unsaturated acids than fats
  - The fatty acids present as glycerides are all straight chain compounds
  - Linolenic acid is an unsaturated acid

104. Consider the following pairs :

- |                      |   |                    |
|----------------------|---|--------------------|
| I. Glycoproteins     | — | Nucleic acids      |
| II. Nucleoproteins   | — | Carbohydrates      |
| III. Metalloproteins | — | Calcium caseinate  |
| IV. DNFB             | — | N-terminal residue |

Which of these are correctly matched ?

- III and IV
- II and III
- I, II and IV
- All are correctly matched

105. In IR spectrum, trichloroacetaldehyde absorbs at  $1770\text{ cm}^{-1}$  which is due to
- C-H stretching
  - C = O stretching
  - C-H bending
  - C-Cl stretching

106. In PMR spectrum of  $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ , how many signals are obtained ?
- Two signals
  - Four signals
  - Eight signals
  - Ten signals

107. Consider the following pairs :

- |                                  |   |                         |
|----------------------------------|---|-------------------------|
| I. R-Bands                       | — | $\pi \rightarrow \pi^*$ |
| II. K-Bands                      | — | $n \rightarrow \pi^*$   |
| III. $-\text{C} \equiv \text{N}$ | — | Chromophore             |
| IV. Hypsochromic shift           | — | Blue shift              |

Which of these are not correctly matched ?

- III and IV
- I and IV
- II and III
- I and II

108. Match List-I with List-II and select the correct answer using the codes given below the lists :

- | <i>List-I</i>            | <i>List-II</i>                       |
|--------------------------|--------------------------------------|
| A. PMR                   | I. Stretching and bending vibrations |
| B. IR                    | II. Type of protons                  |
| C. UV                    | III. Electronic excitation           |
| D. $n \rightarrow \pi^*$ | IV. Low energy transition            |

Codes :

- |     | A  | B   | C   | D   |
|-----|----|-----|-----|-----|
| (a) | I  | II  | IV  | III |
| (b) | II | III | IV  | I   |
| (c) | II | I   | III | IV  |
| (d) | IV | II  | III | I   |

109. van der Waal's equation of state corrects the ideal gas law

- For excluded volume
- For interactions force
- For both excluded volume and interaction force
- For both temperature and pressure

110. Critical temperature ( $T_c$ ) in an isotherm correspond to, when

- $\partial P/\partial V = 0$
- $\partial^2 P/\partial V^2 = 0$
- $\partial P/\partial V \neq 0$
- $\partial^2 P/\partial V^2 = \partial P/\partial V = 0$

111. On decreasing the reduce mass ( $\mu$ ) of a binary mixture of gas to  $\mu/4$ , the collision frequency ( $Z_{1,2}$ ) is increased to

- 200%
- 100%
- 300%
- 0%

112. The gas will behave like a perfect gas

- If the second virial coefficient (B) is zero
- If the third virial coefficient (C) is zero
- If the second virial coefficient is high
- If both second (B) and third virial (C) coefficients are high

113. Thermal energy for monoatomic gas ( $E_{th}$ ) at  $25^\circ\text{C}$  with one translational degree of freedom is ( $R = 8.314\text{ J K}^{-1}\text{ mol}^{-1}$ )

- $3718\text{ kJ mol}^{-1}$
- $1239.3\text{ kJ mol}^{-1}$
- $2478.6\text{ kJ mol}^{-1}$
- $7436\text{ kJ mol}^{-1}$

114. For reversible isothermal expansion of an ideal gas
- (a)  $dU = 0$
  - (b)  $dU > 0$  and  $dH < 0$
  - (c)  $dU = dH = 0$
  - (d)  $dU < 0$  and  $dH > 0$
115. For reversible adiabatic process, the entropy change ( $\Delta S$ ) of the system is
- (a)  $\Delta S (\text{System}) = 0$
  - (b)  $\Delta S (\text{System}) > 0$
  - (c)  $\Delta S (\text{System}) < 0$
  - (d)  $\Delta S (\text{System}) \neq 0$
116. The process would be spontaneous in forward direction, if
- (a)  $\Delta G > 0$  and  $\Delta S < 0$
  - (b)  $\Delta G = 0$  and  $\Delta S = 0$
  - (c)  $\Delta G > 0$  and  $\Delta S > 0$
  - (d)  $\Delta G < 0$  and  $\Delta S > 0$
117. The value of equilibrium constant ( $K$ ) would be high when
- (a)  $\Delta G$  is more positive
  - (b)  $\Delta G$  is more negative
  - (c)  $\Delta G$  is zero
  - (d)  $K$  not depend on  $\Delta G$
118. Degree of freedom ( $F$ ) in biphasic region of one component system is
- (a) Two
  - (b) One
  - (c) Three
  - (d) Zero
119. Three phases would be in equilibrium when
- (a)  $\mu_1 = \mu_2 = \mu_3$
  - (b)  $\mu_1 > \mu_2 \neq \mu_3$
  - (c)  $\mu_1 \neq \mu_2 > \mu_3$
  - (d)  $\mu_1 = \mu_2 \neq \mu_3$
120. The eutectic temperature in two components system is
- (a) When one component is solidified
  - (b) When two components are solidified
  - (c) When none of the component is solidified
  - (d) When degree of freedom is zero

**SPACE FOR ROUGH WORK**

BAC-30

16D