Chemistry

Single Correct Questions +3 | -1.00

1. The monosaccharide present in the following disaccharide is

(A)
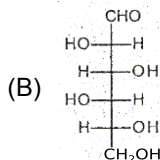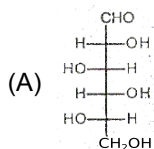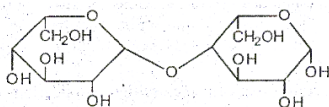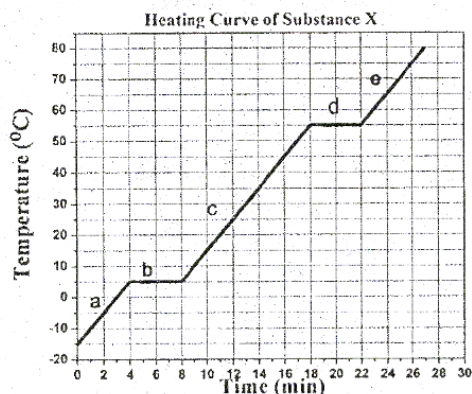
(B)

(C)

(D)
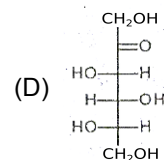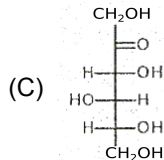
2. A substance X was heated at constant pressure and the temperature observed at various times of heating was plotted as given below

Which of the following is/are correct?
I. Melting point of X is -5° C
II. Solid and liquid forms of X coexist in the region b
III. Boiling point of X is 55° C
IV. Solid and liquid forms of X coexist in the region d

(A) I and IV   (B) II and III   (C) III only   (D) I, II and III

3. An orbital among the following that has two radial nodes and two angular nodes is

(A) 3d   (B) 4p   (C) 4f   (D) 5d

4. Among the following, the reaction/s that can be classified as oxidation – reduction is /are

I. $Cr_2O_7^{2-}(aq) + 2OH^-(aq) \rightarrow 2CrO_4^{2-} + H_2O(l)$
II. $SiCl_4(l) + 2Mg(s) \rightarrow 2MgCl_2(l) + Si(s)$
III. $6Cl_2(l) + 12KOH(l) \rightarrow 2KClO_3(s) + 10KCl + 6H_2O(l)$
IV. $2H_2O_2 \rightarrow 2H_2O(l) + O_2(g)$

(A) I and IV   (B) I, II and III   (C) II, III and IV   (D) IV only

Space for rough use

5. Which of the following graphs describes the relationship between $[H_3O^+]$ and $[OH^-]$ in an aqueous solution at a constant temperature?
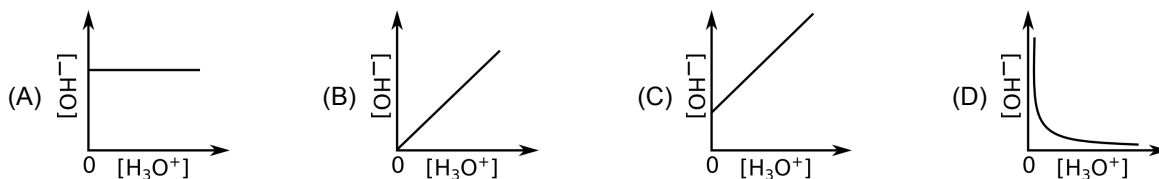

6. Which of the following statement/s is /are correct?

    I. Number of significant figures in 2345.100 is three.
    II. 0.00787 rounded to two significant figures is written as 0.787×10^{-2}
    III. 340 rounded to two significant figures is written as 0.34×10^3
    IV. The number of significant figures in 0.020 is two

(A) II and III   (B) III and IV   (C) I, II and IV   (D) III only

7. The gaseous product obtained on reaction of BF_3 with LiH is

(A) HF (B) H_2 (C) B_2H_6 (D) F_2

8. An adsorption isotherm equation proposed by Langmuir is of the form $V = \dfrac{V_0 bP}{(1 + bP)}$ where V is the volume of gas adsorbed at pressure P. For a given adsorbate / adsorbent system, V_0 and b are constants. The dependence of V on P can be depicted as
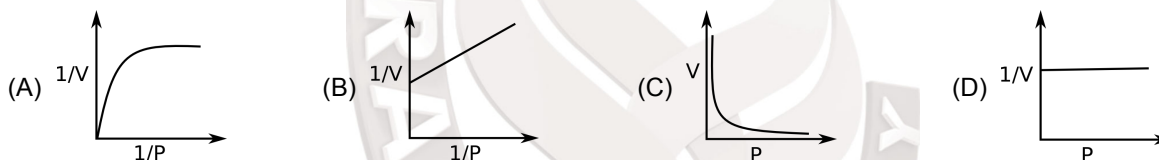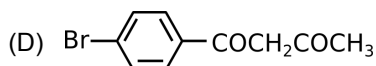

9. A scientist attempts to replace a few carbon atoms in 1.0 g of diamond with boron atoms or nitrogen atoms in separate experiments. Which of the following is correct?

(A)   The resulting material with B doping will be an n – type semiconductor.

(B)   The resulting material with B doping will be a p – type semiconductor.

(C)   B doping is NOT possible as B cannot form multiple bonds.

(D)   The resulting material with N doping will be a p – type semiconductor.

10. The order of pK_a values of the following acid is
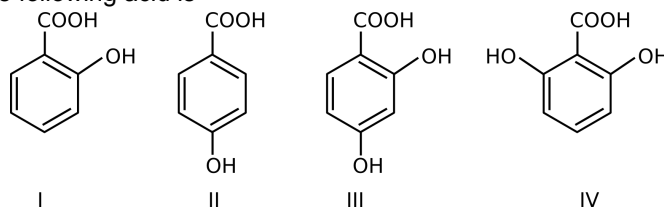
(A) IV > I > III > II   (B) III > IV > I > II   (C) II > I > III > IV   (D) II > III > I > IV

Space for rough use

11. The major product of the following reaction is

$$CH_3COCH_2COOC_2H_5 \xrightarrow[\text{ii) } H_3O^+]{\text{i) } Br\text{-}\langle\text{-}Cl, Mg \text{ ether, 1 mol}}}$$

(A) Cl—⟨⟩—C(OH)(CH_3)CH_2COOC_2H_5

(B) Cl—⟨⟩—COCH_2COCH_3

(C) Br—⟨⟩—C(OH)(CH_3)CH_2COOC_2H_5

(D) Br—⟨⟩—COCH_2COCH_3
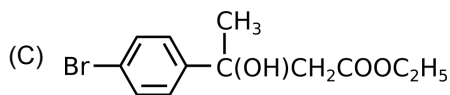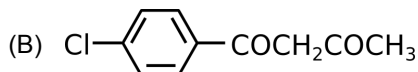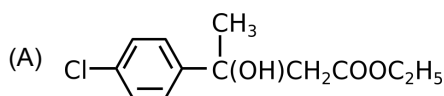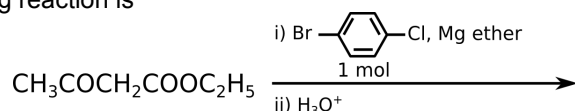
12. Which of the following is a strong oxidising agent?

(A) $AlCl_3$ (B) $TlCl_3$ (C) NF_3 (D) PCl_3
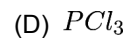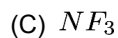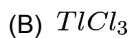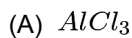
13. Concentration of K^+ ions inside a biological cell was found to be 25 times higher than that outside. The magnitude of the potential difference between the two sides of the cell is close to (2.303 RT/F can be taken as 59 mV' difference in concentrations of other ions can be taken as negligible).

(A) 4.2 mV (B) 195 mV (C) 82 mV (D) -82 mV

14. Which of the following is *not* paramagnetic?

(A) S^{2-} (B) N^{2-} (C) O^{2-} (D) NO
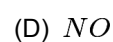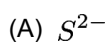
15. The Newman projection shown is the same as
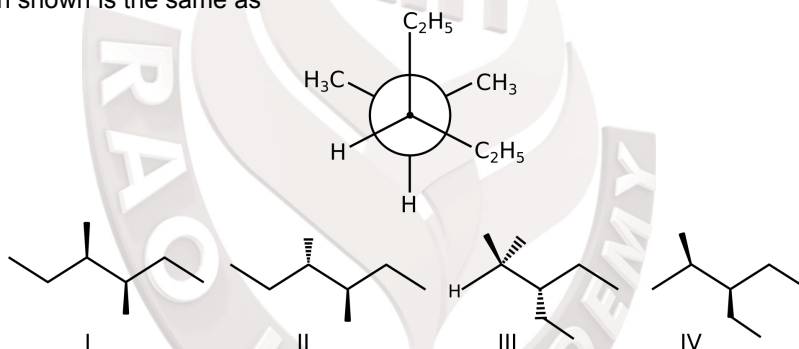
(A) I and IV (B) II and III (C) III and IV (D) I and II

16. The compound 'X' undergoing the following reaction is

$$X \xrightarrow[\substack{\text{ii) } H^+ \\ \text{iii) acid } K_2Cr_2O_7 \\ \text{iv) Heat}}]{\text{i) dil aq NaOH}} C_8H_4O_3$$

(A) ... (B) ... (C) ... (D) ...
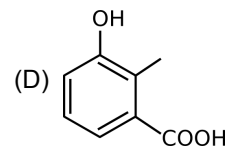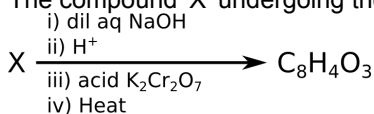
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17. The complex $[M(en)(Br)_2(Cl)_2]$ has two optical isomers. Their configurations can be represented as

(A)

(B)

(C)

(D)
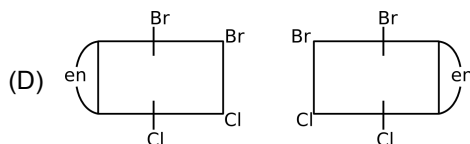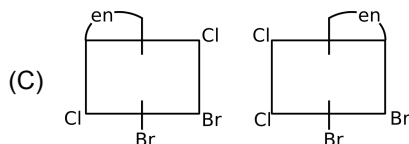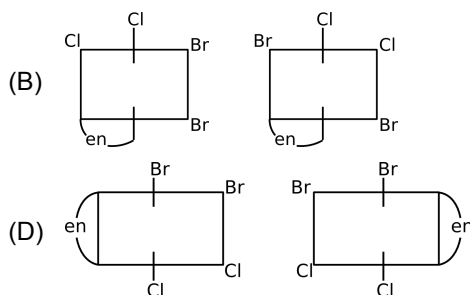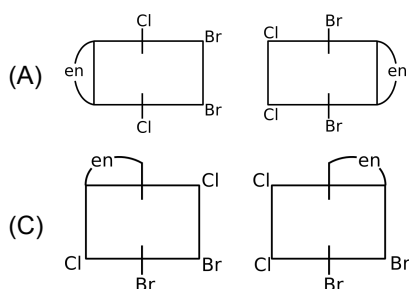
18. The standard electrode potential (E^0) of the Daniel cell is 1.1 V and the overall cell reaction can be represented as $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$.
Under which of the following conditions will the cell potential be higher than 1. 1 V?

(A) $1.0M\ Zn^{2+},\ 1.0M\ Cu^{2+}$
(B) $1.2M\ Zn^{2+},\ 1.2M\ Cu^{2+}$
(C) $0.1M\ Zn^{2+},\ 1.0M\ Cu^{2+}$
(D) $1.0M\ Zn^{2+},\ 0.01M\ Cu^{2+}$

19. In the following reaction, the values of a, b and c, respectively are
$a\ F_2(g) + b\ OH^-(aq) \rightarrow c\ F^-(aq) + d\ OF_2(g) + e\ H_2O(l)$

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

20. Among the following, number of oxygen atoms present is the *maximum* in

(A) 1.0 g of O_2 molecules
(B) 4.0 g of O atoms
(C) 1.0 g of O_3
(D) 1.7 g of H_2O

21. The reactions from those given below that involve a carbocation intermediate are

(i)

(ii)

(iii)
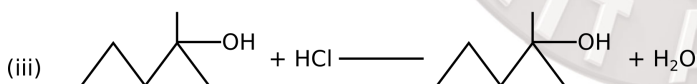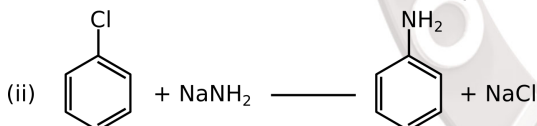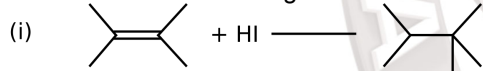
(A) i, ii and iii   (B) i and ii   (C) i and iii   (D) ii and iii
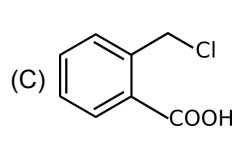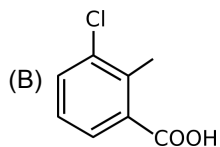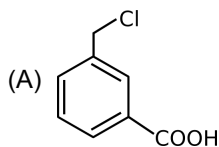
22. The IUPAC name of the complex $[Pt(en)(NH_3)(Cl)_2(ONO)][Ag(CN)_2]$ is

(A) monoamminedichlorido (ethane-1,2-diammine) nitritoplatinum (IV) dicyanoargentate(I)

(B) monoaminebischlorido (ethane-1,2-diammine) nitritoplatinate (IV) dicyanosilver (I)

(C) monoaminebischlorido (ethane-1, 2-diammine) nitritoplatinate (IV) dicyanoargentate(I)

(D) monoamminedichlorido (ethane-1, 2 -diamine) nitritoplatinum (IV) dicyanoargentate (I)

Space for rough use

23. If for an aqueous solution of a weak acid, $pH = pK_a + 2$ at 25°C, the approximate fraction of the acid in the dissociated form is

(A) 1.1 %   (B) 0.99 %   (C) 99.0 %   (D) 9.9 %

24. Which one of the following is *not* used as a monomer for the synthesis of a high molecular weight silicone polymer?

(A) $MeSiCl_3$ (B) Me_2SiCl_2 (C) Me_3SiCl (D) $PbSiCl_3$

25. The *major* product of the following reaction is

(A)   (B)   (C)   (D)
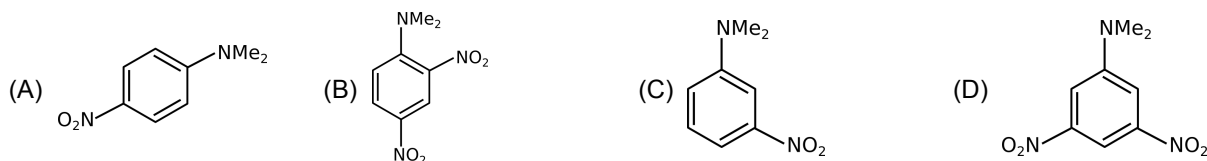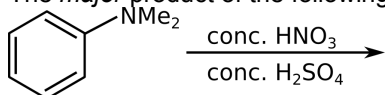
26. During World War II, soldier posted at high altitudes experienced crumbling of the tin buttons of their uniforms into a grey powder. This can be attributed to

(A)   oxidation of tin

(B)   interaction with nitrogen in the air at low pressure

(C)   change in the crystal structure of tin

(D)   Reaction of tin with water vapour in the air

27. For the reaction $4NO_2(g) + O_2(g) \rightarrow 2N_2O_5(g)$, $\Delta H_{reaction} = -112\ kJ$. If the N_2O_5 is assumed to be formed in the reaction as a solid, $\Delta H_{reaction}$ will be $(\Delta H_{sublimation}\ of\ N_2O_5\ is\ 54\ kJ\ mol^{-1})$

(A) $-220\ kJ$ (B) $-4\ kJ$ (C) $-166\ kJ$ (D) $-332\ kJ$

28. Solubility product of $AgCl$ is 1.8×10^{-10}. The minimum volume (in L) of water required to dissolve $1\ mg$ of $AgCl$ is close to (NEW)

(A) 0.5 (B) 7.5 (C) 50 (D) 0.75

29. Compound $'X'$ in the following reaction is:

(A)   (B)   (C)   (D)
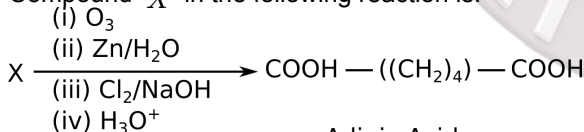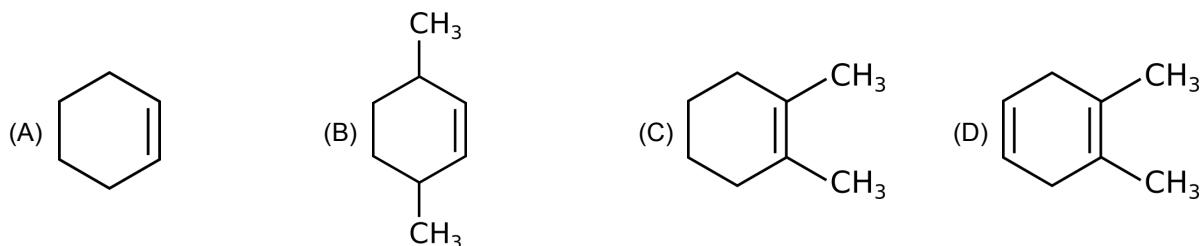
Space for rough use

30. Density of CO_2 gas at 0^oC and 2.00 atm pressure can be expressed as

(A) 2 g m^{-3} (B) 4 g m^{-3} (C) 4×10^3 kg m^{-3} (D) 8 g L^{-1}

31. The correct order of boiling points of the following compound is
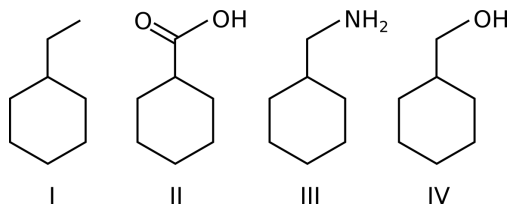
(A) $III < IV < II < I$ (B) $I < III < IV < II$

(C) $I < II < III < IV$ (D) $IV < III < I < II$

32. Urea, $CO(NH_2)_2$, decomposes at 90^oC as $CO(NH_2)_2(aq) \rightarrow NH_4^+(aq) + OCN^-(aq)$. Experimental data obtained for the reaction is given in the following plot
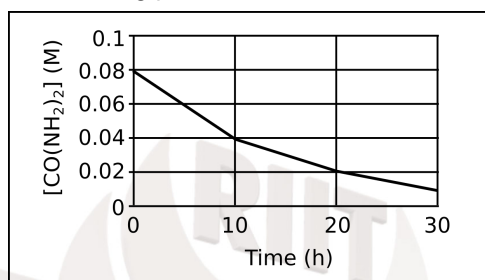
From the graph it can be inferred that

(A) Average rate of the reaction is the same for successive time intervals of 10 h

(B) Unit of the rate constant of the reaction is h^{-1}

(C) Rate constant of the reaction is the lowest at 30 h

(D) The reaction is of zero order

33. Which amoung the following is nonlinear?

(A) N_3^- (B) CIF_2^- (C) Br_3^- (D) $BrCl_2^+$

34. The standard redox potential for the reaction $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ is -1.23 V. If the same reaction is carried out at 25^oC and at $pH = 7$, the potential will be

(A) -0.82 V (B) -3.28 V (C) 0.82 V (D) -1.18 V

35. The correct sequence of reagents from those listen below for the following conversion is

I. $NaNH_2$ II. Br_2 III. $H_2/Pd - C$, quinoline   IV. H_3O^+

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

Space for rough use

36. The pressure inside two gas cylinders of volume $25\ m^3$ and $50\ m^3$ are $10\ kPa$ and $20\ kPa$ respectively. The cylinders are kept at the same temperature and separated by a valve. What is pressure of in the combined system when the valve is opened?

(A) $30\ kPa$ (B) $15\ kPa$ (C) $16.7\ kPa$ (D) $2.5\ kPa$

37. A sample of water from a river was analyzed for the presence of metal ions and the observations were recorded as given below

Reagent added	Observation
$dil.HCl$	No change
$aq.Na_2CO_3$	White precipitate
$aq.Na_2SO_4$	No change

The water sample is likely to contain

(A) Ba^{2+} (B) Cu^{2+} (C) Li^+ (D) Mg^{2+}

38. The spin only magnetic moment of $[Fe(NH_3)_6]^{3+}$ and $[FeF_6]^{3-}$ (in units of BM) respectively are

(A) 1.73 and 1.73 (B) 5.92 and 1.73 (C) 1.73 and 5.92 (D) 5.92 and 5.92

39. Which of the energy values marked as I, II and III in the following diagram, will change by the addition of a suitable catalyst?
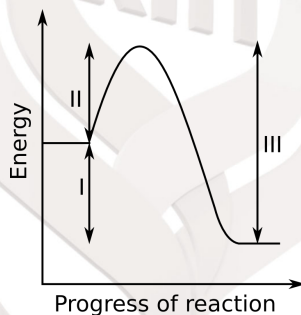
(A) II only   (B) I and II   (C) II and III   (D) III only

40. The most stable radical among the following is

Space for rough use

41. The maximum number of moles of CH_3I consumed by one mole of crixivan, a drug used against AIDS is

Crixivan

    (A) 2   (B) 3   (C) 5   (D) 7

42. A dilute solution of an alkali metal in liquid ammonia is
    I. blue in colour   II. conducts electricity
    III. paramagnetic   IV. an oxidising agent

    (A) I and III   (B) II and IV   (C) I, II and III   (D) I and III

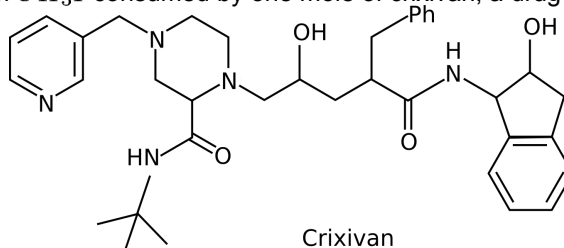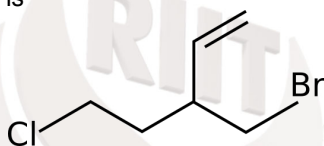43. The lattice enthalpy and enthalpy of the solution in water for solid $NaCl$ are $753\ kJ\ mol^{-1}$ and $5\ kJ\ mol^{-1}$ respectively. If the solution enthalpies of Na^+ and Cl^- are in the ratio $6:5$, the enthalpy of hydration of Na^+ ion is

    (A) $408\ kJ\ mol^{-1}$ (B) $-412\ kJ\ mol^{-1}$ (C) $-408\ kJ\ mol^{-1}$ (D) $412\ kJ\ mol^{-1}$

44. The IUPAC name of the following compound is

    (A) 1-Bromo-4-chloro-3-enthenylbutane   (B) 4-Bromo-1-chloro-3-enthenylbutane

    (C) 3-(Bromomethyl)-5-chloropent-1-ene   (D) 3-(Bromomethyl)-1-chloropent-4-ene

45. Which of the following elements will exhibit photoelectric effect with light of the longest wavelength?

    (A) K (B) Rb (C) Mg (D) Ca

46. The sequence of the reagents required for the following conversion is

    (A) $(i)B_2H_6/H_2O_2/OH^-\ (ii)Na\ (iii)C_2H_5I$ (B) $(i)HCl\ (ii)\ C_2H_5ONa$

    (C) $(i)H_3O^+\ (ii)Na\ (iii)C_2H_5OH$ (D) $(i)H_3O^+\ (ii)Na\ (iii)C_2H_5Cl$

47. An ion exchange resin, RH_2, can replace Ca^{2+} in hard water as
    $$RH_2 + Ca^{2+} \rightarrow RCa^{2+} + 2H^+$$
    When a $1.0\ L$ hard water sample was passed throgh the resin, all H^+ ions were replaced by Ca^{2+} ions and the pH of eluted water was found to be 2.0. The hardness of water (as ppm of Ca^{2+}) in the sample of water treated is

    (A) 50   (B) 100   (C) 125   (D) 200

Space for rough use

48. The major product $'X'$ formed in the following reaction is

$$\text{benzene} \xrightarrow[\text{(ii) } HNO_3, H_2SO_4]{\text{(i) n-}C_4H_9Cl, \text{ anhyd. } AlCl_3} X$$

(A)

(B)

(C)

(D)
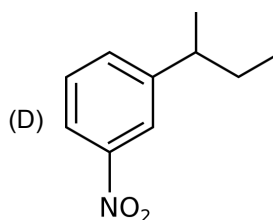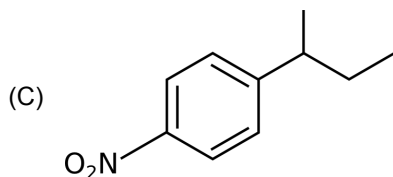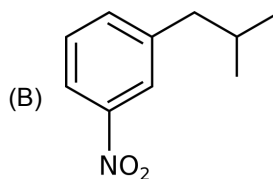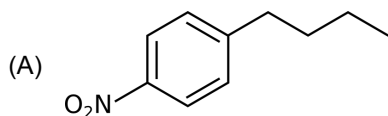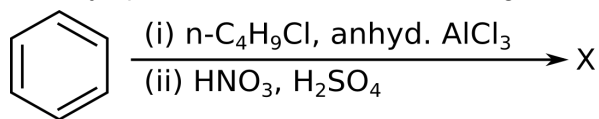
49. Which of the following accounts best for the fact that F^- is smaller than O^{2-}?

(A) F^- has a larger nuclear mass than O^{2-}

(B) F^- has a larger nuclear charge than O^{2-}

(C) F^- is more polarizable than O^{2-}

(D) F is more electronegative than O

50. The most likely to lose water on protonation is

(A)

(B)

(C)

(D)
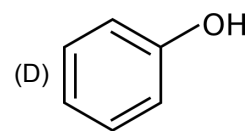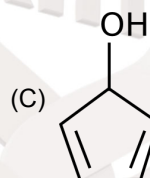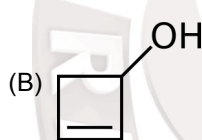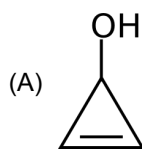
51. The most stable Lewis structure of N_2O is

(A) $: \ddot{O} = N = \ddot{N} :$

(B) $: \ddot{N} = O = \ddot{N} :$

(C) $: \ddot{\ddot{N}} - N \equiv O :$

(D) $: \ddot{\ddot{O}} - N \equiv N :$
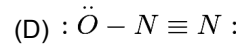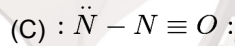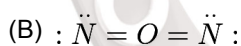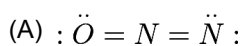
52. Compound $'P'$ that undergoes the sequence of reactions given below to give the product Q is

$$P \xleftarrow[\begin{array}{l}\text{(i) excess } CH_3OH \\ \text{(ii) PCC} \\ \text{(iii) } CH_3MgBr \\ \text{(iv) } H_3O^+\end{array}]{} Q$$

(A)

(B)

(C)

(D)
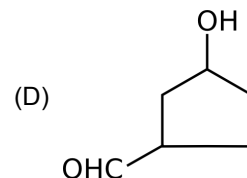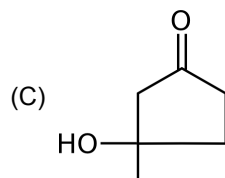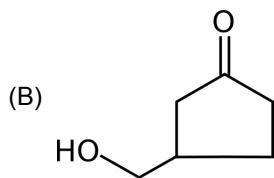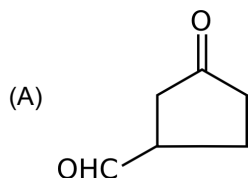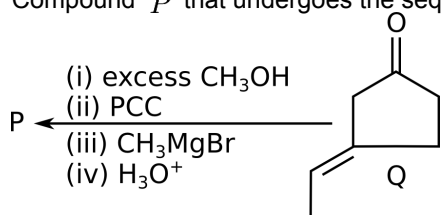
Space for rough use

53. Penicillamine is used in the treatment of arthritis. One molecule of penicillamine contains a single sulphur atom and the weight percentage of sulphur in penicillamine is 21.49%. Molecular weight of penicillamine in $g \ mol^{-1}$ is

    (A) 85.40 (B) 68.76 (C) 125.2 (D) 149.2

54. The daily energy requirement of a teenager is $7800 \ kJ.$ As calculated from the data given in the table below, the amount of glucose he has to consume (g) per day assuming that the entire energy he requires comes from the combustion of glucose is

Molecule	$\Delta H_f(kJ \ mol^{-1})$
$C_6H_{12}O_6$	-1273
$CO_2(g)$	-394
H_2O	-286

    (A) 262   (B) 500   (C) 131   (D) 250

55. At $298 \ K,$ change in internal for the complete combustion of fullerene, $C_{60}(s)$, an allotrope of carbon, and the enthalpy of formation of $CO_2(g)$ are $-25970 \ kJ \ mol^{-1}$ and $-393 \ kJ \ mol^{-1}$ respectively. The enthelpy of formation of $C_{60}(s)$ at $298 \ K$ is

    (A) $-2390 \ kJ$ (B) $4.95 \times 10^4 \ kJ$ (C) $2.60 \times 10^4 \ kJ$ (D) $2390 \ kJ$

56. From the given standard electrode potentials
    $Sn^{4+}(aq) + 2e^- \rightarrow Sn^{2+}(aq) \qquad E^0 = 0.15 \ V$
    $Br_2(l) + 2e^- \rightarrow 2Br^-(aq) \qquad E^0 = 1.07 \ V$
    The approximate free energy change for the process
    $2Br^-(aq) + Sn^{4+}(aq) \rightarrow Br_2(l) + Sn^{2+}(aq)$ is

    (A) $177.6 \ kJ$ (B) $355 \ kJ$ (C) $-177.6 \ kJ$ (D) $-355 \ kJ$

57. A common method to clean acid spills is to use Na_2CO_3 (Molar mass $106 \ g$). If $50.0 \ mL$ of $0.75 \ M \ HCl$ is spilt on a wooden surface, the amount of Na_2CO_3 required is

    (A) $3.75 \ g$ (B) $7.5 \ g$ (C) $2.0 \ g$ (D) $4.0 \ g$

58. The rate of the reaction between two reactants X and Y can be expressed as $R = k[X]^2[Y]$. In an experiment, the initial rate of the reaction was found to be R_1 when the initial concentrations of X and Y are $[X_0]$ and $[Y_0]$. Another experiment was performed in which $[X_0]$ was taken as $1/2[X_0]$. What should be $[Y_0]$ in this experiment to get the initial rate as $0.5R_1$?

    (A) $4[Y_0]$ (B) $1/2[Y_0]$ (C) $2[Y_0]$ (D) $[Y_0]$

59. The number of quaternary and chiral carbon atoms present in elatol, isolated from an algae are respectively :

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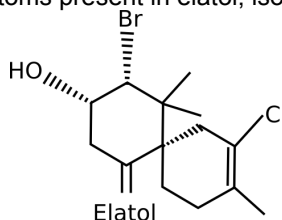
    (A) $2, 3$ (B) $4, 2$ (C) $3, 2$ (D) $1, 3$

Space for rough use

60.   A crystal of KCl containing a small amount of $CaCl_2$ will have :

(A)   vacant Cl^- sites

(B)   vacant K^+ sites and a higher density as compared to pure KCl

(C)   vacant K^+ sites and a lower density as compared to pure KCl

(D) K^+ ions in the interstitial sites

61.   The correct order of basicity of the following species is :

(A) $III < IV < II < I$ (B) $III < I < II < IV$ (C) $III < II < I < IV$ (D) $IV < I < II < III$

62.   In $YBa_2Cu_3O_{7-x}$, a super conducting oxide that got George Bendnorz and Karl Muller the Nobel prize in 1986, Cu and exist in both $+2$ and $+3$ oxidation states and their proportion depends on the value of $'X'$. In $YBa_2Cu_3O_{7-0.5}$

(A)   0.5 moles of Cu are in +3 oxidation state.

(B)   5% of Cu is in +3 oxidation state.

(C)   All the Cu is in +3 oxidation state.
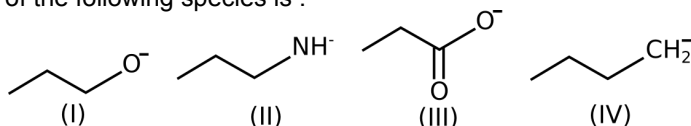
(D)   All Cu is in +2 oxidation state.

63.   If the radius of the hydrogen atom is $53\ pm$, the radius of the He^+ ion is close to :

(A) $75\ pm$ (B) $38\ pm$ (C) $106\ pm$ (D) $27\ pm$

64.   The molecule in which all atoms are *not* coplanar is :

(A)   (B)

(C)   (D)
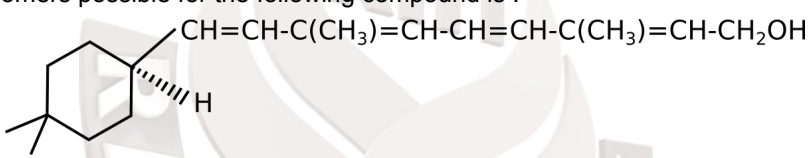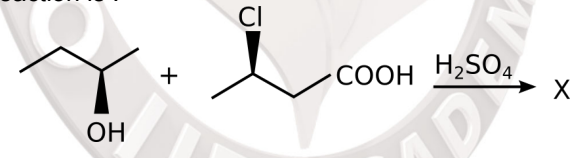
65.   The analysis of three different binary oxides of bromine (Br) and oxygen (O) gives the following results :

Comound	Mass of O combined with 1.0 g of Br
X	0.101 g
Y	0.303 g
Z	0.503 g

Which of the following statement is *not* correct ?

(I) Compound Y is Br_2O_3 (II) Compound Z is Br_2O_5
(III) Compound Z is Br_2O_7 (IV) Compound Y is Br_2O_5

(A)   I and III   (B)   II and IV

(C)   III and IV   (D)   I and II

Space for rough use

66. Among the following pairs, the one in which both the compounds as pure liquids can show significant auto ionization is :

   (A) H_2O and H_2S (B) BrF_3 and ICl_3 (C) PF_5 and PCl_5 (D) HF and HCl

67. Aluminium and copper are extracted from their oxide and sulphide ores respectively. Which of the following is correct ?
   (I) Cu is extracted by the auto reduction of copper oxide by copper sulphide.
   (II) Al cannot be obtained by chemical reduction due to its strong affinity for oxygen.
   (III) In electrometallurgy of Al, graphite is used as cathode to avoid reoxidation of Al into Al_2O_3 by preventing formation of O_2
   (IV) Sulphide ores of copper are difficult to be reduced than the oxide ores

   (A) I, II, IV (B) II and III (C) I and III (D) II and IV

68. The equilibrium constant K for the reversible reaction $A = B$ is 2×10^3 at $350\ K$. The rate constants of the forward reaction in the presence and absence of a suitable catalyst at the same temperature are $5 \times 10^4\ s^{-1}$ and $4 \times 10^{-6}\ s^{-1}$ respectively. The rate constant of the reverse reaction in the absence of the catalyst is :

   (A) $2 \times 10^{-3}\ s^{-1}$ (B) $2.5 \times 10^{-1}\ s^{-1}$ (C) $1.6 \times 10^{-7}\ s^{-1}$ (D) $1.25 \times 10^{-2}\ s^{-1}$

69. $2.0\ L$ of N_2 gas kept at $25^0 C$ and $5\ atm$ pressure were expanded isothermally against a constant pressure of $1\ atm$ until the pressure of the gas reaches $1\ atm$. Assuming ideal behaviour, work of expansion in this process (in J) is close to :

   (A) $810\ J$ (B) $194\ kJ$ (C) $-810\ kJ$ (D) $3390\ kJ$

70. The number of stereoisomers possible for the following compound is :

   (A) 4 (B) 2 (C) 16 (D) 32

71. The product $'X'$ in the following reaction is :

   (A) a racemic mixture of ester   (B) an optically inactive ester
   (C) an optically active ester   (D) a meso ester

72. The $C - O$ bond length is the shortest in :

   (A) $[Cr(CO)_6]$ (B) $[Mo(CO)_6]$ (C) $[Mn(CO)_6]^+$ (D) $[V(CO)_6]^-$

73. The standard molar entropies of $H_2(g)$, $N_2(g)$ and $NH_3(g)$ are $130, 190$ and $193\ Jmol^{-1}K^{-1}$ respectively. For the reaction is $\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \rightleftharpoons NH_3(g)\ (\Delta H_{reaction} = -45\ kJ)$ to be equilibrium, the temperature must be equal to :

   (A) $464\ K$ (B) $928\ K$ (C) $737\ K$ (D) $354\ K$

Space for rough use

74. Comound $'Y'$ (molar mass $= 88.12\ gmol^{-1}$) containing 54.52% carbon, 9.17% hydrogen and 36.31% oxygen gives a reddish - brown precipitate in Fehling's test. $'Y'$ is :

(A)

(B)

(C)

(D)
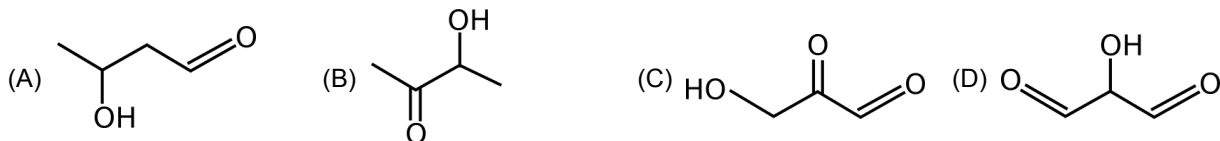
75. Number of moles of $KClO_3$ that have to be heated to produce $1.0\ L$ of $O_2\ (g)$ at STP can be expressed as :

(A) $\dfrac{1}{3}\left(\dfrac{1}{22.4}\right)$　　　(B) $\dfrac{1}{2}\left(\dfrac{1}{22.4}\right)$　　　(C) $\dfrac{2}{3}\left(\dfrac{1}{22.4}\right)$　　　(D) $\dfrac{3}{2}\left(\dfrac{1}{22.4}\right)$

76. Among the following, the compound with the highest dipole moment is :

(A) CH_3COOCH_3　　　(B) CH_3CONH_2　　　(C) $CH_3COC_2H_5$　　　(D) CH_3COCl

77. In which of the following, all the bond lengths are *not* the same ?
(I) IF_4^+　　(II) BF_4^-　　(III) SF_4　　(IV) $TeCl_4$

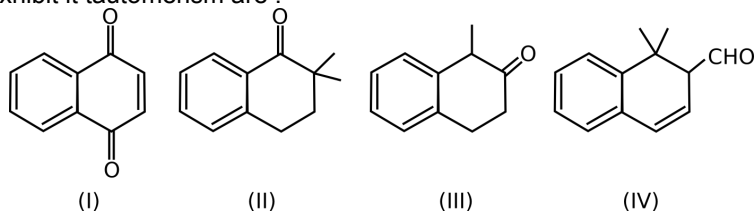(A) I, II, IV　　　(B) II, III, IV　　　(C) I, III, IV　　　(D) I, II, III

78. Compound $X(pK_a \sim 15)$ and $Y(pK_a \sim 10)$, both produce H_2 on treatment with sodium metal and both yield a mixture of isomers on mononitration. X and Y respectively are :

(A) IV, I　　　(B) III, II　　　(C) III, I　　　(D) I, III
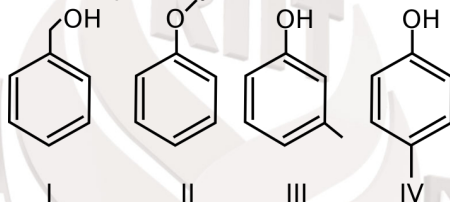
79. The compound which would undergo the reaction with ammonia by S_N1 mechanism is :
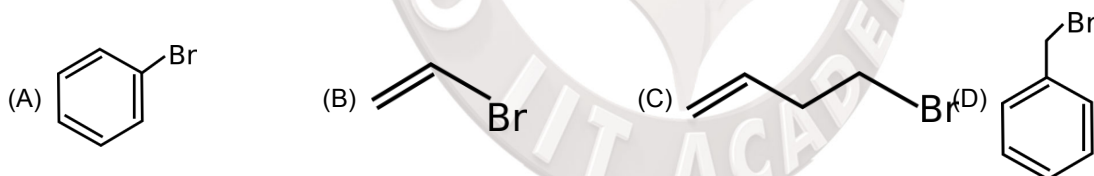
80. The molecules that can exhibit it tautomerism are :

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

Space for rough use