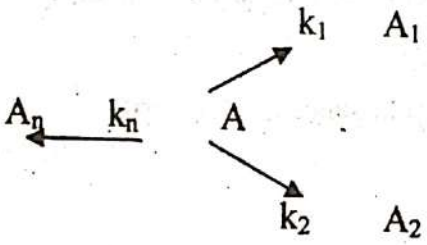
CHEMISTRY

1. A Zero order reaction has k=0.025 Ms^{-1} for the disappearance of A. What will be the concentration of A after 15s if the initial concentration is 0.5M ?

   (A) 0.5M (B) 0.32M (C) 0.125M (D) 0.06M

2. For a 1st order decomposition



   The overall k will be given by

   (A) $k = k_1+k_2+.....k_n$ (B) k=(kl+k2+.....+kn)/n

   (C) k=kl*k2*.....*kn (D) None of these

3. The rate of a gaseous reaction triples when temperature is increased by 10 °C from 25 °C. The E_a for the reaction (in kJ mol^{-1}) is

   (A) 40 (B) 70 (C) 83.8 (D) 200

4. Molar ionic conductance at infinite dilution of Na^+ and Cl^- ions are $50.11*10^{-4}$ and $76.34*10^{-4}$ $Sm^2 mol^{-1}$. The transport no. of Na^+ is

   (A) 0.604 (B) 0.732 (C) 0.396 (D) 0.699

5. The ionic conductance of As^+ is 53.962 ohm^{-1} cm^2, its ionic mobility in cm/sec is

   (A) 0.000559 (B) 0.000641 (C) 53.962 (D) 26.981

(*Turn Over*)

6. The free energy change in joule for the following cell at 25 °C is

Sn / Sn^{2+} (a=0.6) // Pb^{2+} (a=0.3) / Pb

(A) -984.3 (B) 79.6 (C) 0.0051 (D) 980

7. Walden rule is relationship between

(A) Conductance and temperature (B) Conductance and ionic mobility

(C) Conductance and transport number (D) Conductance and viscosity

8. The molar conductance of acetic acid at 25 °C is 15.0 $Sm^2\ mol^{-1}$ and molar conductance at infinite dilution is 390.0 $Sm^2\ mol^{-1}$. The degree of dissociation of acetic acid is

(A) 3.60% (B) 3.75% (C) 3.85% (D) 3.95%

9. The pH of a 0.1 M aqueous solution of NH_4OH ($Kb = 1.0*10^{-5}$) is

(A) 3 (B) 10.5 (C) 11 (D) 4

10. Ka of a weak acid HB is 10^{-5}. The pK_a of the conjugate base B^- is

(A) 6 (B) 9 (C) 5 (D) 8

11. 500 ml of aqueous solution of 0.05 moles of NaOH. The pH of the solution is

(A) 5 (B) 3 (C) 13 (D) 7

12. The solution produces of a sparingly soluble salt AB_2 is $1.08*10^{-13}\ M^3$ at room temp, its molar solubility is

(A) $3*10^{-4}$ M (B) $3*10^{5}$ M (C) $3*10^{-5}$ M (D) $3*10^{-13}$ M

(Continued)

13. Find out the number of components, number of phases and degree of freedom in the following equilibrium reaction

$NH_4Cl\,(s) \rightarrow NH_3(g) + HCl(g)$

(A) 1, 1, 1 (B) 1, 2, 2 (C) 1, 2, 1 (D) 1, 0, 2

14. Triple point is the point where

(A) three components are in equilibrium

(B) number of degree of freedom is three

(C) number of degree of freedom is zero

15. Which of the following solution have the lowest freezing point ?

(A) 0.1m NaCl (B) 0.1m KNO_3 (C) 0.2 glucose (D) 0.1m $Ca(NO_3)_2$

16. The van't Hoff factor (i) for a very dilute aqueous solution of HCN is 1.00002. The percentage degree of dissociation of HCN is

(A) 2×10^{-2} (B) 2×10^{-3} (C) 2×10^{-5} (D) 2×10^{-7}

17. How many unit cells are present in 39 gm of potassium that crystalises in body centred cubic structure? N_A = Avogrado's number.

(A) N_A (B) $N_A/4$ (C) $0.5\,N_A$ (D) $0.75\,N_A$

18. The inter ionic distance for caesium chloride crystal will be

(A) a (B) $a/2$ (C) $a\sqrt{3}/2$ (D) $2a/\sqrt{3}$

(*Turn Over*)

19. A match box exhibits

(A) cubic (B) monoclinic (C) orthorhombic (D) tetragonal

20. For a reaction

$Ag_2O(s) \rightleftarrows 2Ag(s)+{}^1/_2O_2(g)$

ΔH, ΔS & T are 40.63k.Jmol^{-1}, 108.8 JK^{-1}mol^{-1} & 373.4K respectively. Predict the feasibility of the reaction

(A) feasible (B) non feasible

(C) remains at equilibrium (D) not predicted

21. A particle of mass m is confinedin a one dimensional box of length a. What is the probability of finding the particle in the region $0 \le x \le a/2$.

(A) 0 (B) 1/2 (C) 1/3 (D) 1/4

22. $y^3 = x$ is not an acceptable function because it is

(A) Infinite (B) Not square integrable

(C) Not continuous (D) Not single valued

23. The Commutator of x and d/dx is

(A) –1 (B) 0 (C) 1 (D) ∞

24. sin 2x is an eigenfunction of

(A) d/dx (B) d/dy (C) d^2/dx^2 (D) d^3/dx^3

(*Continued*)

25. The energy of a 3-D box is $27h^2/8ma^2$. The degree of degeneracy is

(A) 1 (B) 2 (C) 3 (D) 4

26. The zero point energy of a particle in one dimensional box with $a = 9$ angstorm is

(A) $h^2/648$ m (B) $h^2/64$ m (C) $h^2/48$ m (D) $h/648$ m

27. 1 mole of ideal gas at 2 atm expands irreversibly and adiabatically into vacuum to decrease its pressure to 1 atm. ΔS for such change is in joule per Kelvin

(A) 5.77 (B) 9.57 (C) –2.61 (D) –109.05

28. ΔG_{mix} when 10 moles of helium are mixed with 10 mol of Ne is

(A) – 47318 J (B) – 34350 J (C) – 12968 J (D) – 1717 J

29. What is the change in chemical potential when 2 moles of O_2 is transferred from partial pressure of 10 atm to 2 atm at 300 K.

(A) –4.014 $kJmol^{-1}$ (B) –8.028 $kJmol^{-1}$

(C) 1.729 $kJmol^{-1}$ (D) 40.14 $kJmol^{-1}$

30. The bond dissociation energy of gaseous H_2, Cl_2 and HCl are 104, 58 & 103 KCal mol^{-1} respectively. What is the enthalpy of formation of HCl?

(A) 591 $KCalmol^{-1}$ (B) 149 $KCalmol^{-1}$

(C) –22 $KCalmol^{-1}$ (D) –103 $KCalmol^{-1}$

31. At what temperature liquid water will be in equilibrium with water vapour

$\Delta H_{VAP} = 40.73\ kJmol^{-1}$ & $\Delta S_{VAP} = 0.109\ kJmol^{-1}K^{-1}$

(A) 373 K (B) 373.6 K (C) 300 K (D) 273 K

32. The standard Gibbs Free energy change ΔG^0 for a reaction is zero. The value of equilibrium constant will be

(A) 10 (B) 1 (C) 100 (D) ∞

33. For the reaction

$$Ag_2O(s) \rightleftarrows 2Ag(s) + {}^1/_2O_2(g)$$

Which of the following is true?

(A) $\Delta H = \Delta E$ (B) $\Delta H < \Delta E$ (C) $\Delta H > \Delta E$ (D) $\Delta H = 1/2\Delta E$

34. The isotope $_{92}U^{235}$ decays in a nucleus of steps to an isotope of $_{82}Pb^{207}$. The group of particles emitted in this process will be

(A) $4\alpha, 7\beta$ (B) $6\alpha, 4\beta$ (C) $7\alpha, 4\beta$ (D) $10\alpha, 8\beta$

35. Radioactivity of a radioactive element remains 1/10 of original radioactivity after 2.303 seconds. The half life period is

(A) 2.303 (B) 0.2303 (C) 0.693 (D) 0.0693

36. IUPAC name of the complex NO_2 $[Fe(CN)_5NO]$

(A) Sodium nitrosyl pentacyano Iron (II) (B) Sodium pentacyano nitrosyl ferrate

(C) Disodium pentacyano nitro Iron(II) (D) Sodium nitrosyl pentacyano Iron(III)

(*Continued*)

37. EAN of $[Cr(NH_3)_6]$ is

(A) 27 (B) 24 (C) 33 (D) 35

38. How many isomers are possible for the complex $[Co(en)_2Cl_2]^+$

(A) two geometrical & two optical (B) one geometrical & one optical

(C) two geometrical (D) two optical

39. The shape of hybridisation in $[FeF_6]$ complex is

(A) d^2sp^3 (B) sp^3d^2 (C) sd^3 (D) sp^3

40. Structure of complexes $[Ni(CN)_4]^{2-}$ and $[Cu(NH_3)_4]^{2+}$

(A) Both are tetrahedral

(B) Both are square planar

(C) One is square planar and other is tetrahedral

(D) None of the above

41. No. of unpaired electron in $[Cu(CN)_4]^{3-}$

(A) two (B) one (C) zero (D) three

42. CFSE for d^3 & d^6 system in tetrahedral complexes are

(A) $-0.36\ \Delta_0$ & $-0.27\ \Delta_0$ (B) $-0.27\ \Delta_0$ & $-0.54\ \Delta_0$

(C) $-0.36\ \Delta_0$ & $-0.18\ \Delta_0$ (D) $-0.27\ \Delta_0$ & $-0.27\ \Delta_0$

(Turn Over)

43. The number of d-electron in

$[Co(H_2O)_6]^{2+}$ where $\Delta_0 = 9300\ cm^{-1}$

$[Ni(H_2O)_6]^{2+}$ where $\Delta_0 = 8500\ cm^{-1}$

(A) 7, 8 (B) 8, 7 (C) 6, 4 (D) 8, 8

44. The magnetic moment of the complex where number of unpaired electron is 3

(A) 2:83 (B) 3.0 (C) 3.87 (D) 4.0

45. Jhan-Teller effect is observed in octahedral complexes of

(A) Zn (B) Al (C) Cu (D) Co

46. CFSE for square planar and octahedral complexes are related as

(A) $\Delta_{SP} = \frac{1}{2}\Delta_0$ (B) $\Delta_{SP} = 1.3\Delta_0$ (C) $\Delta_{SP} = 0.6\Delta_0$ (D) $\Delta_{SP} = \frac{2}{3}\Delta_0$

47. Among $[Ni(Co)_4]$, $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$

(A) $[Ni(Co)_4]$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic

(B) $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[Ni(Co)_4]$ is paramagnetic

(C) $[Ni(Co)_4]$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic

(D) $[Ni(Co)_4]$ is diamagnetic and $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ are paramagnetic

(*Continued*)

48. Which of the following are hard or soft acids Cu^+, Na^+, Ag^+, Pt^{2+}

(A) Cu^+ and Ag^+ - hard acid
Na^+ and Ag^{2+} - hard acid

(B) Cu^+ and Pt^{2+} - soft acid
Na^+ and Pt^{2+} - soft acid

(C) Cu^+, Ag^{2+}, Pt^{2+} - soft acid
Na^+ - hard acid

(D) All are soft acids

49. The order of increasing acid strength of following acid is HPO_3, HNO_3, $HAsO_3$

(A) $HAsO_3 < HPO_3 < HNO_3$

(B) $HNO_3 < HPO_3 < HAsO_3$

(C) $HPO_3 < HAsO_3 < HNO_3$

(D) $HAsO_3 < HNO_3 < HPO_3$

50. Structure and hybridisation of I_3

(A) Tetrahedral, sp^2 hybridisation

(B) Linear, dsp^3 hybridisation

(C) Planar, sp^2

(D) Square planar, dsp^2

51. Which forms interstitial compound ?

(A) Fe (B) Co (C) Ni (D) All

52. In 3*d* transition series with increase of nuclear charge , the screen effect

(A) increases

(B) decreases

(C) first decreases and then increases

(D) first increases and then decreases

53. Which of the oxides is amphoteric in nature

(A) CrO (B) Cr_2O_3 (C) CrO_3 (D) CrO_5

54. The ratio of radii of first orbitals of H, He^+ , Li^{2+} is

(A) 1:2:3 (B) 6: 3: 2 (C) 1: 4: 9 (D) 9: 4: 1

55. What is the energy in eV required to excite the electron from $n = 1$ to $n = 2$ state in hydrogen atom

(A) 13.6 (B) 3.4 (C) 17 (D) 10.2

56. If the first ionisation energy of hydrogen is E , then ionisation energy of He^+ would be

(A) E (B) $2E$ (C) $0.5E$ (D) $4E$

57. The number of spectral lines that are possible when electron in 7th shell in different hydrogen atoms return to the 2nd shell is

(A) 12 (B) 15 (C) 14 (D) 10

58. Bond order of O_2, O_2^+ , O_2^- is

(A) $O_2 > O_2^- > O_2^+$ (B) $O_2^- > O_2 > O_2^+$

(C) $O_2^+ > O_2 > O_2^-$ (D) $O_2^+ > O_2^- > O_2$

59. Shape of CLF_3 is

(A) Planar (B) Tetrahedral (C) T- shape (D) Pyramidal

60. Term symbol for electronic state of the molecules O_2 and O_2^+ are

(A) $^3\Sigma_g^-$, $^2\pi_g$ (B) $^1\Sigma_g^+$, $^2\pi_g$ (C) $^2\Sigma_g^+$, $2\pi_u$ (D) $3\Sigma_g^+$, $2\pi_g$

(Continued)

61. In carbonyl compound the increase in polarity of a solvent shifts the following transitions to shorter wavelength

(A) $n \rightarrow \pi^*$ (B) $\pi \rightarrow \pi^*$ (C) $n \rightarrow \sigma^*$ (D) $\sigma \rightarrow \sigma^*$

62. Ultraviolet spectroscopy is used for the detection of

(A) functional group (B) extent of conjugation

(C) geometrical isomers (D) All of these

63. For CO_2 molecule , the number of modes of vibrations are

(A) 3 (B) 5 (C) 4 (D) 6

64. Which of the following solvents cannot be used in NMR spectroscopy

(A) CCl_4 (B) CS_2 (C) $CHCl_3$ (D) $(CCl_3)C=O$

65. NMR spectra is observed in the region:

(A) radiofrequency (B) microwave

(C) UV/Vis (D) X-ray

66. The NMR spectroscopy is used for detection of

(A) Hydrogen bonding (B) aromaticity

(C) geometrical isomers (D) All of these

67. The number of double bonds present in compound $C_3H_8O_3$

(A) 2 (B) 4 (C) 0 (D) 3

68. Following peaks were obtained in mass spectrum of an organic compound m/e values at 88, 73, 60(M*), 45
The organic compound should be

(A) $CH_3CH_2COOCH_3$ (B) $CH_3COOCH_2CH_3$

(C) $CH_3CH_2CH_2COOH$ (D) None of these

69. McLafferty rearrangement ion peak in mass spectrum is usually the basic peak for

(A) aldehyde (B) ketone

(C) acids(straight chain) (D) All of these

70. In mass spectra of straight chain hydrocarbon

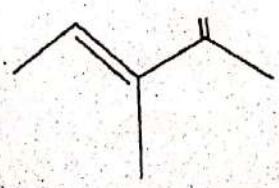
(A) Peaks are observed at 14 mass unit apart

(B) peaks at 43 and 57 are most intense

(C) abundance of parent peak decreases with increase in molecular mass

(D) All of these

71. In UV spectra λ_{max} of the compound



(A) 247 nm (B) 226 nm (C) 237 nm (D) 262 nm

(Continued)

72. Porphyrins are

(A) Bidentate (B) Tridentate (C) Tetradentate (D) hexadentate

73. Which of the following is not an electroanalytical technique

(A) Ion exchange chromatography (B) Electro-gravimetry

(C) Polarography (D) Coulometry

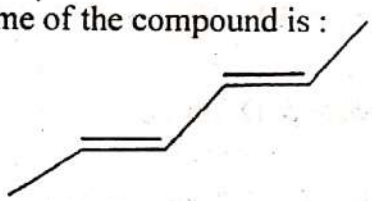
74. Which of the following iron complex is involved in electron transfer in plants and bacteria

(A) myoglobin (B) ferredoxin (C) ferritin (D) transferin

75. The pH of 60% ionized 0.01 N acid solution is

(A) 0.222 (B) 0.444 (C) 2.22 (D) 4.44

76. The name of the compound is :



(A) (2Z, 4Z) -2, 4-hexadiene (B) (2Z, 4E)-2, 4- hexadiene

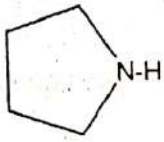
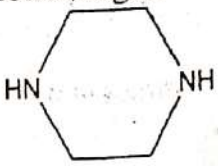
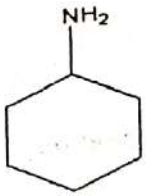
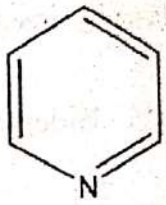
(C) (2E, 4Z)-2, 4-hexadiene (D) (2E, 4E) -2, 4- hexadiene

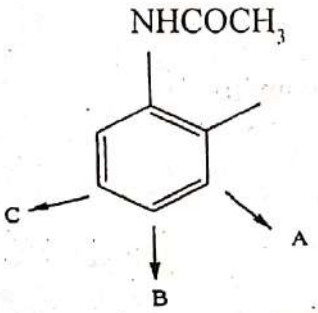
77. Flagpole interaction is present in

(A) Boat form of cyclohexane (B) Chair form of cyclohexane

(C) Anti form of *n*-butane (D) Fully eclipsed form of *n*-butane

78. Weakest base among the following is

(A)  (B)  (C)  (D) 

79. 

Identify the position where eletrophilic aromatic substitution (EAS) is most favourable

(A) A (B) B (C) C (D) A and C

80. Which of the following pair gives same phenyl osazone ?

(A) D-Glucose & D-Allose (B) D-Glucose & D-Alfrose

(C) D-Glucose & D-mannose (D) D-Glucose & D-Talose

81. An alkene having molecular formula C_9H_{18} on ozonolysis gives 2,2-dimethyl propanal and 2-butaneone. The alkene is :

(A) 2, 2, 4-trimethyl-3-hexene (B) 2, 2, 6-trimethyl-3-hexene

(C) 2, 3, 4-trimethyl-2-hexene (D) 2, 2, 4-trimethyl-2-hexene

82. Compund (X) gives very unpleasant odour with $CHCL_3$ /alc. KOH. (X) is

(A) $C_6H_5NHCH_3$ (B) $C_6H_5CONH_2$ (C) $C_6H_5NH_2$ (D) $C_6H_5NHC_2H_5$

(Continued)

83. Osmium tetroxide is a reagent used for

(A) Hydroxylation of acetylene

(B) Hydroxylation of Olefins to give cis -Diols

(C) Hydroxylation of Olefins to give trans -Diols

(D) Hydroxylation of carbonyl compounds

84. Oxymercuration demercuration reaction of 1-methyl cyclohexene gives

(A) cis-2- methyl cyclohexanol

(B) trans-2- methyl cyclohexanol

(C) 1 -methyl cyclohexanol

(D) Mixture of cis & trans-2- methyl cyclohexanol

85. In the reaction sequence

$$\text{Glycerol} \xrightarrow[\Delta]{KHSO_4} X \xrightarrow[\Delta]{\text{Zn-Hg/conc. HCL}} Y \xrightarrow[CCl_4]{\text{NBS}} Z$$

z will be

(A) 1-bromopropane

(B) 2-bromopropane

(C) 3-bromopropane

(D) 1, 2- dibromopropane

86. Cinnamic acid is β-phenyl-α, β-unsaturated acId .This acid can be prepared from Perkin reaction by

(A) C_6H_5CHO (B) CH_3COOH

(C) C_6H_5CHO & CH_3COOH (D) C_6H_5CHO & AC_2O

87. In which reaction product is hydrocarbon

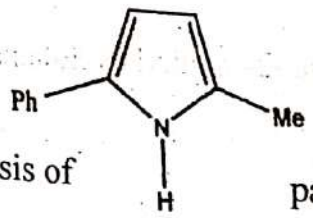
(A) $RCOOK \xrightarrow{\text{Electrolysis}}$ (B) $RCOOAg \xrightarrow{I_2/\Delta}$

(C) $CH_3{-}CH_3 \xrightarrow{Cl_2/hv}$ (D) $CH_3 - C(CH_3)_2{-}Cl \xrightarrow{C_2H_5OH}$

88. An organic compound (A) on reduction gives compound (B). (B) on treatment with $CHCl_3$ and alcoholic KOH gives (C). (C) on catalytic reduction gives N-methylaniline .The compound (A) is

(A) Methyl amine (B) Nitromethane (C) Aniline (D) Nitrobenzene

89. Predict the starting material for the synthesis of



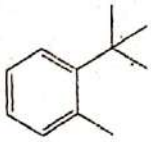
paal -knorr synthesis

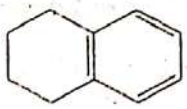
(A) $PhCOCH_2CH_2COCH_3 + NH_3$ (B) $CH_3COCH_2CH_2COCH_3 + CH_3NH_2$

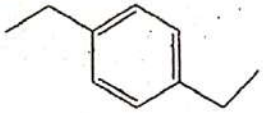
(C) $PhCOCH_2CH(CH_3)\text{-}COPh + NH_3$ (D) $CH_3COCH_3 + PhNH_2$

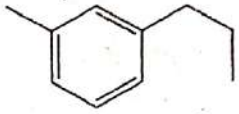
(Continued)

90. Which of the following compounds form ortho benzene dicarboxylic acid when oxidised by hot aqueous potassium permanganate ?

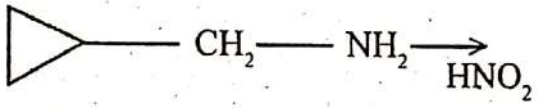
(A) 

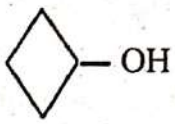
(B) 

(C) 

(D) 

91.



A + 

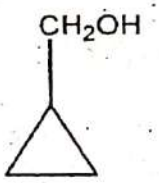
+

$CH_2 = CHCH_2CH_2OH$

48% 47%

Then A will be

(A) $CH_2=CHCH_2CH_2OHM$

(B) 

(C) 

(D) 

92. Consider the following sequence of the reaction :

Glucose $\xrightarrow{PhNHNH_2 \text{ (excess)}}$ **A** $\xrightarrow{H_3O^+ \text{/heat}}$ **B** $\xrightarrow{Zn/AcOH}$ **C**

The product C is expected to be

(A) arabinose (B) fructose (C) sorbitol (D) mannose

93. Monomer of natural rubber is:

(A) 1, 3-butadiene (B) 2-methyl-1,3-butadiene

(C) 1,2-butadiene (D) 1, 3-pentadiene

94. Polymer used in bullet proof glass is :

(A) PMMA (B) Lexane (C) Nomex (D) Kelvar

95. α-Tocophenol is found in

(A) Vegetable oils (B) Lemon (C) Peanuts (D) Tomatoes

96. A pigment protein in animal is

(A) Chlorophyll (B) Carotenoid (C) Haemoglobin (D) Blood

97. Which of the following molecule is capable of forming Zwitter ion

(A) $CH_3CHOH-NH_2$ (B) H_2NCH_2COOH

(C) CH_3COOH (D) CCl_3-NO_2

98. Violet colour is obtained when dil $CuSO_4$ is added in an alkaline solution of protein .The test is known as

(A) Biuret (B) Xanthoproteic test

(C) Hopkin kole (D) Mitton's test

99. In which of the following compounds percentage of nitrogen can't be estimated accurately by Kjeldath's method

(A) Urea (B) Phenylhydrazine (C) Nitrobenzene (D) Gaunide

100. The substance used in the preparation of malachite green is :

(A) HCHO (B) CH_3CHO (C) C_6H_5CHO (D) CH_3COCH_3
