Chemistry

Single correct answer type:

41. Schottky defect in crystals is observed when

(A) Unequal number of cations and anions are missing from the lattice

(B) Equal number of cations and anions are missing from the lattice

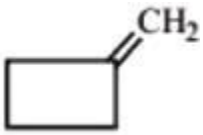
(C) An ion leaves its normal site and occupies an interstitial site

(D) Density of the crystal is increased

Solution: (B)

42. The cyclobutyl methylamine with nitrous acid gives

(A)



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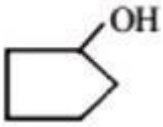

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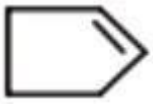


(D) All of these

Solution: (D)

43. The exothermic formation of ClF_3 is represented by the equation:

$Cl_{2(g)} + 3F_{2(g)} \rightleftharpoons 2ClF_{3(g)}$; $\Delta H = -329\ kJ$

Which of the following will increase the quantity of ClF_3 in an equilibrium mixture of Cl_2, F_2 and ClF_3?

(A) Adding F_2

(B) Increasing the volume of the container

(C) Removing Cl_2

(D) Increasing the temperature

Solution: (A)

44. For the reaction

$2NO_{2(g)} \rightleftharpoons 2NO_{(g)} + O_{2(g)}$,

$(K_c = 1.8 \times 10^{-6}\ at\ 184^oC)\ (R = 0.0831\ kJ/mol.K)$

When K_p and K_c are compared at 184^oC, it is found that

(A) Whether K_p is greater than, less than or equal to K_c depends upon the total gas pressure

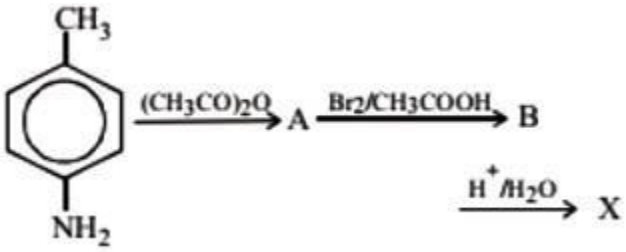
(B) $K_p = K_c$

(C) K_p is less than K_c

(D) K_p is greater than K_c

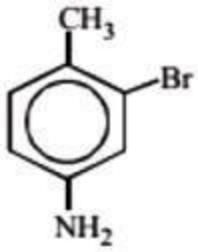
Solution: (D)

45.45.



What is X?

(A)



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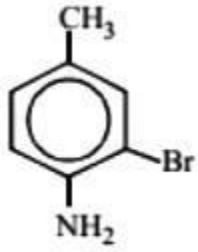

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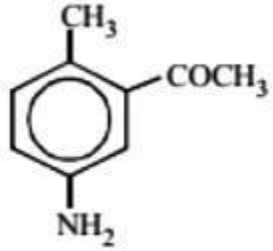
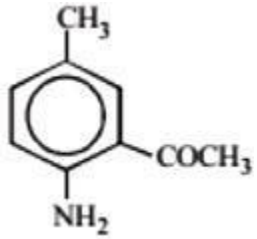
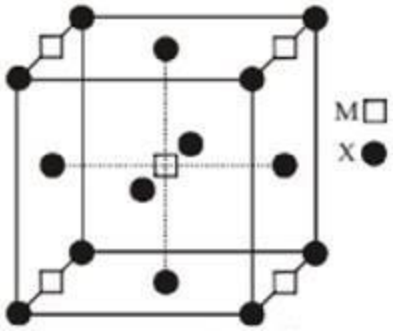


(D)



Solution: (B)

46. A compound M_pX_q has cubic close packing (ccp) arrangement of X. Its unit cell structure is shown below. The empirical formula of the compound is



(A) MX (B) MX_2 (C) M_2X (D) M_5X_{14}

Solution: (B)

47. What is Z is the following sequence of reactions?

<math> <mrow> <mtext>Phenol</mtext> <mover accent="true"> <mrow> <munder accentunder="true"> <mo>→</mo> <mtext>dust</mtext> </munder> </mrow> <mtext>Zn</mtext> </mover> <mtext>X</mtext> <mover accent="true"> <mrow> <munder accentunder="true"> <mo>→</mo> <msub> <mtext>Anhyd. AlCl</mtext> <mn>3</mn> </msub> </munder> </mrow> <mrow> <msub> <mtext>CH</mtext> <mn>3</mn> </msub> <mtext>Cl</mtext> </mrow> </mover> <mtext>Y</mtext> <mover accent="true"> <mrow> <munder accentunder="true"> <mo>→</mo> <msub> <mtext>KMnO</mtext> <mn>4</mn> </msub> </munder> </mrow> <mtext>Alkaline</mtext> </mover> <mtext>Z</mtext> </mrow> </math>

(A) Benzene (B) Toluene

(C) Benzaldehyde (D) Benzoic acid

Solution: (C)

48. Which of the following oxy-acids has the maximum number of hydrogens directly attached to phosphorus?

(A) $H_4P_2O_7$ (B) H_3PO_2 (C) H_3PO_3 (D) H_3PO_4

Solution: (B)

49. The number of geometrical isomers of $CH_3CH = CH - CH = CH - CH = CHCl$ is

(A) 2 (B) 4 (C) 6 (D) 8

Solution: (D)

50. If 'a' stands for the edge length of the cubic system: simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively,

(A) $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$ (B) $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

(C) $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{3}}{2}a$ (D) $1a : \sqrt{3}a : \sqrt{2}a$

Solution: (A)

51. For a first order reaction $A \rightarrow P$, the temperature (T) dependent rate constant (k) was found to follow the equation $\log k = -(2000)\frac{1}{T} + 6.0$. The pre-exponential factor A and the activation energy E_a, respectively, are

(A) $1.0 \times 10^6\ s^{-1}$ and $9.2\ kJ\ mol^{-1}$

(B) $6.0\ s^{-1}$ and $16.6\ kJ\ mol^{-1}$

(C) $1.0 \times 10^6\ s^{-1}$ and $16.6\ kJ\ mol^{-1}$

(D) $1.0 \times 10^6\ s^{-1}$ and $38.3\ kJ\ mol^{-1}$

Solution: (D)

52. 1-Propanol and 2-propanol can be distinguished by

(A) Oxidation with alkaline $KMnO_4$ followed by reaction with Fehling solution

(B) Oxidation with acidic dichromate followed by reaction with Fehling solution

(C) Oxidation by heating with copper followed by reaction with Fehling solution

(D) Oxidation with concentrated H_2SO_4 followed by reaction with Fehling solution

Solution: (C)

53. Which group contains coloured ions out of

1. Cu^{2+} 2. Ti^{4+}

3. Co^{2+} 4. Fe^{2+}

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

Solution: (B)

54. The half life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be $(\log 2 = 0.301)$

(A) 23.03 minutes (B) 46.06 minutes

(C) 460.6 minutes (D) 230.03 minutes

Solution: (B)

55. A mixture of benzaldehyde and formaldehyde on heating with aqueous $NaOH$ solution gives

(A) Benzyl alcohol and sodium formate

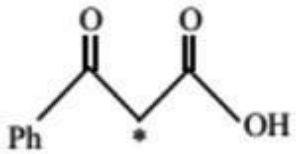
(B) Sodium benzoate and methyl alcohol

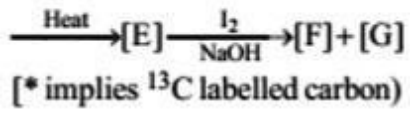
(C)Sodium benzoate and sodium formate

(D) Benzyl alcohol and methyl alcohol

Solution: (A)

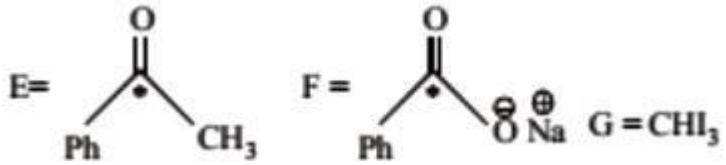
56. In the following reaction sequence, the correct structures of E, F and G are





[* implies ^{13}C labelled carbon)

(A)



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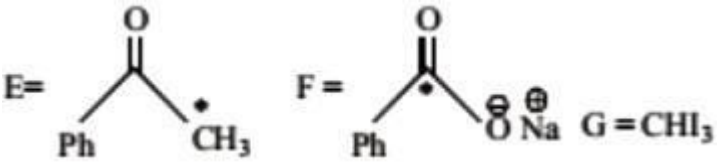
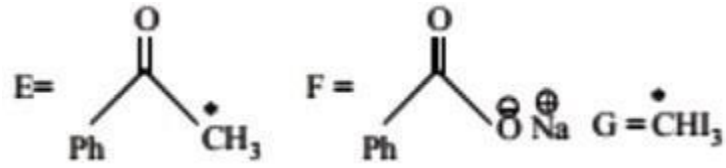


(C)



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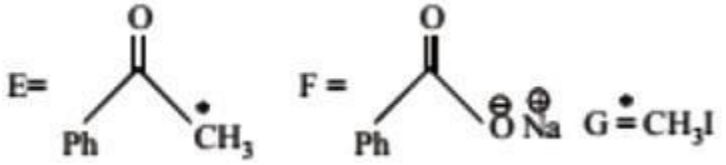


Solution: (C)

57. Standard entropies of X_2, Y_2 and XY_3 are 60, 30 and 50 $JK^{-1}mol^{-1}$ respectively. For the reaction

$\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3, \Delta H = -36\ kJ$ to be at equilibrium, the temperature should be:

(A) 750 K (B) 1000 K (C) 1250 K (D) 500 K

Solution: (A)

58. 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) Methylamine (B) Nitromethane

(C) Aniline (D) Nitrobenzene

Solution: (D)

59. The standard reduction potential for Cu^{2+}/Cu is $+0.34$. Calculate the reduction potential at $pH = 14$ for the above couple. ($K_{sp}\ Cu(OH)_2 = 1 \times 10^{-19}$)

(A) $-0.22\ V$ (B) $+0.22\ V$ (C) $-0.44\ V$ (D) $+0.44\ V$

Solution: (A)

60. A substance $C_4H_{10}O$ yields on oxidation a compound, C_4H_8O which gives an oxime and a positive iodoform test. The original substance on treatment with conc. H_2SO_4 givens C_4H_8. The structure of the compound is

(A) $CH_3CH_2CH_2CH_2OH$ (B) $CH_3CHOHCH_2CH_3$

(C) $(CH_3)_3COH$ (D) $CH_3CH_2 - O - CH_2CH_3$

Solution: (B)

61. The emf of a particular voltaic cell with the cell reaction $Hg_2^{2+} + H_2 \rightleftharpoons 2Hg + 2H^+$ is 0.65 V. The maximum electrical work of this cell when $0.5\ g$ of H_2 is consumed.

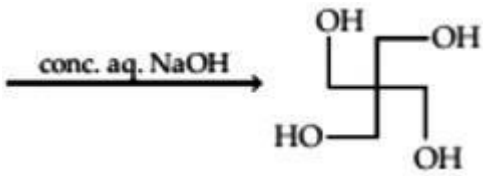
(A) $-3.12 \times 10^4 J$ (B) $-1.25 \times 10^5\ J$

(C) $25.0 \times 10^6 J$ (D) None

Solution: (A)

62. The number of aldol reactions(s) that occurs in the given transformation is:

$CH_3CHO + 4HCHO$

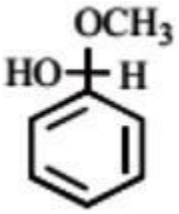


(A) 1 (B) 2 (C) 3 (D) 4

Solution: (C)

63. Which of the following is not intermediate in the acid catalyzed reaction of benzaldehyde with 2 equivalent of methanol to give acetal?

(A)



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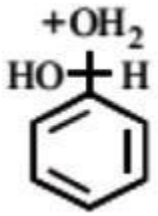

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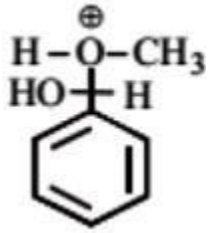

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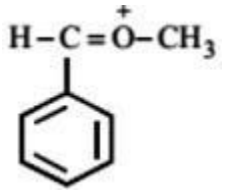


Solution: (B)

64. Iron crystallizes in several modifications. At about $911^{o}C$, the bcc $'\alpha'$ form undergoes a transition to fcc $'\gamma'$ form. If the distance between the two nearest neighbours is the same in the two forms at the transition temperature, the ratio of the density of iron in fcc form (ρ_2) to the of iron of bcc form (ρ_1) at the transition temperature

(A) $\frac{\rho 1}{\rho 2} = 0.918$ (B) $\frac{\rho 1}{\rho 2} = 0.718$ (C) $\frac{\rho 1}{\rho 2} = 0.518$ (D) $\frac{\rho_1}{\rho_2} = 0.318$

Solution: (A)

65. The half life of the first order reaction

$CH_3CHO(g) \rightarrow CH_4(g) + CO(g)$

If initial pressure of $CH_2CHO(g)$ is 80 mm Hg and the total pressure at the end of 20 minutes is 120 mm Hg

(A) 80 min (B) 120 min (C) 20 min (D) 40 min

Solution: (C)

66. A compound is soluble in conc. H_2SO_4. It does not decolourise bromine in carbon tetrachloride but is oxidized by chromic anhydride in aqueous sulphuric acid within two seconds, turning orange solution to blue, green and then opaque. The original compound is

(A) A primary alcohol (B) A tertiary alcohol

(C) An alkane (D) An ether

Solution: (A)

67. The values of Planck's constant is $6.63 \times 10^{-34}\ Js$. The velocity of light is $3.0 \times 10^8\ m\ s^{-1}$. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of $8 \times 10^{15}\ s^{-1}$?

(A) 5×10^{-18} (B) 4×10^1 (C) 3×10^7 (D) 2×10^{-25}

Solution: (B)

68. The number of stereoisomers possible for a compound of the molecular formula

$CH_3 - CH = CH - CH(OH) - Me$ is:

(A) 2 (B) 4 (C) 6 (D) 3

Solution: (B)

69. The optically active tartaric acid is named as $D-(+)-$ tartaric acid because it has a positive

(A) Optical rotation acid because it has a positive

(B) pH in organic solvent

(C) Optical rotation and is derived from $D-(+)-$ glyceraldehyde

(D) Optical rotation when substituted by deuterium

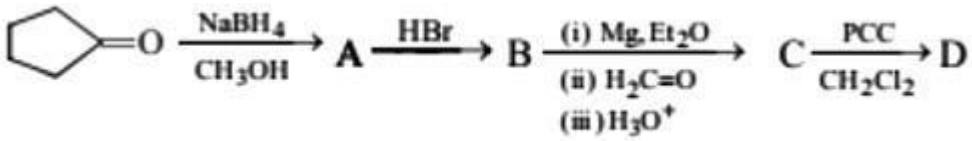
Solution: (C)

70. Consider the reaction : $N_2 + 3H_2 \rightarrow 2NH_3$ carried out at constant temperature and pressure. If ΔH and ΔU are the enthalpy and internal energy changes for the reaction, which of the following expressions is true?

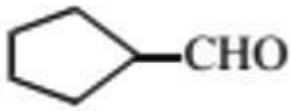
(A) $\Delta H > \Delta U$ (B) $\Delta H < \Delta U$ (C) $\Delta H = \Delta U$ (D) $\Delta H = 0$

Solution: (B)

71. What is D in the following sequence of reactions?



(A)



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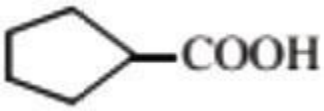

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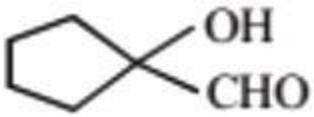


(D)

Solution: (A)

72. Knowing that the chemistry of lanthanoids(Ln) is dominated by its + 3 oxidation state, which of the following statements is incorrect?

(A) The ionic size of Ln (III) decrease in general with increasing atomic number

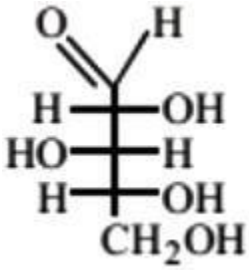
(B) Ln (III) compounds are generally colourless

(C) Ln (III) hydroxide are mainly basic in character

(D) Because of the large size of the Ln (III) ions the bonding in its compounds is predominantly ionic in character

Solution: (B)

73. What is the Rand S configuration for each stereogenic centre in this sugar from top to bottom?



(A) R, R, S (B) R, S, S (C) R, S, R (D) S, S, R

Solution: (C)

74. Saponification of coconut oil yields glycerol and

(A) Palmitic acid (B) Sodium palmitate

(C) Oleic acid (D) Stearic acid

Solution: (B)

75. A certain reaction is non spontaneous at 298 K. The entropy change during the reaction is 121 JK^{-1}. Is the reaction is endothermic or exothermic? The minimum value of ΔH for the reaction is

(A) endothermic, $\Delta H = 36.06\ kJ$

(B) exothermic, $\Delta H = -36.06\ kJ$

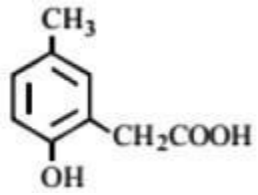
(C) endothermic, $\Delta H = 60.12\ kJ$

(D) exothermic, $\Delta H = -60.12\ kJ$

Solution: (A)

76. p-cresol reacts with chloroform in alkaine medium to give the compound A which adds hydrogen cyanide to form, the compound B. The latter on acidic hydrolysis gives chiral carboxylic acid. The structure of the carboxylic acid is

(A)



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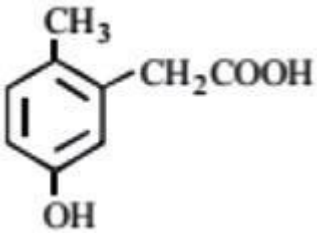
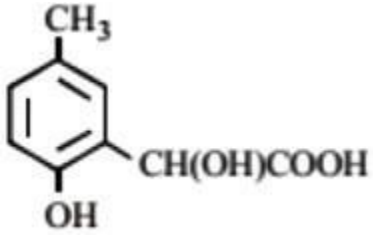


(C)



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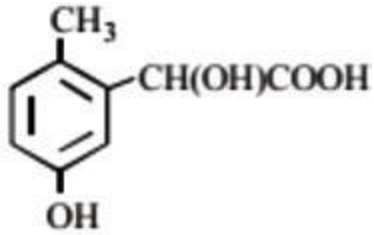


Solution: (C)

77. Which of the following has maximum number of lone pairs associated with Xe?

(A) XeF_4 (B) XeF_6 (C) XeF_2 (D) XeO_3

Solution: (C)

78. Which one of the following statements is not true regarding (+) Lactose?

(A) On hydrolysis (+) Lactose gives equal amount of D(+) glucose and D(+) galactose

(B) (+) Lactose is a β-glycoside formed by the union of a molecule of D(+) glucose and a molecule of D(+) galactose

(C) (+) Lactose is a reducing sugar and does not exhibit mutarotation

(D) (+) Lactose, $C_{12}H_{12}O_{11}$ contains 8-OH groups

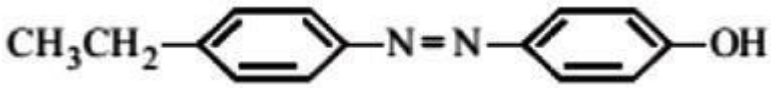
Solution: (C)

79. If one strand of DNA has the sequence ATGCTTGA, the sequence in the complimentary strand would be

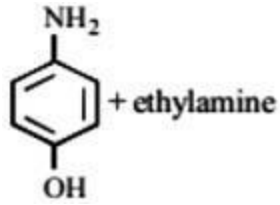
(A) TACGAACT (B) TCCGAACT (C) TACGTACT (D) TACGTAGT

Solution: (A)

80. The starting reagents needed to make the azo compound shown below



(A)



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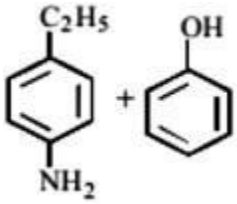
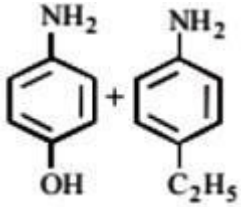
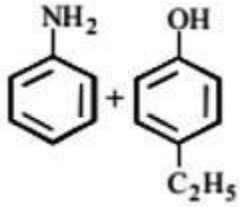


(C)



(D)



Solution: (B)