

CHEMISTRY

46. Match List I with List II :

List I

(Complex/ion)

- A. $[\text{Pt}(\text{Cl}_2)(\text{NH}_3)_2]$
B. $[\text{CO}(\text{NH}_3)_6]\text{Cl}_3$
C. $[\text{NiCl}_4]^{2-}$
D. $[\text{Fe}(\text{CO})_5]$

List-II

(Shape/geometry)

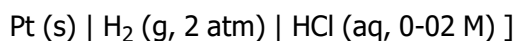
- I. Octahedral
II. Trigonal bipyramidal
III. Square planar
IV. Tetrahedral

Choose the correct answer from the options given below :

- (1) A-I, B-III, C-IV, D-II (2) A-III, B-IV, C-I, D-II
(3) A-III, B-I, C-IV, D-II (4) A-IV, B-I, C-III, D-II

Ans. (3)

47. Calculate emf of the half cell given below :



$E_{\text{H}_2/\text{H}^+}^0 = 0 \text{ V}$

(Given $\frac{2.303RT}{F} = 0.059$)

$\log 2 = 0.3010$)

- (1) -0.109 V (2) 0.109 V (3) 0.035 V (4) -0.035 V

Ans. (2)

48. At 298 K, a certain buffer solution contains equal concentrations of X^- and HX , K_b for X^- is 10^{-10} . What is the pH of this buffer solution ?

- (1) 10 (2) 4 (3) 2 (4) 6

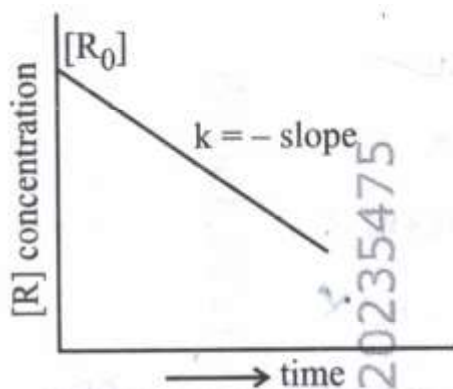
Ans. (2)

49. Given below are certain reactions identify the reaction for which $K_p \neq K_c$.

- (1) $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$ (2) $\text{H}_2\text{O}(\text{g}) + \text{CO}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{CO}_2(\text{g})$
(3) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ (4) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$

Ans. (3)

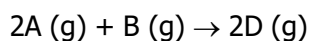
50. For a certain reaction $\text{R} \rightarrow \text{Product}$, the plot of concentration $[\text{R}]$ vs time has a negative slope as shown. The order of reaction is :



- (1) 1 (2) 2.5 (3) 2 (4) 0

Ans. (4)

51. Consider the following reaction



$$\Delta U^\ominus = -10 \text{ kJ mol}^{-1} \text{ and } \Delta S^\ominus = -44 \text{ J K}^{-1} \text{ at } 298 \text{ K.}$$

Identify the correct option with ΔG^\ominus for the reaction and spontaneity of the reaction at 298 K.

(Given : $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$)

- (1) $+0.63568 \text{ kJ mol}^{-1}$ non-spontaneous (2) $-0.63568 \text{ kJ mol}^{-1}$, spontaneous
(3) $-1.635 \text{ kJ mol}^{-1}$, spontaneous (4) $+1.635 \text{ kJ mol}^{-1}$, non-spontaneous

Ans. (1)

52. Given below is an expression for the rate constant of a first order reaction occurring at a certain temperature, T (K).

$$\ln k = 14.34 - \frac{1.25 \times 10^4}{T}$$

The energy of activation in kcal mol^{-1} for the reaction is :

(Given : k in s^{-1} , $R = 1.987 \text{ cal mol}^{-1} \text{ K}^{-1}$)

- (1) 12.42 (2) 18.63 (3) 14.34 (4) 24.84

Ans. (4)

53. Select the reagents that reduce nitriles to primary amines :

- A. (i) LiAlH_4 ; (ii) H_2O B. $\text{Sn} + \text{HCl}$ C. H_2/Ni D. $\text{Na}(\text{Hg})/\text{C}_2\text{H}_5\text{OH}$
E. $\text{Br}_2/\text{aq. NaOH}$

Choose the correct answer from the options given below:

- (1) A, B and C only (2) A, D and E only (3) A, C and D only (4) B, D and E only

Ans. (3)

54. The correct statement with regard to the secondary structure of DNA/RNA is'
- (1) DNA possesses a double strand helix structure and contains thymine as one of the four bases.
 - (2) DNA possesses a single strand helix structure and contains uracil as one of the four bases.
 - (3) RNA possesses a double strand helix structure and contains uracil as one of the four bases.
 - (4) RNA possesses a single strand helix structure and contains thymine as one of the four bases.

Ans. (1)

55. During Lassaigne's test, the elements present in an organic compound are converted from :

- (1) ionic form to ionic form
- (2) covalent form to ionic form
- (3) ionic form to covalent form
- (4) covalent form to covalent form

Ans. (2)

56. Mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law due to :

- (1) stronger intermolecular forces between chloroform molecules than those between chloroform and acetone molecules
- (2) formation of hydrogen bonding between acetone and chloroform
- (3) repulsive forces
- (4) increase in escaping tendency of molecules of each component.

Ans. (2)

57. In a test tube containing a salt, a few drops of dilute H_2SO_4 was added, which gave colourless vapours having the smell of vinegar. The vapours turned the blue litmus paper red. Identify the correct anion from the following:

- (1) Carbonate, CO_3^{2-}
- (2) Sulphide, S^{2-}
- (3) Acetate, CH_3COO^-
- (4) Sulphate, SO_4^{2-}

Ans. (3)

58. Identify the correct statement about ClF_3 from the following options

- (1) It has T-shaped geometry with three lone pairs on Cl atom
- (2) It has T-shaped geometry with two lone pairs on Cl atom
- (3) It has a trigonal pyramidal geometry with two lone pairs on Cl atom
- (4) It has a planar trigonal geometry with two lone pairs on Cl atom

Ans. (2)

59. Match List I with List II :

List I

(Complex)

- A. $[Pt(NH_3)_2Cl_2]$
- B. $[Co(en)_3]^{3+}$
- C. $[Co(NH_3)_5NO_2]Cl_2$
- D. $[Cr(H_2O)_6]Cl_3$

List II

(Type of isomerism)

- I. Optical
- II. Solvate
- III. Geometrical
- IV. Linkage

Choose the correct answer from the options given below :

(1) A-I, B-III, C-II, D-IV

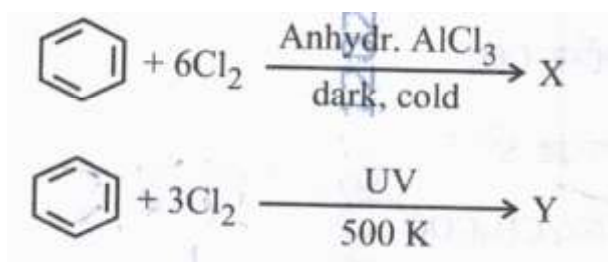
(2) A-II, B-IV, C-III, D-I

(3) A-III, B-I, C-IV, D-II

(4) A-III, B-I, C-II, D-IV

Ans. (3)

60. The number of chlorine atoms present in the organic products X and Y of the following reactions, respectively, are :



(1) 3 and 3

(2) 6 and 6

(3) 6 and 3

(4) 3 and 6

Ans. (2)

61. Identify the incorrect statement from the following

- (1) Phosphorus, arsenic and antimony show catenation property.
- (2) $\text{P}(\text{C}_2\text{H}_5)_3$ and $\text{As}(\text{C}_6\text{H}_5)_3$ form $d\pi-d\pi$ bond with transition metals.
- (3) Nitrogen can form $d\pi-d\pi$ bond with oxygen.
- (4) Nitrogen can form $d\pi-d\pi$ multiple bonds with itself

Ans. (3)

62. At a certain temperature, T (K), during a process, 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is :

(1) 700 J

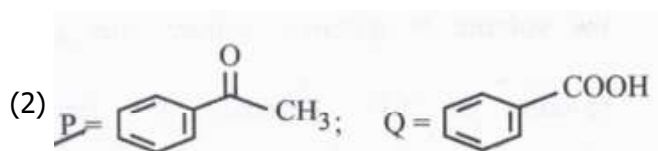
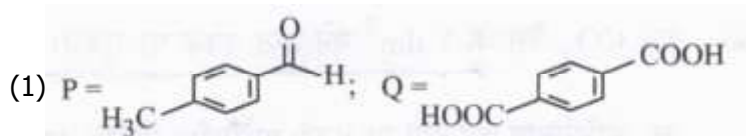
(2) 400 J

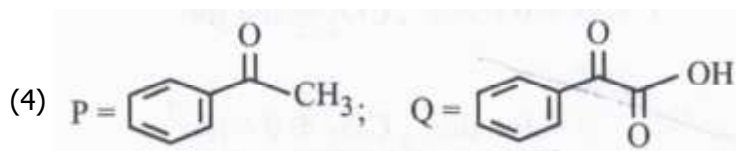
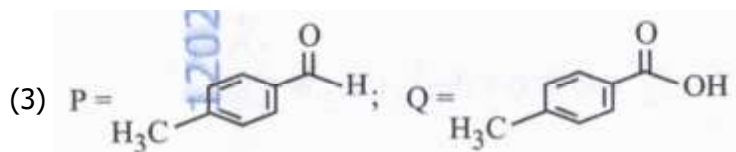
(3) 300 J

(4) 500 J

Ans. (3)

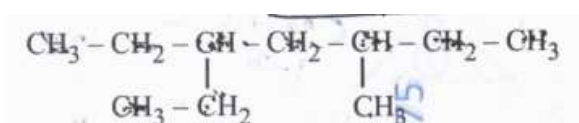
63. Compound P ($\text{C}_8\text{H}_8\text{O}$) gives a red orange precipitate with 2,4-DNP reagent and it does not reduce Fehling's reagent. On drastic oxidation with chromic acid, P gives an aromatic product Q that produces effervescence on treating with aq. NaHCO_3 . Compounds P and Q, respectively, are :





Ans. (2)

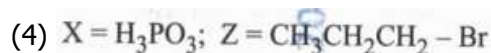
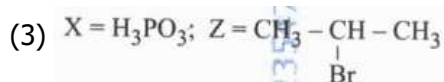
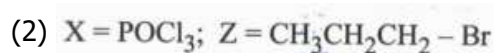
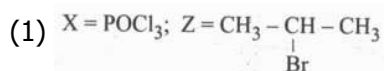
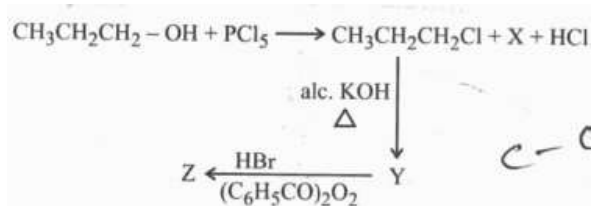
64. The correct IUPAC name of the following compound is :



(1) 3-ethyl-5-methylheptane (2) 3-methyl-5-ethylheptane (3) 2,4-diethylhexane (4) 3,5-diethylhexane

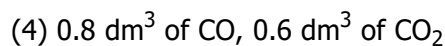
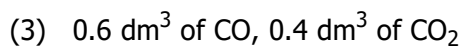
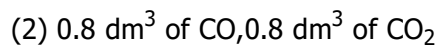
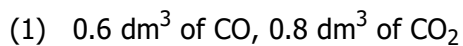
Ans. (1)

65. In the following reaction sequence, X and Z, respectively are :

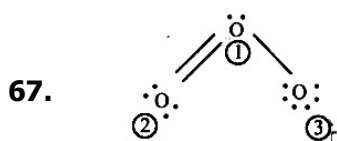


Ans. (2)

66. When 1 dm³ of CO₂ gas is passed over hot coke, the volume of gaseous mixture after complete reaction at STP becomes 1.4 dm³. The composition of the gaseous mixture at STP is :



Ans. (4)



The correct formal charges on oxygen atoms numbered 2, 1 and 3 respectively are :

- (1) 0, 0, 0 (2) -1, 0, +1 (3) +1, 0, -1 (4) 0, +1, -1

Ans. (4)

68. Match List I with List II :

List I

(Order of reaction)

- A. Zero order
B. First order
C. Second order
D. Third order

List-II

(Unit of rate constant)

- I. $\text{mol}^{-1} \text{L s}^{-1}$
II. $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$
III. s^{-1}
III. $\text{mol L}^{-1} \text{s}^{-1}$

Choose the correct answer from the options given below :

- (1) A-IV, B-III, C-II, D-I (2) A-IV, B-III, C-I, D-II (3) A-I, B-II, C-III, D-IV (4) A-IV, B-II, C-I, D-III

Ans. (2)

69. The correct order of increasing metallic character of Na, Be, P, Mg and Si is :

- (1) $\text{Be} < \text{Si} < \text{P} < \text{Mg} < \text{Na}$ (2) $\text{P} < \text{Si} < \text{Na} < \text{Mg} < \text{Be}$
(3) $\text{P} < \text{Si} < \text{Be} < \text{Mg} < \text{Na}$ (4) $\text{P} < \text{Mg} < \text{Be} < \text{Si} < \text{Na}$

Ans. (3)

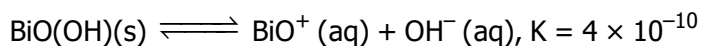
70. The number of hydrogen atoms present in 5.4 g of urea is :

(Given : Molar mass of urea : 60 g mol^{-1} , $N_A : 6.022 \times 10^{23} \text{ particles mol}^{-1}$)

- (1) 2.168×10^{22} (2) 2.168×10^{23} (3) 1.084×10^{22} (4) 1.084×10^{23}

Ans. (2)

71. In a qualitative analysis, Bi^{3+} is detected by appearance of precipitate of $\text{BiO(OH)}(\text{s})$. Calculate pH when the following equilibrium exists at 298 K :



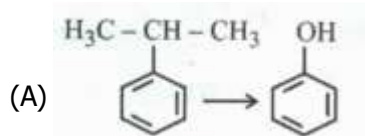
(Given : $\log 2 = 0.3010$)

- (1) 4.699 (2) 5.286 (3) 8.714 (4) 9.301

Ans. (4)

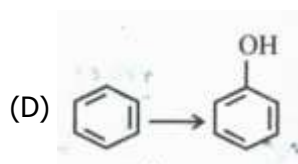
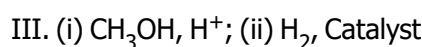
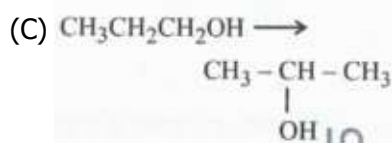
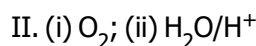
72. Match List-I with List-II

List-I



List-II

- I. (i) oleum; (ii) NaOH, Δ ; (iii) H^+



Choose the correct answer from the options given below :

- (1) A-I, B-III, C-IV, D-II (2) A-II, B-IV, C-III, D-I (3) A-II, B-III, C-IV, D-I (4) A-II, B-III, C-I, D-IV

Ans. (3)

73. A bulb is rated at 150 watt, converting 8% energy into light. If energy of one photon is 4.42×10^{-19} J, how many photons are emitted by the bulb per second ?

- (1) 27.2×10^{19} (2) 4.06×10^{19} (3) 1.35×10^{19} (4) 2.71×10^{19}

Ans. (4)

74. The pair of molecules that are metamers among the following is :

- (1) $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ and $\text{CH}_3 - \text{CH}(\text{OH}) - \text{CH}_3$

- (3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$

- (4) $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ and $\text{H}_3\text{C}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$

Ans. (1)

75. Identify the correct statements :

- A. The molality of 2.5 g of ethanoic acid (Molar mass : 60 g mol^{-1}) in 75 g of benzene solution is 0.556 m.
 B. The molarity of a solution containing 5 g of NaOH (molar mass : 40 g mol^{-1}) in 450 mL of solution is 0.278 M at 298 K.
 C. Aquatic species are more comfortable in cold water.
 D. The solubility of gas increases with decrease in pressure.
 E. For a binary mixture of A and B, the number of moles of A and B are n_A and n_B respectively. The mole

fraction of B will be $x_B = \frac{n_A}{n_A + n_B}$.

Choose the correct answer from the options given below :

- (1) A, B and C only (2) A, D and E only (3) A and B only (4) A and C only

Ans. (1)

76. Which one of the following is an ambidentate ligand ?

- (1) Oxalate (2) Ethane-1,2-diamine
(3) Thiocyanate (4) Ethylenediaminetetraacetate ion

Ans. (3)

77. The functional group that can be identify through phthalein dye test is

- (1) Carboxylic acid (2) Alcohol (3) Aldehyde (4) Phenolic

Ans. (4)

78. Match List-I with List-II

List-I

List-II

- (A) C_2H_4 I. 3σ bonds, 2π bonds
(B) C_2H_2 II. 3σ bonds, one lone pair
(C) CH_4 III. 4σ bonds
(D) NH_3 IV. 5σ bonds, 1π bonds

Choose the correct answer from the options given below :

- (1) A-IV,B-I,C-III,D-II (2) A-III,B-IV,C-II,D-I (3) A-II,B-III,C-I,D-IV (4) A-I,B-II,C-IV,D-III

Ans. (1)

79. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposited at cathode is :

(Given : Molar mass of Cu = 63 g mol^{-1} ;

$1 \text{ F} = 96487 \text{ C mol}^{-1}$)

- (1) 0.2938 g (2) 0.5876 g (3) 0.4036 g (4) 1.7018 g

Ans. (1)

80. Match List I with List II :

List-I

List-II

(Quantum Numbers)

(Orbital)

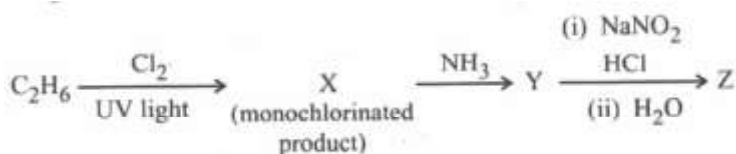
- | 'n' | 'l' | |
|------|-----|---------|
| A. 2 | 1 | I. 3d |
| B. 4 | 0 | II. 2p |
| C. 5 | 3 | III. 4s |
| D. 3 | 2 | IV. 5f |

Choose the correct answer from the options given below :

- (1) A-II, B-III, C-IV, D-I (2) A-I, B-II, C-III, D-IV
(3) A-II, B-III, C-I, D-IV (4) A-IV, B-II, C-III, D-I

Ans. (1)

81. The major product Z formed in the following sequence of reactions is



- (1) $\text{C}_2\text{H}_5\text{-N=N-OH}$ (2) $\text{C}_2\text{H}_5\text{OH}$ (3) $\text{C}_2\text{H}_5\text{NO}_2$ (4) $\text{C}_2\text{H}_5\text{NH}_2$

Ans. (2)

82. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because:

- (1) After losing one more electron, it acquires $4f^{14}$ electronic configuration.
 (2) Its nearest inert gas is Radon.
 (3) After losing one more electron, it acquires $4f^0$ electronic configuration
 (4) Its atomic number is 61

Ans. (3)

83. Methane reacts with steam at 1273 K in the presence of nickel catalyst to form :

- (1) CO and H_2 (2) CO and H_2O (3) CO_2 and H_2 (4) CO_2 and H_2O

Ans. (1)

84. Identify the incorrect statement from the following :

- (1) Oxygen exhibits only- 2 oxidation state.
 (2) The order of catenation property of Group 14 elements is $\text{C} \gg \text{Si} > \text{Ge} \sim \text{Sn}$.
 (3) Carbon has the ability to form $p\pi-p\pi$ multiple bond with itself.
 (4) ECl_3 (E = B and Al) is a monomer when E = B and a dimer when E = Al.

Ans. (1)

85. Phenolphthalein is used as an indicator for the titration of sodium hydroxide solution against a standard solution of oxalic acid. The colour change that is observed at an alkaline pH close to the equivalence point during this titration is:

- (1) pink to colourless (2) pinkish red to yellow (3) colourless to pink (4) yellow to pinkish red

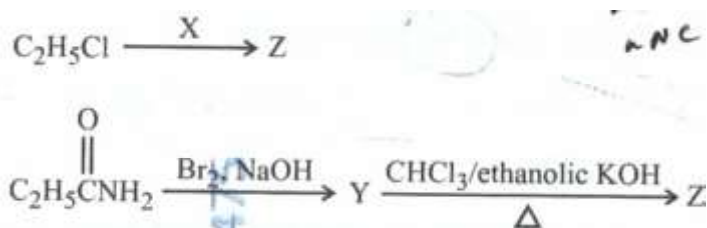
Ans. (3)

86. Identify the incorrect statement from the following :

- (1) The largest and the smallest species among Mg, Mg^{2+} , Al and Al^{3+} are Al and Mg^{2+} , respectively
 (2) The IUPAC name of the element with atomic number 107 is Unnilseptium.
 (3) The similarity in behaviour of Li with Mg is referred to as 'diagonal relationship'.
 (4) The oxidation state and covalency of Al in $[\text{AlCl}(\text{H}_2\text{O})_5]^{2+}$ are 3 and 6 respectively.

Ans. (1)

87. The following two reactions give the same foul smelling product Z



X and Z respectively are

- (1) X = AgCN; Z = C₂H₅CN (2) X = AgCN; Z = C₂H₅NC
(3) X = KCN; Z = C₂H₅CN (4) X = KCN; Z = C₂H₅NC

Ans. (2)

88. The calculated 'spin-only' magnetic moment of Ti²⁺(3d²) is :

- (1) 3.87 BM (2) 4.90 BM (3) 2.84 MB (4) 5.92 Bm

Ans. (3)

89. Match List I with List II :

List I

(Transition metal/ compound/complex)

- A. V₂O₅
B. Fe
C. PdCl₂
D. Ni complex

List-II

(Catalytic Role)

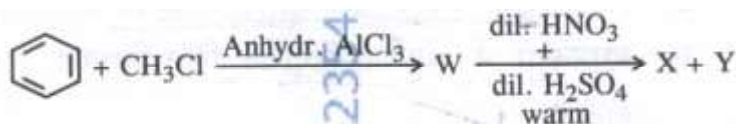
- I. Preparation of ammonia from N₂/H₂ mixture
II. Polymerisation of alkynes
III. Preparation of H₂SO₄ from SO₂
IV. Oxidation of ethyne to ethanal

Choose the correct answer from the options given below "

- (1) A-III, B-IV, C-I, D-II (2) A-III, B-I, C-IV, D-II
(3) A-II, B-I, C-IV, D-III (4) A-IV, B-I, C-III, D-II

Ans. (2)

90. Two products X and Y are formed in the following reaction sequence



The suitable method that can be used for the separation of products X and Y is

- (1) Continuous extraction (2) Differential extraction (3) Sublimation (4) Fractional distillation

Ans. (4)