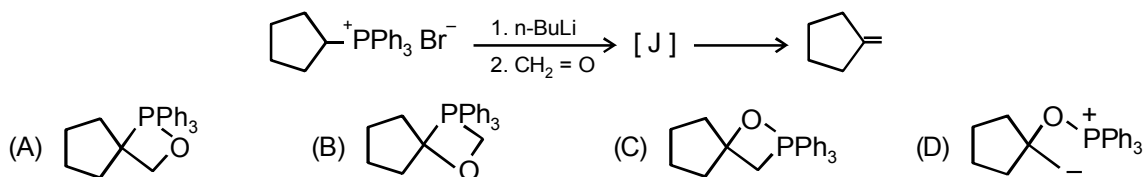
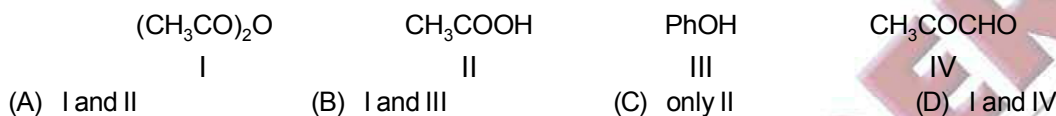


6. The intermediate J in the following witting reaction is



Solution : (A)

7. Among the following compounds, the one(s) that gives (give) effervescence with aqueous NaHCO_3 solution is (are)



Solution : (C)

8. The system that contains the maximum number of atoms is

- (A) 4.25 g of NH_3 (B) 8 g of O_2 (C) 2 g of H_2 (D) 4 g of He

Solution : (C)

9. Metal ion responsible for the Minamata disease is

- (A) Co^{2+} (B) Hg^{2+} (C) Cu^{2+} (D) Zn^{2+}

Solution : (B)

10. Among the following observations, the correct one that differentiates between SO_3^{2-} and SO_4^{2-} is

- (A) Both form precipitate with BaCl_2 , SO_3^{2-} dissolves in HCl but SO_4^{2-} does not
 (B) SO_3^{2-} forms precipitate with BaCl_2 , SO_4^{2-} does not
 (C) SO_4^{2-} forms precipitate with BaCl_2 , SO_3^{2-} does not
 (D) Both form precipitate with BaCl_2 , SO_4^{2-} dissolves in HCl but SO_3^{2-} does not

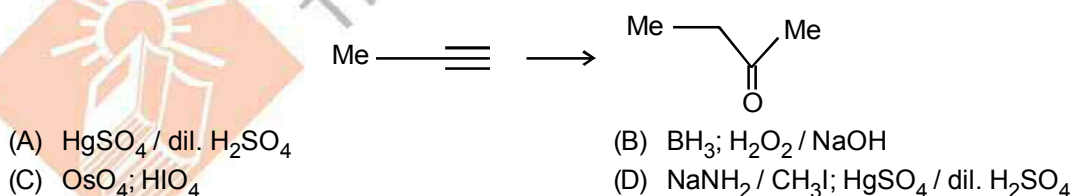
Solution : (A)

11. The pH of 10^{-4} M KOH solution will be

- (A) 4 (B) 11 (C) 10.5 (D) 10

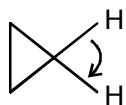
Solution : (D)

12. The reagents to carry out the following conversion are

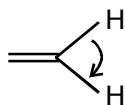


Solution : (D)

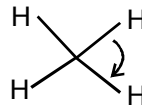
13. The correct order of decreasing H–C–H angle in the following molecules is



I



II



III

- (A) I > II > III (B) II > I > III (C) III > II > I (D) I > III > II

Solution : (B)

14. ${}_{98}\text{Cf}^{246}$ was formed along with a neutron when an unknown radioactive substance was bombarded with ${}_{6}\text{C}^{12}$. the unknown substance was

- (A) ${}_{91}\text{Pa}^{234}$ (B) ${}_{90}\text{Th}^{234}$ (C) ${}_{92}\text{U}^{235}$ (D) ${}_{92}\text{U}^{238}$

Solution : (C)

15. The rate of a certain reaction is given by, rate = $k[\text{H}^+]^n$. The rate increases 100 times when the pH changes from 3 to 1. The order (n) of the reaction is

- (A) 2 (B) 0 (C) 1 (D) 1.5

Solution : (C)

16. $({}_{32}\text{Ge}^{76}, {}_{34}\text{Se}^{76})$ and $({}_{14}\text{Si}^{30}, {}_{16}\text{S}^{32})$ are examples of

- (A) isotopes and isobars (B) isobars and isotones
(C) isotones and isotopes (D) isobars and isotopes

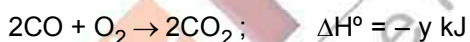
Solution : (B)

17. The enthalpy of vaporization of a certain liquid at its boiling point of 35°C is $24.64 \text{ kJ mol}^{-1}$. The value of change in entropy for the process is

- (A) $704 \text{ J K}^{-1} \text{ mol}^{-1}$ (B) $80 \text{ J K}^{-1} \text{ mol}^{-1}$ (C) $24.64 \text{ J K}^{-1} \text{ mol}^{-1}$ (D) $7.04 \text{ J K}^{-1} \text{ mol}^{-1}$

Solution : (B)

18. Given that



The heat of formation of carbon monoxide will be

- (A) $\frac{y-2x}{2}$ (B) $y+2x$ (C) $2x-y$ (D) $\frac{2x-y}{2}$

Solution : (A)

19. Commercial sample of H_2O_2 is labeled as 10 v. Its % strength is nearly

- (A) 3 (B) 6 (C) 9 (D) 12

Solution : (A)

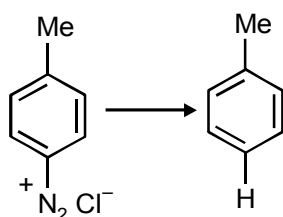
20. In DNA, the consecutive deoxynucleotides are connected via
 (A) phospho diester linkage (B) phospho monoester linkage
 (C) phospho triester linkage (D) amide linkage

Solution : (B)

21. The reaction of aniline with chloroform under alkaline conditions leads to the formation of
 (A) Phenyl cyanide (B) Phenyl isonitrile (C) Phenyl cyanate (D) Phenyl isocyanate

Solution : (B)

22. The reagent with which the following reaction is best accomplished is



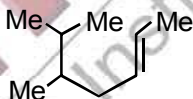
- (A) H_3PO_2 (B) H_3PO_3 (C) H_3PO_4 (D) NaHSO_3

Solution : (A)

23. At a certain temperature the time required for the complete diffusion of 200 mL of H_2 gas is 30 minutes. The time required for the complete diffusion of 50 mL of O_2 gas at the same temperature will be
 (A) 60 minutes (B) 30 minutes (C) 45 minutes (D) 15 minutes

Solution : (B)

24. The IUPAC name of the following molecule is



- (A) 5, 6-Dimethyl hept-2-ene (B) 2, 3-Dimethyl hept-5-ene
 (C) 5, 6-Dimethyl hept-3-ene (D) 5-Isopropyl hex-2-ene

Solution : (A)

25. For one mole of an ideal gas the slope of V vs. T curve at constant pressure of 2 atm is $X \text{ lit mol}^{-1} \text{ K}^{-1}$. The value of the ideal universal gas constant 'R' in terms of X is
 (A) $X \text{ lit atm mol}^{-1} \text{ K}^{-1}$ (B) $X/2 \text{ lit atm mol}^{-1} \text{ K}^{-1}$ (C) $2X \text{ lit atm mol}^{-1} \text{ K}^{-1}$ (D) $2X \text{ atm lit}^{-1} \text{ mol}^{-1} \text{ K}^{-1}$

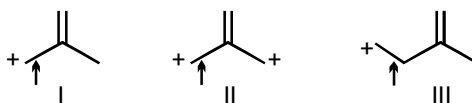
Solution : (C)

26. An atomic nucleus having low n/p ratio tries to find stability by
 (A) the emission of an α particle
 (B) the emission of a positron
 (C) capturing an orbital electron (K-electron capture)
 (D) emission of a β particle

Solution : (C)

[Option (B) is also correct]

27. The correct order of decreasing length of the bond as indicated by the arrow in the following structures is



- (A) I > II > III (B) II > I > III (C) III > II > I (D) I > III > II

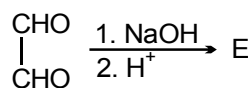
Solution : (C)

28. If Cl_2 is passed through hot aqueous NaOH , the products formed have Cl in different oxidation states. These are indicated as

- (A) -1 and +1 (B) -1 and +5 (C) +1 and +5 (D) -1 and +3

Solution : (B)

29. In the following reaction, the product E is



- (A) $\begin{array}{c} \text{CH}_2\text{OH} \\ | \\ \text{CHO} \end{array}$ (B) $\begin{array}{c} \text{CHO} \\ | \\ \text{CO}_2\text{H} \end{array}$ (C) $\begin{array}{c} \text{CH}_2\text{OH} \\ | \\ \text{CO}_2\text{H} \end{array}$ (D) $\begin{array}{c} \text{CO}_2\text{H} \\ | \\ \text{CO}_2\text{H} \end{array}$

Solution : (C)

30. The amount of electrolytes required to coagulate a given amount of AgI colloidal solution (-ve charge) will be in the order

- (A) $\text{NaNO}_3 > \text{Al}_2(\text{NO}_3)_3 > \text{Ba}(\text{NO}_3)_2$ (B) $\text{Al}_2(\text{NO}_3)_3 > \text{Ba}(\text{NO}_3)_2 > \text{NaNO}_3$
(C) $\text{Al}_2(\text{NO}_3)_3 > \text{NaNO}_3 > \text{Ba}(\text{NO}_3)_2$ (D) $\text{NaNO}_3 > \text{Ba}(\text{NO}_3)_2 > \text{Al}_2(\text{NO}_3)_3$

Solution : (D)

31. The value of ΔH for cooling 2 mole of an ideal monoatomic gas from 225°C to 125°C at constant pressure will be [given $C_p = \frac{5}{2}R$]

- (A) 250 R (B) -500 R (C) 500 R (D) -250 R

Solution : (B)

32. The quantity of electricity needed to separately electrolyze 1 M solution of ZnSO_4 , AlCl_3 and AgNO_3 completely is in the ratio of

- (A) 2 : 3 : 1 (B) 2 : 1 : 1 (C) 2 : 1 : 3 (D) 2 : 2 : 1

Solution : (A)

33. The emission spectrum of hydrogen discovered first and the region of the electromagnetic spectrum in which it belongs, respectively are

- (A) Lyman, ultraviolet (B) Lyman, visible (C) Balmer, ultraviolet (D) Balmer, visible

Solution : (D)

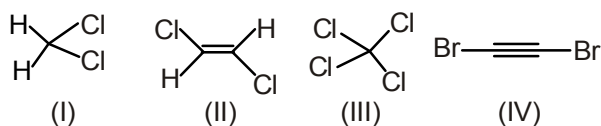
34. As per de Broglie's formula a macroscopic particle of mass 100 gm and moving at a velocity of 100 cm s⁻¹ will have a wavelength of
 (A) 6.6×10^{-29} cm (B) 6.6×10^{-30} cm (C) 6.6×10^{-31} cm (D) 6.6×10^{-32} cm

Solution : (C)

35. The electronic configuration of Cu is
 (A) Ne3s²3p⁶3d⁹4s² (B) Ne3s²3p⁶3d¹⁰4s¹ (C) Ne3s²3p⁶3d³4s²4p⁶ (D) Ne3s²3p⁶3d⁵4s²4p⁴

Solution : (B)

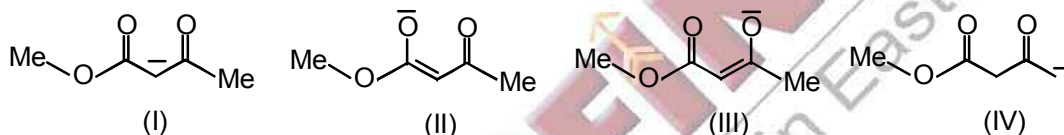
36. The compound that will have a permanent dipole moment among the following is



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

Solution : (A)

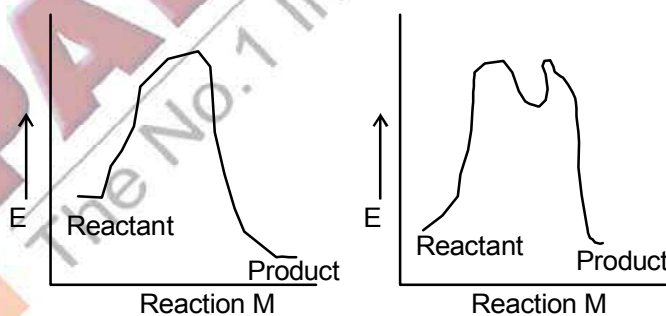
37. Among the following structures the one which is not a resonating structure of others is



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

Solution : (D)

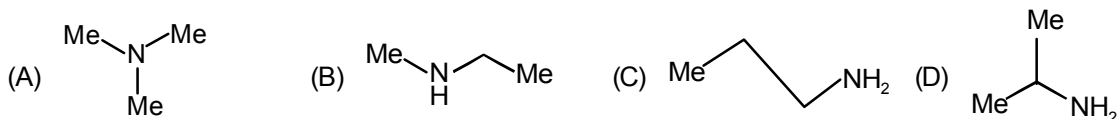
38. The correct statement regarding the following energy diagrams is



- (A) Reaction M is faster and less exothermic than Reaction N
 (B) Reaction M is slower and less exothermic than Reaction N
 (C) Reaction M is faster and more exothermic than Reaction N
 (D) Reaction M is slower and more exothermic than Reaction N

Solution : (C)

39. An amine C_3H_9N reacts with benzene sulfonyl chloride to form a white precipitate which is insoluble in aq. NaOH. The amine is



Solution : (B)

40. Among the followings, the one which is not a "greenhouse", is



Solution : (D)

41. The number of amino acids as number of peptide bonds in a linear tetrapeptide (made of different amino acids) are respectively



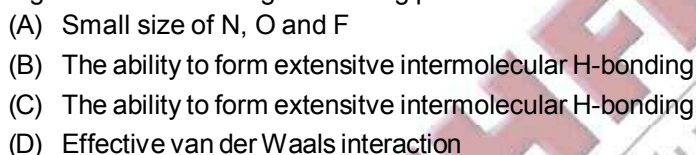
Solution : (C)

42. The 4th higher homologue of ethane is



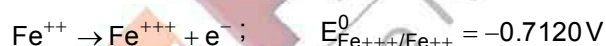
Solution : (C)

43. The hydrides of the first elements in groups 15-17, namely NH_3 , H_2O and HF respectively show abnormally high values for melting and boiling points. This is due to



Solution : (B)

44. The two half cell reactions of an electrochemical cell is given as

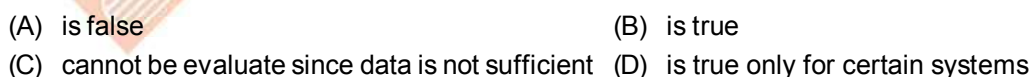


The value of cell EMF will be



Solution : (B)

45. In case of heteronuclear diatomics of the type AB, where A is more electronegative than B, bonding molecular orbital resembles the character of A more than that of B. The statement

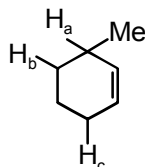


Solution : (B)

Category : II

Q.46 to Q.55 carry two marks each, for which only one option is correct. Any wrong answer will lead to deduction of 2/3 mark.

46. The order of decreasing ease of abstraction of hydrogen atoms in the following molecule is



- (A) $H_a > H_b > H_c$ (B) $H_a > H_c > H_b$ (C) $H_b > H_a > H_c$ (D) $H_c > H_b > H_a$

Solution : (B)

47. The bond angle in NF_3 (102.3°) is smaller than NH_3 (107.2°). This is because of

- (A) large size of F compared to H (B) large size of N compared to F
(C) opposite polarity of N in the two molecules (D) small size of H compared to N

Solution : (C)

48. The compressibility factor (Z) of one mole of a van der Waals gas of negligible 'a' value is

- (A) 1 (B) $\frac{bp}{RT}$ (C) $1 + \frac{bp}{RT}$ (D) $1 - \frac{bp}{RT}$

Solution : (C)

49. At $25^\circ C$ the molar conductance of 0.007 M hydrofluoric acid is $150 \text{ mho cm}^2 \text{ mol}^{-2}$ and its $\Lambda_m^0 = 500 \text{ mho cm}^2 \text{ mol}^{-1}$. The value of the dissociation constant of the acid the given concentration at $25^\circ C$ is

- (A) $7 \times 10^{-4} \text{ M}$ (B) $7 \times 10^{-5} \text{ M}$ (C) $9 \times 10^{-3} \text{ M}$ (D) $9 \times 10^{-4} \text{ M}$

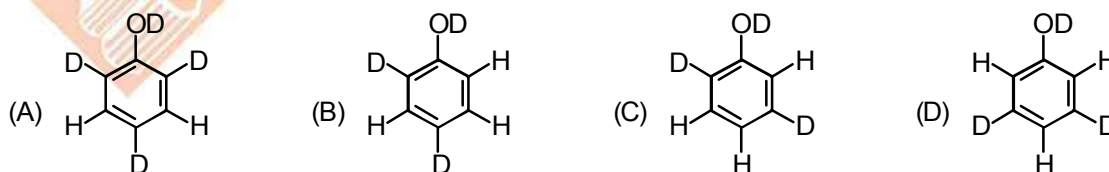
Solution : (D)

50. A piece of wood from an archaeological sample has $5.0 \text{ counts min}^{-1}$ per gram of C-14, while a fresh sample of wood has a count of $15.0 \text{ min}^{-1} \text{ gram}^{-1}$. If half life of C-14 is 5770 years, the age of the archaeological sample is

- (A) 8,500 years (B) 9,200 years (C) 10,000 years (D) 11,000 years

Solution : (B)

51. When phenol is treated with D_2SO_4/D_2O , some of the hydrogen get exchanged. The final product in the exchange reaction is



Solution : (A)

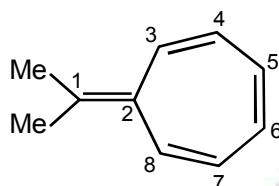
52. To observe an elevation of boiling point of 0.05°C , the amount of a solute (Mol. Wt. = 100) to be added to 100 g of water ($k_b = 0.5$) is
 (A) 2 g (B) 0.5 g (C) 1 g (D) 0.75 g

Solution : (C)

53. The structure of XeF_6 is experimentally determined to be distorted octahedron. Its structure according to VSEPR theory is
 (A) Octahedron (B) Trigonal bipyramid
 (C) Pentagonal bipyramid (D) Tetragonal bipyramid

Solution : (C)

54. The most likely protonation site in the following molecule is



- (A) C-1 (B) C-2 (C) C-3 (D) C-6

Solution : (A)

55. The volume of ethyl alcohol (density 1.15 g/cc) that has to be added to prepare 100 cc of 0.5 M ethyl alcohol solution in water is
 (A) 1.15 cc (B) 2 cc (C) 2.15 cc (D) 2.30 cc

Solution : (B)

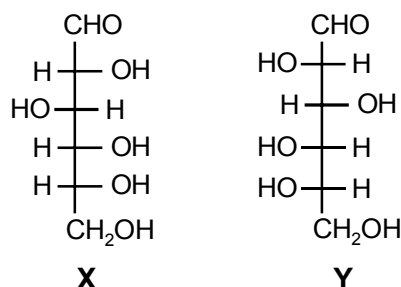
Category : III

Q.56 to Q.60 carry two marks each, for which one or more than one options may be correct. Marking of correct options will lead to maximum mark of two on pro rata basis. There will be no negative marking for these questions. However, any marking of wrong option will lead to award of zero mark against the respective question – irrespective of the number of correct options marked.

56. Cupric compounds are more stable than their cuprous counterparts in solid state. This is because
 (A) the endothermic character of the 2^{nd} I P of Cu is not so high
 (B) size of Cu^{2+} is less than Cu^+
 (C) Cu^{2+} has stabler electronic configuration as compared to Cu^+
 (D) the lattice energy released for cupric compounds is much higher than Cu^+

Solution : (B), (D)

57. Among the following statements about the molecules X and Y, the one (s) which is (are) correct is (are)



- (A) X and Y are diastereomers
 (B) X and Y are enantiomers
 (C) X and Y are both aldohexoses
 (D) X is a D-sugar and Y is an L-sugar

Solution : (B), (C), (D)

58. For a spontaneous process, the correct statement(s) is (are)

- (A) $(\Delta G_{\text{system}})_{T,P} > 0$
 (B) $(\Delta S_{\text{system}}) + (\Delta S_{\text{surroundings}}) > 0$
 (C) $(\Delta G_{\text{system}})_{T,P} < 0$
 (D) $(\Delta U_{\text{system}})_{T,V} > 0$

Solution : (B), (C)

59. The formal potential of $\text{Fe}^{3+} / \text{Fe}^{2+}$ in a sulphuric acid and phosphoric acid mixture ($E^\circ = +0.61 \text{ V}$) is much lower than the standard potential ($E^\circ = +0.77 \text{ V}$). This is due to

- (A) formation of the species $[\text{FeHPO}_4]^+$
 (B) lowering of potential upon complexation
 (C) formation of the species $[\text{FeSO}_4]^+$
 (D) high acidity of the medium

Solution : (B), (C), (D)

60. Two gases X (Mol. Wt. M_X) and Y (Mol. Wt. M_Y ; $M_Y > M_X$) are at the same temperature T in two different containers. Their root mean square velocities are C_X and C_Y respectively. If the average kinetic energies per molecule of two gases X and Y are E_X and E_Y respectively, then which of the following relation(s) is(are) true?

- (A) $E_X > E_Y$
 (B) $C_X > C_Y$
 (C) $E_X = E_Y = \frac{3}{2}RT$
 (D) $E_X = E_Y = \frac{3}{2}k_B T$

Solution : (B), (D)



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