46. An example of a disproportionation reaction is

(a) $2MnO_4^- + 10I^- + 16H^+ \longrightarrow 2Mn^{2+} + 5I_2 + 8H_2O$

(b) $2NaBr + Cl_2 \longrightarrow 2NaCl + Br_2$

(c) $2KMnO_4 \longrightarrow K_2MnO_4 + MnO_2 + O_2$

(d) $2CuBr \longrightarrow CuBr_2 + Cu$

47. The ratio of mass per cent of C and H of an organic compound ($C_xH_yO_z$) is 6 : 1. If one molecule of the above compound ($C_xH_yO_z$) contains half as much oxygen as required to burn one molecule of compound C_xH_y completely to CO_2 and H_2O. The empirical formula of compound $C_xH_yO_z$ is

(a) $C_3H_6O_3$ (b) C_2H_4O (c) $C_3H_4O_2$ (d) $C_2H_4O_3$

48. The isoelectronic set of ions is

(a) F^-, Li^+, Na^+ and Mg^{2+}

(b) N^{3-}, Li^+, Mg^{2+} and O^{2-}

(c) Li^+, Na^+, O^{2-} and F^-

(d) N^{3-}, O^{2-}, F^- and Na^+

49 The correct statements among I to III are :

I. Valence bond theory cannot explain the color exhibited by transition metal complexes.

II. Valence bond theory can predict quantitatively the magnetic properties of transition metal complexes.

III. Valence bond theory cannot distinguish ligands as weak and strong field ones.

(a) II and III only

(b) I, II and III

(c) I and II only

(d) I and III only

50. During the change of O_2 to O_2^-, the incoming electron goes to the orbital.

(a) $\pi 2p_x$ (b) $\pi^* 2p_x$ (c) $\pi 2p_y$ (d) $\sigma^* 2p_z$

51. The pH of a 0.02 M NH_4Cl solution will be [Given $K_b(NH_4OH) = 10^{-5}$ and $\log 2 = 0.301$]

(a) 4.65 (b) 2.65 (c) 5.35 (d) 4.35

52. Which of the following solutions will have pH close to 1.0 ?

(a) 100 mL of (M/10) HCl + 100 mL of (M/10) NaOH

(b) 55 mL of (M/10) HCl + 45 mL of (M/10) NaOH

(c) 10 mL of (M/10) HCl + 90 mL of (M/10) NaOH

(d) 75 mL of (M/5) HCl + 25 mL of (M/5) NaOH

53. An ideal gas is allowed to expand from 1 L to 10 L against a constant external pressure of 1 bar. The work done in kJ is

(a) – 9.0 (b) + 10.0 (c) – 0.9 (d) – 2.0

54. The reaction, $MgO(s) + C(s) \rightarrow Mg(s) + CO(g)$, for which $\Delta_r H^\circ = +491.1$ kJ mol^{-1} and $\Delta_r S^\circ = 198.0$ JK^{-1}mol^{-1}, is not feasible at 298 K. Temperature above which reaction will be feasible is

(a) 2040.5 K (b) 1890.0 K

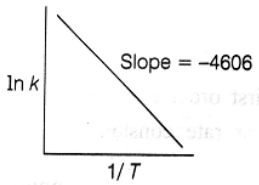
(c) 2380.5 K (d) 2480.3 K

55. One mole of an ideal gas at 300 K in thermal contact with surroundings expands isothermally from 1.0 L to 2.0 L against a constant pressure of 3.0 atm.

In this process, the change in entropy of surroundings (ΔS_{surr}) in JK^{-1} is (1 L atm = 101.3 J)

(a) 5.763 (b) 1.013 (c) – 1.013 (d) – 5.763

56. For a reaction, consider the plot of ln k *versus* $1/T$ given in the figure. If the rate constant of this reaction at 400 K is 10^{-5} s^{-1}, then the rate constant at 500 K is



(a) 4×10^{-4} s^{-1} (b) 10^{-6} s^{-1}

(c) 10^{-4} s^{-1} (d) 2×10^{-4} s^{-1}

57. Decomposition of H_2O_2 follows a first order reaction. In 50 min, the concentration of H_2O_2 decreases from 0.5 to 0.125 M in one such decomposition. When the concentration of H_2O_2 reaches 0.05 M, the rate of formation of O_2 will be

(a) 6.93×10^{-4} mol min^{-1} (b) 2.66 L min^{-1} at STP

(c) 1.34×10^{-2} mol min^{-1} (d) 6.93×10^{-2} mol min^{-1}

58. (A) follows first order reaction, $(A) \rightarrow$ product. Concentration of A, changes from 0.1 M to 0.025 M in 40 min. Find the rate of reaction of A when concentration of A is 0.01 M.

(a) 3.47×10^{-4} M min^{-1} (b) 3.47×10^{-5} M min^{-1}

(c) 1.73×10^{-4} M min^{-1} (d) 1.73×10^{-5} M min^{-1}

59. The following statement (s) is in correct

(a) A plot of log K_p *vs* $\frac{1}{T}$ is linear

(b) A plot of log $[X]$ *vs* time is linear for a first order reaction, $x \rightarrow p$

(c) none

(d) A plot of p *vs* $\frac{1}{V}$ is linear at constant temperature

60. Among the following, the incorrect statement about colloids is

(a) They can scatter light

(b) They are larger than small molecules and have high molar mass

(c) The osmotic pressure of a colloidal solution is of higher order than the true solution at the same concentration

(d) The range of diameters of colloidal particles is between 1 and 1000 nm

61. The correct order of catenation is

(a) C > Sn > Si ≈ Ge (b) Si > Sn > C > Ge

(c) C > Si > Ge ≈ Sn (d) Ge > Sn > Si > C

62. Thermal decomposition of a Mn compound (X) at 513 K results in compound (Y), MnO_2 and a gaseous product. MnO_2 reacts with NaCl and concentrated H_2SO_4 to give a pungent gas Z. X, Y and Z, respectively, are

(a) K_3MnO_4, K_2MnO_4 and Cl_2 (b) K_2MnO_4, $KMnO_4$ and SO_2

(c) $KMnO_4$, K_2MnO_4 and Cl_2 (d) K_2MnO_4, $KMnO_4$ and Cl_2

63. Which of the following combination will produce H_2 gas?

(a) Fe metal and conc. HNO_3

(b) Cu metal and conc. HNO_3

(c) Au metal and NaCN (aq) in the presence of air

(d) Zn metal and NaOH (aq)

64 . Zinc-copper couple that can be used as a reducing agent is obtained by
(a) mixing of zinc dust and copper gauge
(b) zinc coated with copper
(c) copper coated with zinc
(d) zinc and copper wires welded together

65 . The coordination numbers of Co and Al in $[CoCl(en)_2]Cl$ and $K_3[Al(C_2O_4)_3]$, respectively, are (en = ethane-1, 2-diamine)
(a) 5 and 3 (b) 3 and 3 (c) 6 and 6 (d) 5 and 6

66 . Geometrical shapes of the complexes formed by the reaction of Ni^{2+} with Cl^-, CN^- and H_2O, respectively, are
(a) octahedral, tetrahedral and square planar
(b) tetrahedral, square planar and octahedral
(c) square planar, tetrahedral and octahedral
(d) octahedral, square planar and octahedral

67 . Among the following complexes *(K-P)*,
$K_3[Fe(CN)_6]$ (K), $[Co(NH_3)_6]Cl_3$ (L),
$Na_3[Co(ox)_3]$ (M), $[Ni(H_2O)_6]Cl_2$ (N),
$K_2[Pt(CN)_4]$ (O), $[Zn(H_2O)_6](NO_3)_2$ (P)
the diamagnetic complexes are
(a) *K, L, M, N* (b) *K, M, O, P*
(c) *L, M, O, P* (d) *L, M, N, O*

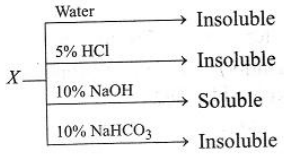
68 . The incorrect option(s) regarding the complex $[Co(en)(NH_3)_3(H_2O)]^{3+}$ (en = $H_2NCH_2CH_2NH_2$) is (are)
(a) It has two geometrical isomers
(b) It will have three geometrical isomers, if bidentate 'en' is replaced by two cyanide ligands
(c) It is paramagnetic
(d) It absorbs light at longer wavelength as compared to $[Co(en)(NH_3)_4]^{3+}$

69 . The correct statement is
(a) leaching of bauxite using concentrated NaOH solution gives sodium aluminate and sodium silicate.
(b) the hall-heroult process is used for the production of aluminium and iron.
(c) pig iron is obtained from cast iron.
(d) the blistered appearance of copper during the metallurgical process is due to the evolution of CO_2.

70 . The electrolytes usually used in the electroplating of gold and silver, respectively, are
(a) $[Au(OH)_4]^-$ and $[Ag(OH)_2]^-$
(b) $[Au(NH_3)_2]^+$ and $[Ag(CN)_2]^-$
(c) $[Au(CN)_2]^-$ and $[Ag(CN)_2]^-$
(d) $[Au(CN)_2]^-$ and $[AgCl_2]^-$

71 . Anhydrous ferric chloride is prepared by
(a) heating hydrated ferric chloride at a high temperature in a stream of air
(b) heating metallic iron in a stream of dry chlorine gas
(c) reaction of ferric oxide with hydrochloric acid
(d) reaction of metallic iron with hydrochloric acid

72 . An organic compound X showing the following solubility profile is

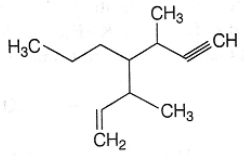


(a) *o*-toluidine (b) oleic acid
(c) *m*-cresol (d) benzamide

73 . A gas X is passed through water to form a saturated solution. The aqueous solution on treatment with silver nitrate gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas Y. Identify X and Y.
(a) $X = CO_2, Y = Cl_2$ (b) $X = Cl_2, Y = CO_2$
(c) $X = Cl_2, Y = H_2$ (d) $X = H_2, Y = Cl_2$

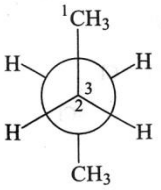
74 . The reagents, NH_4Cl and aqueous NH_3 will precipitate
(a) Ca^{2+} (b) Al^{3+} (c) Bi^{3+} (d) Mg^{2+}

75 . The IUPAC name for the following compound is



(a) 3-methyl-4-(3-methylprop-1-enyl)-1-heptyne
(b) 3, 5-dimethyl-4-propylhept-6-en-1-yne
(c) 3-methyl-4-(1-methylprop-2-ynyl)-1-heptene
(d) 3, 5-dimethyl-4-propylhept-1-en-6-yne

76 .



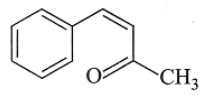
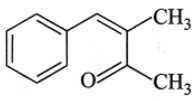
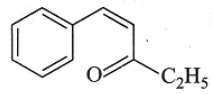
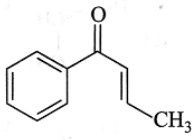
C_2 is rotated anti-clockwise 120° about C_2-C_3 bond. The resulting conformer is
(a) partially eclipsed (b) eclipsed
(c) gauche (d) staggered

77 . The correct statement(s) about the compound $H_3C(HO)HC—CH=CH—CH(OH)CH_3$ (X) is/are
(a) The total number of stereoisomers possible for X is 6
(b) The total number of diastereomers possible for X is 3
(c) If the stereochemistry about the double bond in X is *trans*, the number of enantiomers possible for X is 4
(d) none

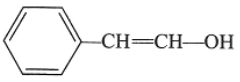
78 A carbonyl compound P, which gives positive iodoform test, undergoes reaction with MeMgBr followed by dehydration to give an olefin Q. Ozonolysis of Q leads to a dicarbonyl compound R, which undergoes intramolecular aldol reaction to give predominantly S.

$$P \xrightarrow[2.\ H^+,\ H_2O\ \ 3.\ H_2SO_4\ /\ heat]{1.\ MeMgBr} Q \xrightarrow{O_3/Zn\text{-}H_2O} R \xrightarrow[heat]{OH^-} S$$

79 . The structure of the carbonyl compound *P*, is

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

80 . Tautomerism is not exhibited by

(a) 
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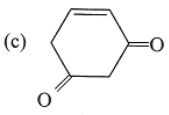
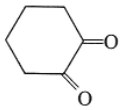
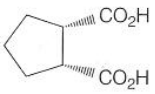
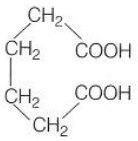
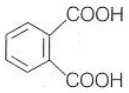
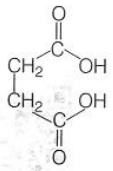
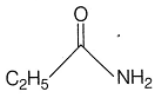
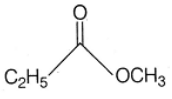
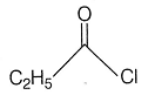
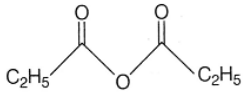
(c) 
(d) 

81 Which dicarboxylic acid in presence of a dehydrating agent is least reactive to give an anhydride?

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

82 . When benzene sulphonic acid and *p*-nitrophenol are treated with $NaHCO_3$, the gases released respectively, are
(a) SO_2, NO_2 (b) SO_2, NO (c) SO_2, CO_2 (d) CO_2, CO_2

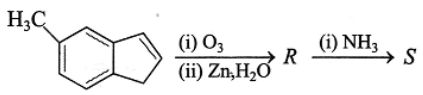
83 . The increasing order of the reactivity of the following with $LiAlH_4$ is

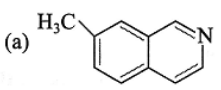
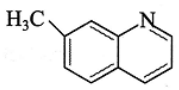
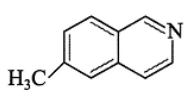
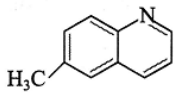
(A) 
(B) 
(C) 
(D) 

(a) $(A) < (B) < (D) < (C)$
(b) $(A) < (B) < (C) < (D)$
(c) $(B) < (A) < (D) < (C)$
(d) $(B) < (A) < (C) < (D)$

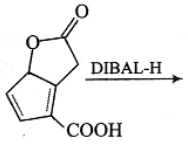
84 . Considering the basic strength of amines in aqueous solution, which one has the smallest pK_b value?
(a) $(CH_3)_2NH$ (b) CH_3NH_2
(c) $(CH_3)_3N$ (d) $C_6H_5NH_2$

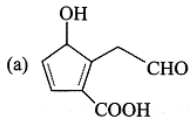
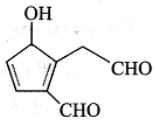
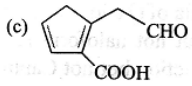
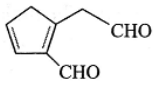
85 . In the following reactions, the product *S* is



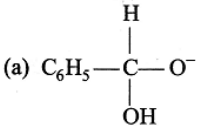
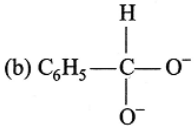
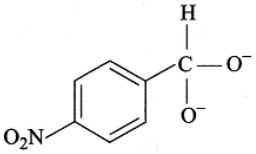
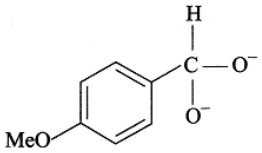
(a) 
(b) 
(c) 
(d) 

86 . The major product obtained in the following reaction is



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

87 . In Cannizzaro's reaction, the intermediate which is the best hydride donor is

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

88 . Which of the given statements is incorrect about glycogen?

(a) It is straight chain polymer similar to amylose
(b) Only α-linkages are present in the molecule
(c) It is present in animal cells
(d) It is present in some yeast and fungi

89 . Which of the following tests cannot be used for identifying amino acids ?
(a) Barfoed test (b) Ninhydrin test
(c) Xanthoproteic test (d) Biuret test

90 . The primary pollutant that leads to photochemical smog is

(a) acrolein (b) nitrogen oxides
(c) ozone (d) sulphur dioxide