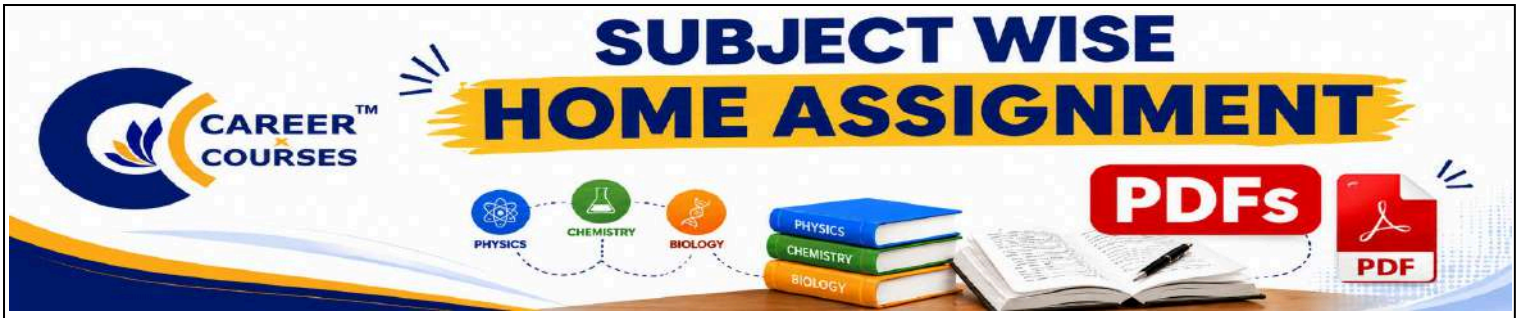


Career and Courses

Subjects : Chemistry | **JEE MAINS CHEMISTRY** | **Date** : 10-11-2026

Total Marks : 600 | **Hours** : 3 Hours

Chemistry - Section A (MCQ)

1. The amount of oxygen in $3.6\,moles$ of water is ..... g

   A) 115.2 B) 57.6 C) 28.8 D) 18.4

2. Consider the reaction
   $4HNO_3(l) + 3KCl(s) \rightarrow Cl_2(g) + NOCl(g) + 2H_2O(g) + 3KNO_3(s)$
   The amount of HNO_3 required to produce 110.0 g of KNO_3 is ..... g
   (Given : Atomic masses of H, O, N and K are $1, 16, 14$ and 39 respectively.)

   A) 32.2 B) 69.4 C) 91.5 D) 162.5

3. Identify the correct statements:
   A. Hydrated salts can be used as primary standard.
   B. Primary standard should not undergo any reaction with air.
   C. Reactions of primary standard with another substance should be instantaneous and stoichiometric.
   D. Primary standard should not be soluble in water.
   E. Primary standard should have low relative molar mass.
   Choose the correct answer from the options given below :

   A) A, B, C and E only B) A, B, and C only C) A, B and E only D) D and E only

4. 80 mL of a hydrocarbon on mixing with 264 mL of oxygen in a closed U-tube undergoes complete combustion. The residual gases after cooling to 273 K occupy 224 mL. When the system is treated with KOH solution, the volume decreases to 64 mL. The formula of the hydrocarbon is:

   A) C_2H_4 B) C_4H_{10} C) C_2H_2 D) C_2H_6

5. Given below are two statements:
   Statement I: When an electric discharge is passed through gaseous hydrogen, the hydrogen molecules dissociate and the energetically excited hydrogen atoms produce electromagnetic radiation of discrete frequencies.
   Statement II: The frequency of second line of Balmer series obtained from He^+ is equal to that of first line of Lyman series obtained from hydrogen atom.
   In the light of the above statements, choose the correct answer from the options given below:

   A) Both Statement I and Statement II are true

   B) Both Statement I and Statement II are false

   C) Statement I is false but Statement II is true

   D) Statement I is true but Statement II is false

6. If the radius of the 3^{rd} Bohr's orbit of hydrogen atom is r_3 and the radius of 4^{th} Bohr's orbit is r_4. Then ....

A) $r_4 = \frac{9}{16} r_3$ B) $r_4 = \frac{16}{9} r_3$ C) $r_4 = \frac{3}{4} r_3$ D) $r_4 = \frac{4}{3} r_3$

7. In a multielectron atom, which of the following orbitals described by three quantum numbers will have same energy in absence of electric and magnetic fields?
A. $\mathrm{n} = 1, \mathrm{l} = 0,\ \mathrm{m}_1 = 0$
B. $\mathrm{n} = 2, \mathrm{l} = 0,\ \mathrm{m}_1 = 0$
C. $\mathrm{n} = 2, \mathrm{l} = 1,\ \mathrm{m}_1 = 1$
D. $\mathrm{n} = 3, \mathrm{l} = 2,\ \mathrm{m}_1 = 1$
E. $\mathrm{n} = 3, \mathrm{l} = 2,\ \mathrm{m}_1 = 0$
Choose the correct answer from the options given below:

A) B and C Only B) A and B Only C) C and D Only D) D and E Only

8. Given below are the quantum numbers for 4 electrons.
$A.\ n = 3, l = 2, m_1 = 1, m_s = +1/2$
$B.\ n = 4, l = 1, m_1 = 0, m_s = +1/2$
$C.\ n = 4, l = 2, m_1 = -2, m_s = -1/2$
$D.\ n = 3, l = 1, m_1 = -1, m_s = +1/2$
The correct order of increasing energy is

A) $D < B < A < C$ B) $D < A < B < C$ C) $B < D < A < C$ D) $B < D < C < A$

9. Given below are two statements:
Statement (I) : The 4f and 5f - series of elements are placed separately in the Periodic table to preserve the principle of classification.
Statement (II) :S-block elements can be found in pure form in nature.
In the light of the above statements, choose the most appropriate answer from the options given below :

A) Statement I is false but Statement II is true

B) Both Statement I and Statement II are true

C) Statement I is true but Statement II is false

D) Both Statement I and Statement II are false

10. The increasing order of the atomic radii of the following elements is
$(a)\ C\ \ (b)\ O\ \ (c)\ F\ \ (d)\ Cl\ \ (e)\ Br$

A) $(b) < (c) < (d) < (a) < (e)$ B) $(a) < (b) < (c) < (d) < (e)$

C) $(d) < (c) < (b) < (a) < (e)$ D) $(c) < (b) < (a) < (d) < (e)$

11. First ionisation enthalpy values of first four group 15 elements are given below. Choose the correct value for the element that is a main component of apatite family :

A) 1402 kJ mol^{-1} B) 834 kJ mol^{-1} C) 1012 kJ mol^{-1} D) 947 kJ mol^{-1}

12. Given below are two statements:
Statement- I: Along the period, the chemical reactivity of the element gradually increases from group 1 to group 18.
Statement - II: The nature of oxides formed by group 1 element is basic while that of group 17 elements is acidic.In the the light above statements, choose the most appropriate from the questions given below:

A) Both statement I and Statement II are true.

B) Statement I is true but Statement II is False.

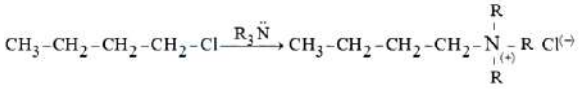
C) Statement I is false but Statement II is true.

D) Both Statement I and Statement II is false.

13. Given below are two statements:
Statement I: The conversion proceeds well in the less polar medium.

$$CH_3-CH_2-CH_2-CH_2-Cl \xrightarrow{HO^-} CH_3-CH_2-CH_2-CH_2-OH + Cl^{(-)}$$

Statement II: The conversion proceeds well in the more polar medium.



In the light of the above statements, choose the correct answer from the options given below

A) Both Statement I and Statement II are true

B) Statement I is true but Statement II is false

C) Statement I is false but Statement II is true

D) Both Statement I and Statement II are false

14. Match the LIST-I with LIST-II.

LIST-I (Molecule/ion)	LIST-II Bond pair : lone pair (on the central atom)
(A) ICl_2^-	(I) 4 : 2
(B) H_2O	(II) 4 : 1
(C) SO_2	(III) 2 : 3
(D) XeF_4	(IV) 2 : 2

Choose the correct answer from the options given below :

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

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

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

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

15. A central atom in a molecule has two lone pairs of electrons and forms three single bonds. The shape of this molecule is

A) see-saw

B) planar triangular

C) $T-$shaped

D) trigonal pyramidal

16. Given below are two statements :
Statement (I) : The correct sequence of bond lengths in the following species is :
$O_2^+ < O_2 < O_2^- < O_2^{2-}$
Statement (II) : The correct sequence of number of unpaired electrons in the following species is :
$O_2 > O_2^+ > O_2^- > O_2^{2-}$
In the light of the above statements, choose the **correct answer** from the options given below :

A) Both Statement I and Statement II are true

B) Both Statement I and Statement II are false

C) Statement I is true but Statement II is false

D) Statement I is false but Statement II is true

17. Gas 'A' undergoes change from state 'X' to state 'Y'. In this process, the heat absorbed and work done by the gas is 10 J and 18 J respectively. Now gas is brought back to state 'X' by another process during which 6 J of heat is evolved. In the reverse process of 'Y' to 'X',

A) 18 J of the work is done by the gas 'A'.

B) 2 J of the work is done by the gas 'A'.

C) 12 J of the work is done on the gas 'A' by the surrounding.

D) 14 J of the work is done on the gas 'A' by the surrounding.

18. Given
$(I)\ H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l);$
$\Delta H^o_{298\,K} = -285.9\,kJ\,mol^{-1}$
$(II)\ H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g);$
$\Delta H^o_{298\,K} = -241.8\,kJ\,mol^{-1}$
The molar enthalpy of vapourisation of water will be.....$kJ\,mol^{-1}$

A) 241.8 B) 22 C) 44.1 D) 527.7

19. The internal energy change (in J) when $90\,g$ of water undergoes complete evaporation at $100^{\circ}C$ is.....
(Given: ΔH_{vap} for water at $373\,K = 41\,kJ/mol,\ R = 8.314\,JK^{-1}mol^{-1}$)

A) 189494 B) 189480 C) 189989 D) 189950

20. It is noticed that Pb^{2+} is more stable than Pb^{2+} but Sn^{2+} is less stable than Sn^{4+}. Observe the following reactions:
$PbO_2 + Pb \rightarrow 2PbO; \Delta_r G^{\circ}(1)$
$SnO_2 + Sn \rightarrow 2SnO; \Delta_r G^{\circ}(2)$
Identify the correct set from the following.

A) $\Delta_r G^{\circ}(1) > 0; \Delta_r G^{\circ}(2) < 0$

B) $\Delta_r G^{\circ}(1) < 0; \Delta_r G^{\circ}(2) < 0$

C) $\Delta_r G^{\circ}(1) < 0; \Delta_r G^{\circ}(2) > 0$

D) $\Delta_r G^{\circ}(1) > 0; \Delta_r G^{\circ}(2) > 0$

21. $\mathrm{A_{(g)} \rightleftharpoons B_{(g)} + \frac{C}{2}(\ g)}$ The correct relationship between K_P, α and equilibrium pressure P is _____.

A) $K_P = \frac{\alpha^{1/2}P^{1/2}}{(2+\alpha)^{1/2}}$ B) $K_P = \frac{\alpha^{3/2}P^{1/2}}{(2+\alpha)^{1/2}(1-\alpha)}$ C) $K_P = \frac{\alpha^{1/2}P^{3/2}}{(2+\alpha)^{3/2}}$ D) $K_P = \frac{\alpha^{1/2}P^{1/2}}{(2+\alpha)^{3/2}}$

22. For the given reaction, choose the correct expression of $\mathrm{K_C}$ from the following :- $\mathrm{Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \rightleftharpoons (FeSCN)^{2+}_{(aq)}}$

A) $\mathrm{K_C = \frac{[FeSCN^{2+}]}{[Fe^{3+}][SCN^{-}]}}$ B) $\mathrm{K_C = \frac{[Fe^{3+}][SCN^{-}]}{[FeSCN^{2+}]}}$ C) $\mathrm{K_C = \frac{[FeSCN^{2+}]}{[Fe^{3+}]^2[SCN^{-}]^2}}$ D) $\mathrm{K_C = \frac{[FeSCN^{2+}]^2}{[Fe^{3+}][SCN^{-}]}}$

23. $(1)\ N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)\ ,\ K_1$
$(2)\ N_2(g) + O_2(g) \rightleftharpoons 2NO(g)\ ,\ K_2$
$(3)\ H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O(g)\ ,\ K_3$
The equation for the equilibrium constart of the reaction
$2NH_3(g) + \frac{5}{2}O_2(g) \rightleftharpoons 2NO(g) + 3H_2O(g)$
(K_4) in terms of K_1, K_2 , and K_3 is

A) $\frac{K_1K_2}{K_3}$ B) $\frac{K_1K_3^2}{K_2}$ C) $K_1K_2K_3$ D) $\frac{K_2K_3^3}{K_1}$

24. What happens when an inert gas is added to an equilibrium keeping volume unchanged?

A) More product will farm B) Less product will form

C) More reactant will fonn D) Equilibrium will remain unchanged

25. pH of water is 7 at $25^{\circ}\mathrm{C}$. If water is heated to $80^{\circ}\mathrm{C}$., it's pH will :

A) Decrease

B) H^+concentration increases, OH^- concentration decreases

C) Remains the same

D) Increase

26. Solubility of calcrum phosphate (molecular mass, M) in water is W_g per 100 mL at 25°C. Its solubility product at 25°C will beapproximately.

A) $10^7\left(\frac{W}{M}\right)^3$ B) $10^7\left(\frac{W}{M}\right)^5$ C) $10^3\left(\frac{W}{M}\right)^5$ D) $10^5\left(\frac{W}{M}\right)^5$

27. What would be the pH of a solution obtained by mixing $5\ g$ of acetic acid and $7.5\ g$ of sodium acetate and making the volume equal to $500\,mL$? $(K_a = 1.75 \times 10^{-5}, pK_a = 4.76)$

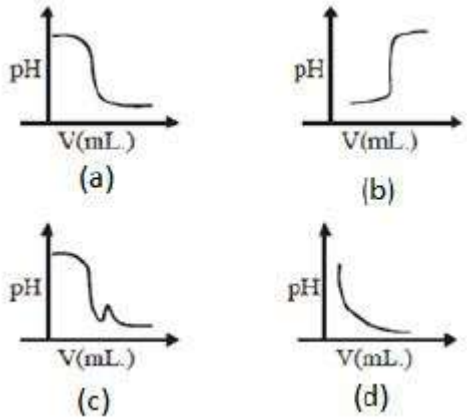
A) $pH = 4.70$

B) $pH < 4.70$

C) pH of solution will be equal to pH of acetic acid

D) $4.76 < pH < 5.0$

28. In an acid -base titration, $0.1\ M\ HCl$ solution was added to the $NaOH$ solution of unknown strength. Which of the following correctly shows the change of pH of the titration mixture in this experiment?



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

29. Which of the following sets includes all the species that will change the orange colour of $K_2Cr_2O_7$ in acidic medium?

A) $Fe^{2+}, Sn^{2+}, I^-, S^{2-}$

B) $S^{2-}, Fe^{3+}, I^-, C_2O_4^{2-}$

C) $Fe^{2+}, NO_2^-, SO_2, Sn^{4+}$

D) $Fe^{3+}, SO_4^{2-}, S^{2-}, Sn^{4+}$

30. Element not showing variable oxidation state is :

A) Bromine B) Iodine C) Chlorine D) Fluorine

31. Given below are two statements :
Statement I: S_8 solid undergoes disproportionation reaction under alkaline conditions to form S^{2-} and $S_2O_3{}^{2-}$
Statement II: ClO_4^- can undergodisproportionation reaction under acidic condition. In the light of the above statements, choose the most appropriate answer from the options given below :

A) Statement I is correct but statement II is incorrect.

B) Statement I is incorrect but statement II is correct

C) Both statement I and statement II are incorrect

D) Both statement I and statement II are correct

32. Which of the given reactions is not an example of disproportionation reaction?

A) $2H_2O_2 \rightarrow 2H_2O + O_2$

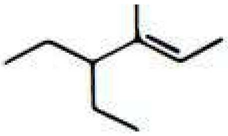
B) $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

C) $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$ D) $3MnO_4{}^{2-} + 4H^+ \rightarrow 2MnO_4{}^- + MnO_2 + 2H_2O$

33. In
$CH_2 = C = CH - CH_3$
1 2 3 4
molecule, the hybridization of carbon $1, 2, 3$ and 4 respectively are :

A) sp^3, sp, sp^3, sp^3 B) sp^2, sp^2, sp^2, sp^3 C) sp^2, sp, sp^2, sp^3 D) sp^2, sp^3, sp^2, sp^3

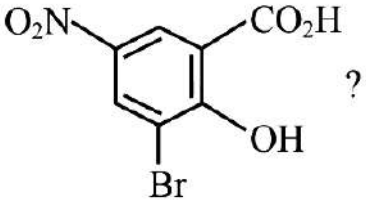
34. The $IUPAC$ name of the following compound is



A) 3— ethyl —4— methylhex —4— ene B) 4, 4— diethyl —3— methylbut —2— ene

C) 4— methyl —3— ethylhex —4— ene D) 4— ethyl —3—methylhex —2— ene

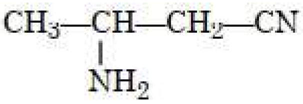
35. What is the correct IUPAC name of this structure?



A) 3-Bromo-2-hydroxy-5-nitrobenzoic acid B) 3-Bromo-4-hydroxy-1-nitrobenzoic acid

C) 2-Hydroxy-3-bromo-5-nitrobenzoic acid D) 5-Nitro-3-bromo-2-hydroxybenzoic acid

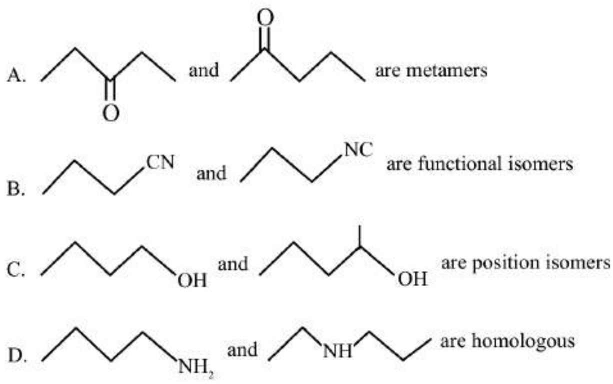
36. $IUPAC$ name of following compound is _______.



A) 2-Aminopentanenitrile B) 2-Aminobutanenitrile

C) 3-Aminobutanenitrile D) 3-Aminopropanenitrile

37. Identify the correct statements from the following



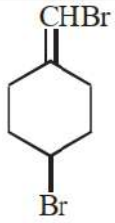
Choose the correct answer from the options given below.

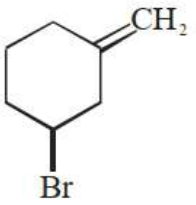
A) C & D only B) B & C only C) A & B only D) A,B & C only

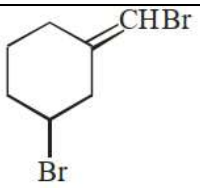
38. Staggered and eclipsed conformers of ethane are:

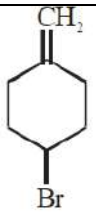
A) Enantiomers B) Rotamers C) Mirror images D) Polymers

39. Which one of the following will show geometrical isomerism?

A) 

B) 

C) 

D) 

40. The optically inactive compound from the following is

A) $2-$ chloropropanal

B) $2-$ chlorobutane

C) $2-$ chloropentane

D) $2-$ chloro $-2-$ methylbutane

41. Two compounds I and II are eluted by column chromato-graphy(adsorption of $I > II$). Which one of the following is a correct statement?

A) II moves slower and has higher R_f value than I

B) II moves faster and has higher R_f value than I

C) I moves faster and has higher R_f value than II

D) I moves slower and has higher R_f value than I

42. Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R
Assertion A : Thin layer chromatography is an adsorption chromatography.
Reason R: A thin layer of silica gel is spread over a glass plate of suitable size in thin layer chromatography which acts as an adsorbent. In the light of the above statements, choose the correct answer from the options given below.

A) Both A and R are true and R is the correct explanation of A.

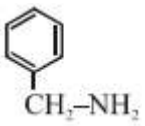
B) Both A and R are true but R is NOT the correct explanation of A

C) A is true but R is false

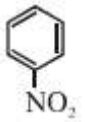
D) A is false but R is true

43. Nitrogen can be estimated by Kjeldahl's method for which of the following compound?

A) 

B) 

C) 

D) 

44. Match List I with List II

List I Element detected	List II Reagent used/Product formed
A Nitrogen	$I.\ Na_2\,[Fe(CN)_5NO]$
B Sulphur	$II.\ AgNO_3$
C Phosphorous	$III.\ Fe_4\,[Fe(CN)_6]_3$
D Halogen	$IV.\ (NH_4)_2\,MoO_4$

Choose the correct answer from the options given below:

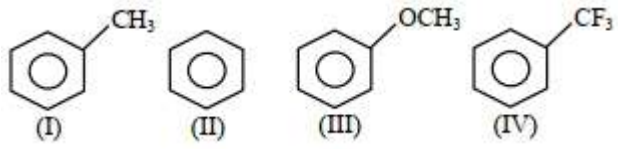
A) $A-II, B-IV, C-I, D-III$

B) $A-IV, B-II, C-I, D-III$

C) $A-II, B-I, C-IV, D-III$

D) $A-III, B-I, C-IV, D-II$

45. The correct arrangement for decreasing order of electrophilic substitution for above compounds is _____.



A) $(IV)>(I)>(II)>(III)$

B) $(III)>(I)>(II)>(IV)$

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

46. Arrange the following carbanions in the decreasing order of stability

I. $p-\mathrm{Br}-\mathrm{C_6H_4}-\overset{\ominus}{\underset{\bullet\bullet}{\mathrm{CH_2}}}$

II. $\mathrm{C_6H_5}-\overset{\ominus}{\underset{\bullet\bullet}{\mathrm{CH_2}}}$

III. $p-\mathrm{CH_3O}-\mathrm{C_6H_4}-\overset{\ominus}{\underset{\bullet\bullet}{\mathrm{CH_2}}}$

IV. $p-\mathrm{CHO}-\mathrm{C_6H_4}-\overset{\ominus}{\underset{\bullet\bullet}{\mathrm{CH_2}}}$

V. $p-\mathrm{CH_3}-\mathrm{C_6H_4}-\overset{\ominus}{\underset{\bullet\bullet}{\mathrm{CH_2}}}$

Choose the correct answer from the options given below :

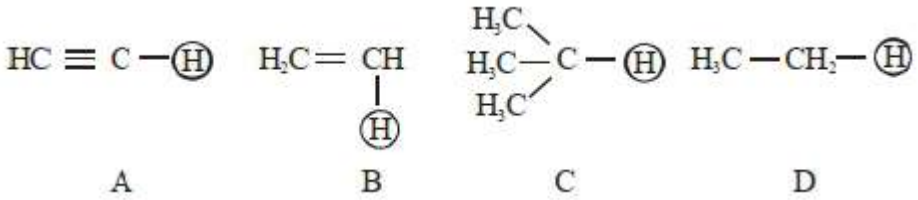
A) I > II > IV > V > III B) I > IV > II > V > III

C) IV > I > II > V > III D) IV > II > I > III > V

47. Which amongst the following is the strongest acid?

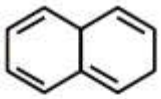
A) $CHBr_3$ B) CHI_3 C) $CH(CN)_3$ D) $CHCl_3$

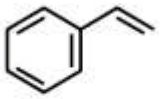
48. The ascending acidity order of the following H atoms is _____.

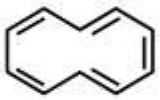


A) $C<D<B<A$ B) $A<B<C<D$ C) $A<B<D<C$ D) $D<C<B<A$

49. Which of the following are aromatic?

A. 

B. 

C. 

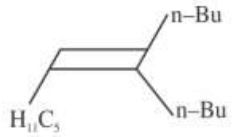
D. 

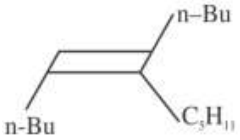
A) B and D only B) A and C only C) A and B only D) C and D only

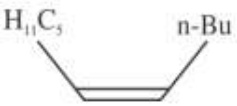
50. IUPAC name of the some alkenes are given below. Find out the correct stability order.
A. 2-Methylbut-2-ene
B. cis-But-2-ene
C. 2,3-Dimethylbut-2-ene
D. Prop-1-ene
Choose the correct answer from the options given below :

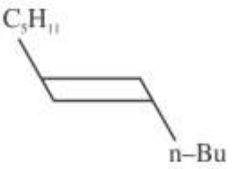
A) C > A > B > D B) C > A > D > B C) B > D > A > C D) A > B > C > D

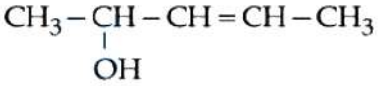
51. What will be the major product of following sequence of reactions?
$n-Bu- \equiv \frac{(i) n-BuLi, n-C_5H_{11}Cl}{(ii) Lindlar\ cat, H_2}$

A) 

B) 

C) 

D) 

52. How many different stereoisomers are possible for the given molecule?


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

53. Given below are two statements:
Statement I : The decrease in first ionization enthalpy from B to Al is much larger than that from Al to Ga.
Statement II : The d orbitals in Ga are completely filled.
In the light of the above statements, choose the most appropriate answer from the options given below

A) Statement I is incorrect but statement II is correct.
B) Both the statements I and II are correct
C) Statement I is correct but statement II is incorrect
D) Both the statements I and II are incorrect

54. Aluminium chloride in acidified aqueous solution forms an ion having _____ geometry.

A) Octahedral B) Square Planar
C) Tetrahedral D) Trigonal bipyramidal

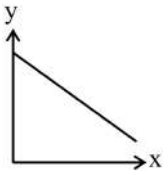
55. Identify the incorrect statement

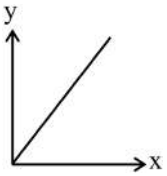
A) In $(Si_3O_9)^{6-}$, tetrahedral SiO_4 units share two oxygen atoms
B) Trialkylchlorosilane on hydrolysis gives R_3SiOH.
C) $SiCl_4$ undergoes hydrolysis to give H_4SiO_4
D) $(Si_3O_9)^{6-}$ has cyclic structure.

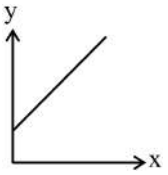
56. $BeCl_2$ reacts with $LiAlH_4$ to give ....

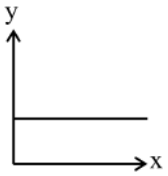
A) $Be + Li\,[AlCl_4] + H_2$ B) $Be + AlH_3 + LiCl + HCl$
C) $BeH_2 + LiCl + AlCl_3$ D) $BeH_2 + Li\,[AlCl_4]$

57. Consider a solution of $CO_2(g)$ dissolved in water in a closed container.
Which one of the following plots correctly represents variation of log (partial pressure of CO_2 in vapour phase above water) [y-axis] with log (mole fraction of CO_2 in water) [x-axis] at $25^\circ C$?

A) 

B) 

C) 

D) 

58. Density of 3 M NaCl solution is $1.25\ \mathrm{g/mL}$. The molality of the solution is _____.

A) 1.79 m B) 2.79 m C) 2 m D) 3 m

59. What is the freezing point depression constant of a solvent, 50 g of which contain 1 g non volatile solute (molar mass $256\ \mathrm{g\ mol^{-1}}$) and the decrease in freezing point is 0.40 K ?

A) $3.72\ \mathrm{K\ kg\ mol^{-1}}$ B) $1.86\ \mathrm{K\ kg\ mol^{-1}}$ C) $4.43\ \mathrm{K\ kg\ mol^{-1}}$ D) $5.12\ \mathrm{K\ kg\ mol^{-1}}$

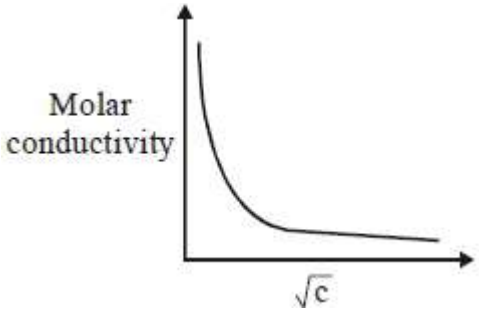
60. Which one of the following $0.10\,\mathrm{M}$ aqueous solutions will exhibit the largest freezing point depression?

A) hydrazine B) glucose C) glycine D) $\mathrm{KHSO_4}$

61. How many electrons would be required to deposit $6.35\ g$ of copper at the cathode during the electrolysis of an aqueous solution of copper sulphate? (Atomic mass of copper $= 63.5\,u$, $N_A =$ Avogadro's constant)

A) $\frac{N_A}{20}$ B) $\frac{N_A}{10}$ C) $\frac{N_A}{5}$ D) $\frac{N_A}{2}$

62. The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the given figure.
The electrolyte X is :



A) CH_3COOH B) KNO_3 C) HCl D) $NaCl$

63. The number of ions from the following that have the ability to liberate hydrogen from a dilute acid is _____.
Ti^{2+}, Cr^{2+} and V^{2+}

A) 2 B) 3 C) 1 D) 0

64. Electrode potentials (E^o) are given below
$Cu^+/Cu = +0.52\,V$,
$Fe^{3+}/Fe^{2+} = +0.77\,V$,
$\frac{1}{2}I_2\,(s)\,/I^- = +0.54\,V$,
$Ag^+/Ag = +0.88\,V$.
Based on the above potentials, strongest oxidizing agent will be

A) Cu^+ B) Fe^{3+} C) Ag^+ D) I_2

65. The correct order of acidic strength of the major products formed in the given reactions, is:

A. $PhNH_2 \xrightarrow[(2)\ CuCN\ (3)\ H_3O^+/\Delta]{(1)\ NaNO_2+HCl(<5^\circ C)} [A]$

B. $CH_3CH_2CHO \xrightarrow[\Delta]{[Ag(NH_3)_2]^+,OH^-} [B]$

C. $CH_4 + O_2 \xrightarrow[(ii)\ Na_2Cr_2O_7/H^+]{(i)\ Mo_2O_3} [C]$

D. $PhCH_2MgBr + CO_2 \xrightarrow[H_3O^+]{\text{Dryether}} [D]$

Choose the correct answer from the options given below :

A) C > B > A > D B) A > D > C > B C) A > D > B > C D) C > A > D > B

66. For a reaction of order n, the unit of the rate constant is :

A) $\text{mol}^{1-n}\text{L}^{1-n}\text{s}^{-1}$ B) $\text{mol}^{1-n}\text{L}^{n-1}\ \text{s}^{-1}$ C) $\text{mol}^{1-n}\text{L}^{1-n}\text{s}$ D) $\text{mol}^{1-n}\text{L}^{2n}\text{s}^{-1}$

67.

$[A]_0 / \text{mol L}^{-1}$	$t_{1/2}$ / min
0.100	200
0.025	100

For a given reaction $R \rightarrow P$, $t_{1/2}$ is related to $[A]_0$ as given in table.

Given: $\log 2 = 0.30$

Which of the following is true?

A. The order of the reaction is $1/2$.

B. If $[A]_0$ is 1 M , then $t_{1/2}$ is $200\sqrt{10}$ min

C. The order of the reaction changes to 1 if the concentration of reactant changes from 0.100 M to 0.500 M .

D. $t_{1/2}$ is 800 min for $[A]_0 = 1.6M$

Choose the correct answer from the options given below:

A) A and C Only B) A, B and D Only C) C and D Only D) A and B Only

68. $A \rightarrow D$ is an endothermic reaction occurring in three steps (elementary).

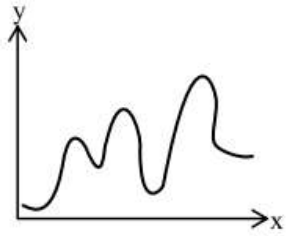
(i) $A \rightarrow B\ \Delta H_i = +ve$

(ii) $B \rightarrow C \Delta H_{ii} = -ve$

(iii) $C \rightarrow D\ \Delta H_{iii} = -ve$

Which of the following graphs between potential energy (y - axis) vs reaction coordinate (x - axis) correctly represents the reaction profile of $A \rightarrow D$?

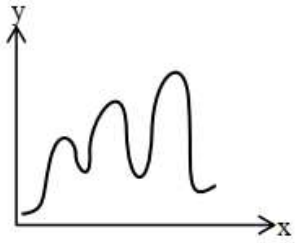
A)



B)



C)



D)



69. The spin only magnetic moments (in BM) for free Ti^{3+}, V^{2+} and Sc^{3+} ions respectively are (At.No. $Sc : 21; Ti : 22; V : 23$)

A) $1.73, 3.87, 0$ B) $0, 3.87, 1.73$ C) $3.87, 1.73, 0$ D) $1.73, 0, 3.87$

70. In $3d$ series, the metal having the highest M^{2+}/M standard electrode potential is .... .

A) Cr B) Fe C) Cu D) Zn

71. Which one of the following metals forms interstitial hydride easily ?

A) Fe B) Mn C) Cr D) Co

72. The lanthanoid that does NOT show $+4$ oxidation state is

A) Dy B) Eu C) Ce D) Tb

73. The octahedral diamagnetic low spin complex among the following is

A) $[NiCl_4]^{2-}$ B) $[CoCl_6]^{3-}$ C) $[CoF_6]^{3-}$ D) $[Co\,(NH_3)_6]^{3+}$

74. The $INCORRECT$ statement is

A) the spin-only magnetic moments of $[Fe(H_2O)_6]^{2+}$ and $[Cr(H_2O)_6]^{2+}$ are nearly similar.

B) the spin-only magnetic moment of $[Ni(NH_3)_4(H_2O)_2]^{2+}$ is $2.83\,BM$.

C) the gemstone, ruby, has Cr^{3+} ions occupying the octahedral sites of beryl.

D) the color of $[CoCl(NH_3)_5]^{2+}$ is violet as it absorbs the yellow light.

75. $[Co_2(CO)_8]$ displays

A) one $Co-Co$ bond, six terminal CO and two bridging CO

B) one $Co-Co$ bond, four terminal CO and four bridging CO

C) no $Co-Co$ bond, six terminal CO and two bridging CO

D) no $Co-Co$ bond, four terminal CO and four bridging CO

76. Match List I with List II

List I Complex	List II $CFSE(\Delta_0)$
A $[Cu\,(NH_3)_6]^{2+}$	I -0.6
B $[\mathrm{Ti}\,(N_2O)_6]^{3+}$	II -2.0
C $[Fe(CN)_6]^{3-}$	III -1.2
D $[NiF_6]^{4-}$	IV -0.4

Choose the correct answer from the options given below:

A) $A-I, B-IV, C-II, D-III$ B) $A-II, B-III, C-I, D-IV$

C) $A-I, B-II, C-IV, D-III$ D) $A-III, B-IV, C-I, D-II$

77. Match the LIST-I with LIST-II

List-I Name of reaction	List-II Reagent or catalyst used
A. Finkelstein reaction	I. SbF_3
B. Swarts reaction	II. Na, dry ether
C. Sandmeyer's reaction	III. NaI
D. Fittig reaction	IV. Cu_2Cl_2

Choose the correct answer from the options given below:

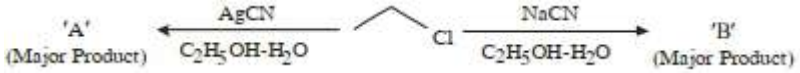
A) A-I, B-IV, C-III, D-II

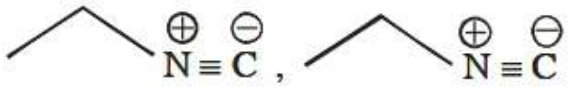
B) A-III, B-I, C-IV, D-II

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

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

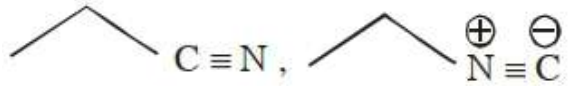
78. Considering the above reactions, the compound $'A'$ and compound $'B'$ respectively are



A) 

B) 

C) 

D) 

79. An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism **:**

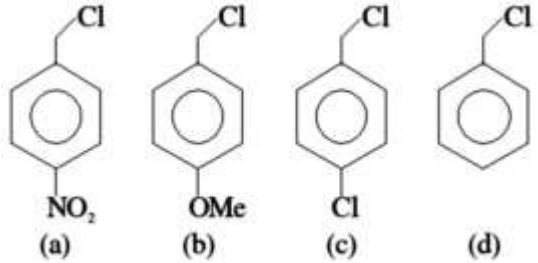
A) secondary alcohol by S_{N^1}

B) tertiary alcohol by S_{N^1}

C) secondary alcohol by S_{N^2}

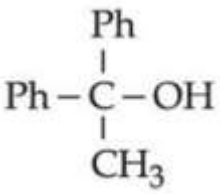
D) tertiary alcohol by S_{N^2}

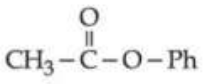
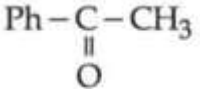
80. Decreasing order towards S_N1 reaction for the following compounds is:



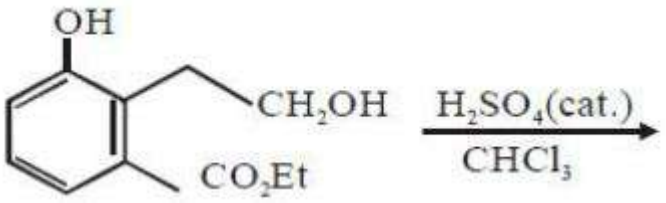
A) $a > c > d > b$ B) $a > b > c > d$ C) $b > d > c > a$ D) $d > b > c > a$

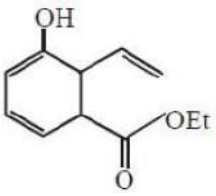
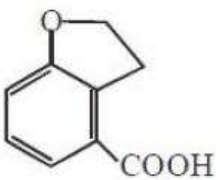
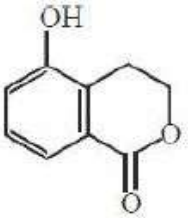
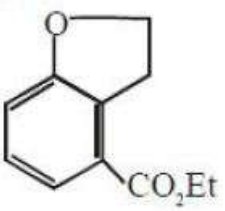
81. Which reactant will give the following alcohol on reaction with one mole of phenyl magnesium bromide $(PhMgBr)$ followed by acidic hydrolysis ?



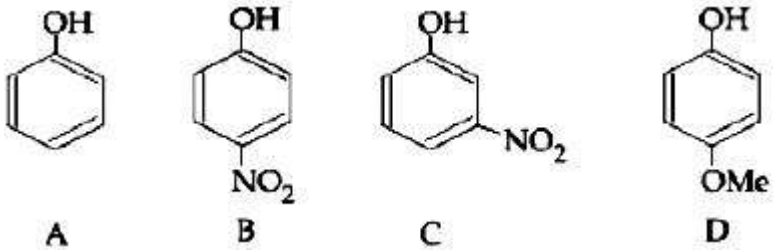
A) $CH_3 - C \equiv N$ B) $Ph - C \equiv N$ C)  D) 

82. The major product of the following reaction is



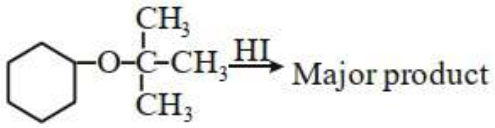
A)  B)  C)  D) 

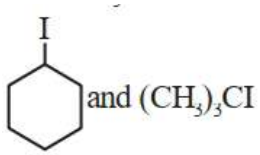
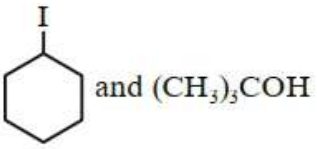
83. The increasing order of pKa values of the following compounds is

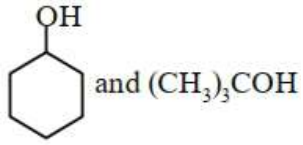
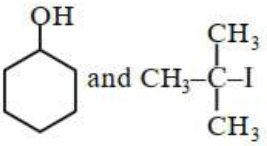


A) $C < B < A < D$ B) $B < C < D < A$ C) $D < A < C < B$ D) $B < C < A < D$

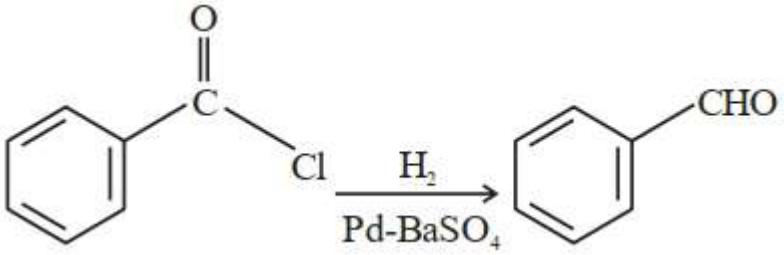
84. Major product formed in the following reaction is a mixture of:



A)  B) 

C)  D) 

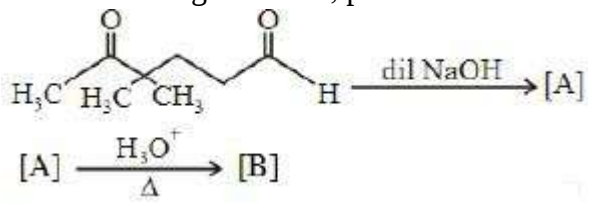
85. The reduction reaction known as:



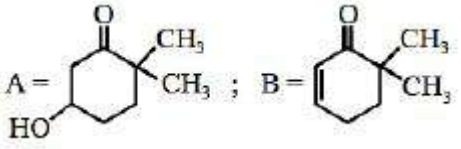
A) Rosenmund reduction B) Wolff-Kishner reduction

C) Stephen reduction D) Etard reduction

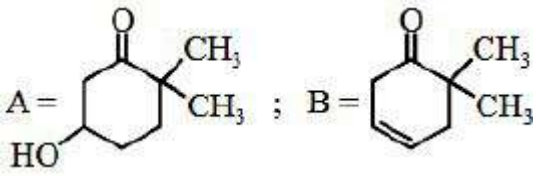
86. In the following reactions, products A and B are



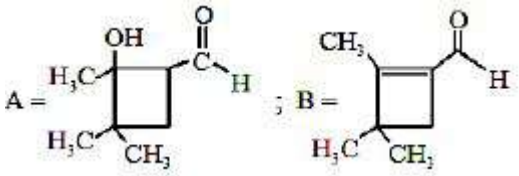
A)



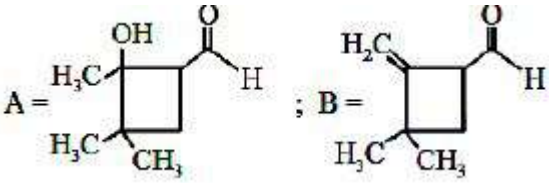
B)



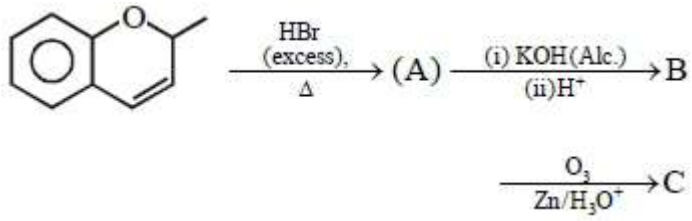
C)



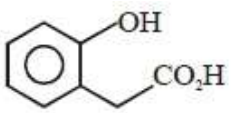
D)



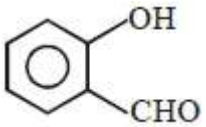
87. The major aromatic product C in the following reaction sequence will be :



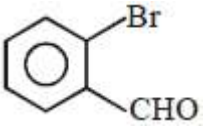
A)



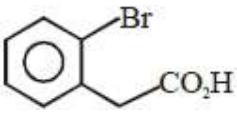
B)



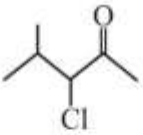
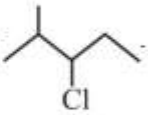
C)

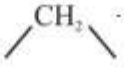


D)



88. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A :  can be subjected to Wolff-Kishner reduction to give  .

Reason R : Wolff-Kishner reduction is used to convert  into  .

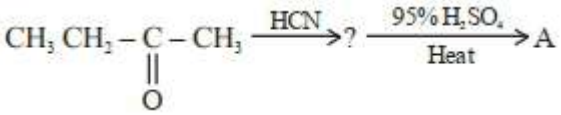
A) Both A and R are true but R is NOT the correct explanation of A.

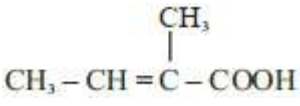
B) A is true but R is false.

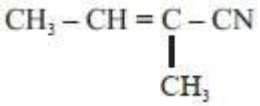
C) A is false but R is true.

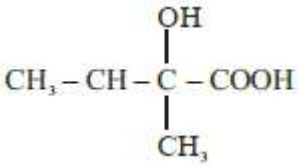
D) Both A and R are true and R is the correct explanation of A.

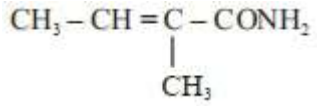
89. The final product $'A'$ in the following reaction sequence



A) 

B) 

C) 

D) 

90. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : A mixture contains benzoic acid and napthalene. The pure benzoic acid can be separated out by the use of benzene.
Reason R : Benzoic acid is soluble in hot water.
In the light of the above statements, choose the most appropriate answer from the options given below.

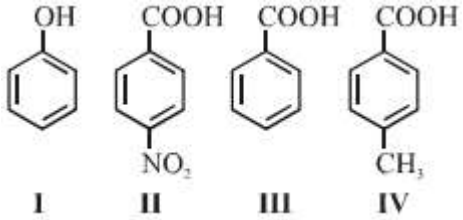
A) Both A and R are true and R is the correct explanation of A.

B) Both A and R are true but R is NOT the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

91. The correct order of acid character of the following compounds is :



A) $III > II > I > IV$

B) $IV > III > II > I$

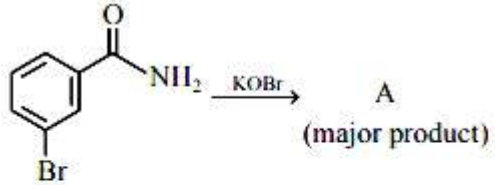
C) $I > II > III > TV$

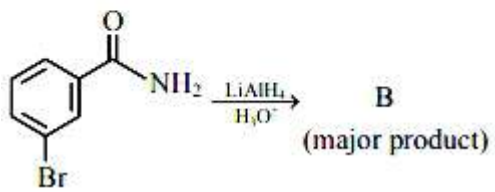
D) $II > III > IV > I$

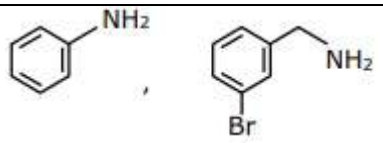
92. A primary aliphatic amine on reaction with nitrous acid in cold $(273\ K)$ and there after raising temperature of reaction mixture to room temperature $(298\ K)$. Gives a/an .....

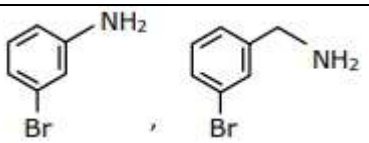
A) nitrile B) alcohol C) diazonium salt D) secondary amine

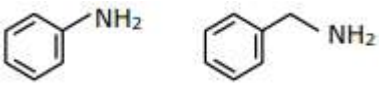
93. In the above reactions, product A and product B respectively are :

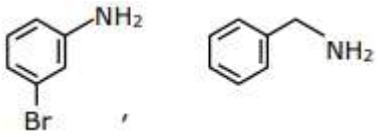




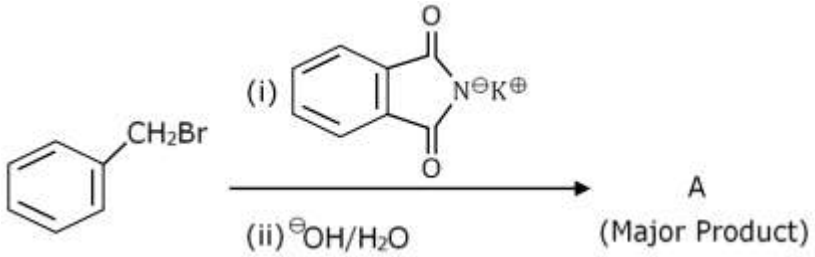
A) 

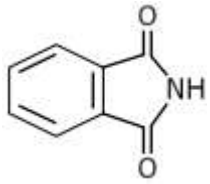
B) 

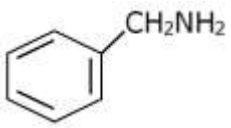
C) 

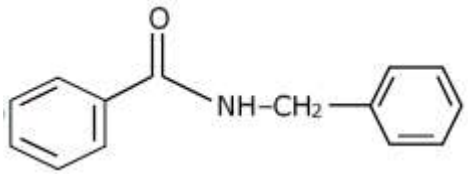
D) 

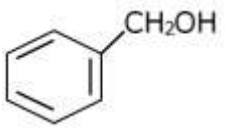
94. What is A in the following reaction?



A) 

B) 

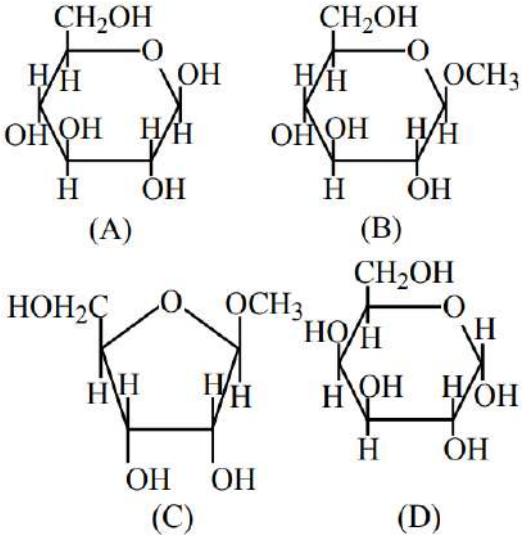
C) 

D) 

95. A sugar ' X ' dehydrates very slowly under acidic condition to give furfural which on further reaction with resorcinol gives the coloured product after sometime. Sugar ' X ' is

A) Aldopentose B) Aldotetrose C) Oxalic\,acid D) Ketotetrose

96. From the given following (A to D) cyclac structures, those which will not react with Tollen's reagent are :



A) B and D B) A and D C) A and B D) B and C

97. The secondary structure of protein is stabilised by:

A) Peptide bond B) glycosidic bond

C) Hydrogen bonding D) van der Waals forces

98. The oxoacid of phosphorus that is easily obtained from a reaction of alkali and white phosphorus and has two $P-H$ bonds, is

A) Phosphonic acid B) Phosphinic acid C) Pyrophosphorus acid D) Hypophosphoric acid

99. Bond dissociation energy of $E-H$ bond of the " H_2E " hydrides of group 16 elements (given below), follows order.
$(A)\ O$
$(B)\ S$
$(C)\ Se$
$(D)\ Te$

A) $A>B>C>D$ B) $A>B>D>C$ C) $B>A>C>D$ D) $D>C>B>A$

100. Chlorine water on standing loses its colour and forms

A) HCl only B) HCl and $HClO_2$

C) HCl and $HOCl$ D) $HOCl$ and $HOCl_2$

Chemistry - Section B (Numeric)

101. The moles of methane required to produce $81\ g$ of water after complete combustion is .... $\times 10^{-2}\ mol$. [nearest integer]

102. $4.5\ g$ of compound $A(MW=90)$ was used to make $250\ mL$ of its aqueous solution. The molarity of the solution in M is $x\times 10^{-1}$. The value of x is ..... (Rounded off to the nearest integer)

103. The number of photons emitted by a monochromatic (single frequency) infrared range finder of power 1 mW and wavelength of 1000 nm, in $0.1\ second$ is x $\times 10^{13}$. The value of x is ..... .
(Nearest integer)
$\left(\mathrm{h}=6.63\times 10^{-34}\ \mathrm{Js}, \mathrm{c}=3.00\times 10^{8}\ \mathrm{ms}^{-1}\right)$

104. The number of s-electrons present in an ion with 55 protons in its unipositive state is

105. The atomic number of Unnilunium is.....

106. The five successive ionization enthalpies of an element are $800, 2427, 3658, 25024$ and $32824\ kJmol^{-1}$. The number of valence electrons in the element is

107. Amongst the following, the number of species having the linear shape is .....
$XeF_2, I_3^+, C_3O_2, I_3^-, CO_2, SO_2, BeCl_2$ and $BCl_2^{\ominus}$

108. The total number of species from the following in which one unpaired electron is present is _____.
$[\mathrm{N_2}, \mathrm{O_2}, \mathrm{C_2^-}, \mathrm{O_2^-}, \mathrm{O_2^{2-}}, \mathrm{H_2^+}, \mathrm{CN^-}, \mathrm{He_2^+}]$

109. When 2 litre of ideal gas expands isothermally into vacuum to a total volume of 6 litre, the change in internal energy is ..... J. (Nearest integer)

110. Standard entropies of $\mathrm{X_2}, \mathrm{Y_2}$ and $\mathrm{XY_5}$ are 70,50 and 110 J $\mathrm{K^{-1}\ mol^{-1}}$ respectively. The temperature in Kelvin at which the reaction
$\frac{1}{2}\mathrm{X_2}+\frac{5}{2}\mathrm{Y_2}\rightleftharpoons \mathrm{XY_5}\Delta\mathrm{H}^{\ominus}=-35\ \mathrm{kJ\ mol^{-1}}$
will be at equilibrium is_____. (Nearest integer)

111. In a chemical reaction $A+2B\overset{K}{\rightleftharpoons}2C+D$, the initial concentration of B was 1.5 times of A but the equilibrium concentrations of A and B were found to be equal. The equilibrium, constant (K) for the aforesaid chemical reaction is

112. For the following reaction at 50°C and at 2 atm pressure,
$2N_2O_5(g) \rightleftharpoons 2N_2O_4(g) + O_2(g)$
N_2O_5 is 50% dissociated.
The magnitude of standard free energy change at this temperature is x.
$x =$ _____ J mol^{-1} [Nearest integer].
Given: $R = 8.314$ J mol^{-1} K^{-1}, $\log 2 = 0.30$, $\log 3 = 0.48$, $\ln 10 = 2.303$, $°C + 273 = K$

113. The normality of H_2SO_4 in the solution obtained on mixing $100mL$ of $0.1\ M H_2SO_4$ with $50mL$ of $0.1\ M$ $NaOH$ is $\times 10^{-1}\ N$. (Nearest Integer)

114. $25.0\ mL$ of $0.050\ M\ Ba(NO_3)_2$ is mixed with $25.0\ mL$ of $0.020\ M\ NaF$,K_{sp} of BaF_2 is 0.5×10^{-6} at $298\ K$. The ratio of $[Ba^{2+}][F^-]^2$ and K_{sp} is ..... (Nearest integer)

115. The difference in oxidation state of chromium in chromate and dichromate salts is .... .

116. See the following chemical reaction:
$Cr_2O_7^{2-} + XH^+ + 6Fe^{2+} \rightarrow YCr^{3+} + 6Fe^{3+} + ZH_2O$
The sum of $X.Y$ and Z is .....

117. In sulphur estimation, 2.0×10^{-3} mol of an organic compound (X) (molar mass 76 g mol^{-1}) gave 0.4813 g of barium sulphate (molar mass 233 g mol^{-1}). The percentage of sulphur in the compound (X) is _____ $\times 10^{-1}$ % (Nearest integer)

118. The number of sigma bonds in $\mathrm{H_3C-C=CH-C\equiv C-H}$ (with H below the CH) is .....

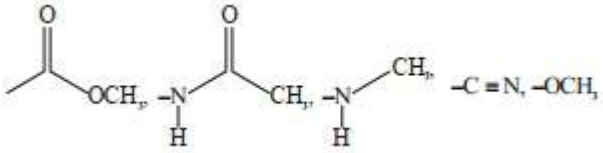
119. The number of acyclic structural isomers (including geometrical isomers) for pentene are .....

120. Optical activity of an enantiomeric mixture is $+12.6°$ and the specific rotation of (t) isomer is $+30°$. The optical purity is .....%

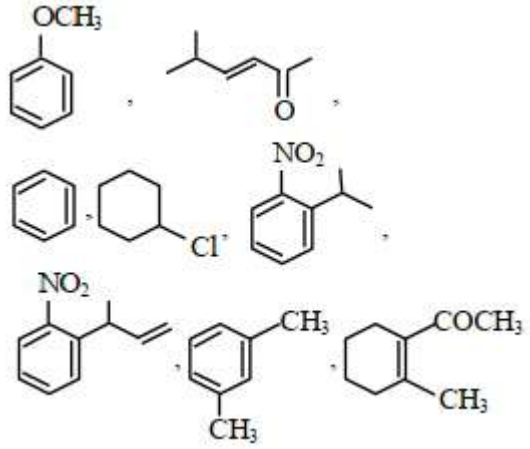
121. The complete combustion of $0.492\ g$ of an organic compound containing $'C'$,$'H'$ and $'O'$ gives $0.793\ g$ of CO_2 and $0.442\ g$ of H_2O. The percentage of oxygen composition in the organic compound is .... (nearest integer)

122. In the sulphur estimation, 0.20 g of a pure organic compound gave 0.40 g of barium sulphate. The percentage of sulphur in the compound is _____ $\times 10^{-1}$%.
(Molar mass : O = 16, S = 32, Ba = 137 in gmol^{-1})

123. Total number of deactivating groups in aromatic electrophilic substitution reaction among the following is _____.



124. How many compounds among the following compounds show inductive, mesomeric as well as hyperconjugation effects?



125. In the following sequence of reactions the maximum number of atoms present in molecule 'C' in one plane is

$$A \xrightarrow[Cu\ tube]{\text{Redhot}} \text{B} \xrightarrow[AnhydrousAlCl_3]{CH_3Cl(1eq} \text{C}$$

(A is a lowest molecular weight alkyne)

126. Number of hydrogen atoms per molecule of a hydrocarbon A having 85.8% carbon is .....(Given : Molar mass of $A = 84\, g\, mol^{-1}$)

127. For a good quality cement, the ratio of silica to alumina is found to be

128. Sea water, which can be considered as a 6 molar (6M) solution of NaCl , has a density of 2 g mL^{-1}. The concentration of dissolved oxygen (O_2) in sea water is 5.8 ppm. Then the concentration of dissolved oxygen (O_2) in sea water, is x $\times 10^{-4}$ m. x = _____. (Nearest integer)
Given: Molar mass of NaCl is 58.5 g mol^{-1} Molar mass of O_2 is 32 g mol^{-1}

129. 5 g of Na_2SO_4 was dissolved in x g of H_2O. The change in freezing point was found to be $3.82\,^oC$. If Na_2SO_4 is 81.5% ionised, the value of x (K_f for water $= 1.86\,^oC\, kg\, mol^{-1}$) is approximately ..... g (molar mass of $S = 32\, g\, mol^{-1}$ and that of $Na = 23\, g\, mol^{-1}$)

130. The limiting molar conductivities of $NaI, NaNO_3$ and $AgNO_3$ are $12.7, 12.0$ and $13.3\ m\ Sm^2\ mol^{-1}$, respectively (all at $25^\circ C$). The limiting molar conductivity of AgI at this temperature is .... $m\, Sm^2\, mol^{-1}$

131. $FeO_4^{2-} \xrightarrow{+2.2\,V} Fe^{3+} \xrightarrow{+0.70\,V} Fe^{2+} \xrightarrow{-0.45\,V} Fe^0$
$E^\theta_{FeO_4^{2-}/Fe^{2+}}$ is $x \times 10^{-3} V$. The value of x is .....

132. A molecule undergoes two independent first order reactions whose respective half lives are 12 min and 3 min. If both the reactions are occurring then the time taken for the 50% consumption of the reactant is ..... min (Nearest integer)

133. For the thermal decomposition of $\text{N}_2\text{O}_5(\text{ g})$ at constant volume, the following table can be formed, for the reaction mentioned below.
$2\ \text{N}_2\text{O}_5(\text{ g}) \rightarrow 2\ \text{N}_2\text{O}_4(\text{ g}) + \text{O}_2(\text{ g})$

Sr.No	Time/s	Total pressure/(atm)
1	0	0.6
2	100	'x'

x = ... $\times 10^{-3}$ atm [nearest integer]
Given : Rate constant for the reaction is 4.606×10^{-2} s^{-1}.

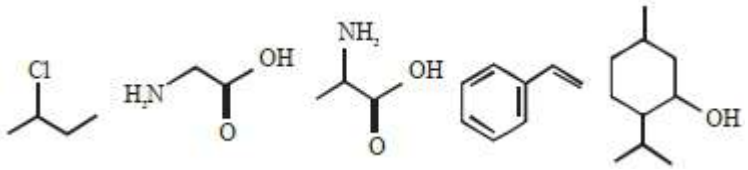
134. The spin only magnetic moment value of the ion among Ti^{2+}, V^{2+}, Co^{3+} and Cr^{2+}, that acts as strong oxidising agent in aqueous solution is _____ BM (Near integer).
(Given atomic numbers: Ti : 22, V : 23, Cr : 24, Co: 27)

135. The number of electrons involved in the reduction of permanganate to manganese dioxide in acidic medium is ……..

136. Total number of relatively more stable isomer(s) possible for octahedral complex $[Cu(en)_2(SCN)_2]$ will be ……

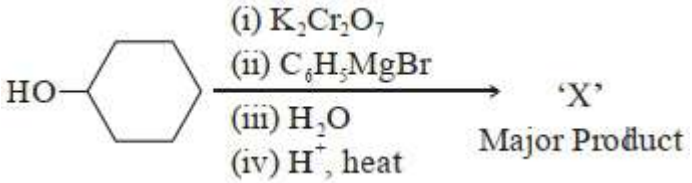
137. In potassium ferrocyanide, there are ……. pairs of electrons in the t_{2g} set of orbitals

138. Observe structures of the following compounds
$[Image]$
The total number of structures/compounds which possess asymmetric carbon atoms is ….



139. Consider all the structural isomers with molecular formula $C_5H_{11}Br$ are separately treated with KOH (aq) to give respective substitution products, without any rearrangement. The number of products which can exhibit optical isomerism from these is_____ .

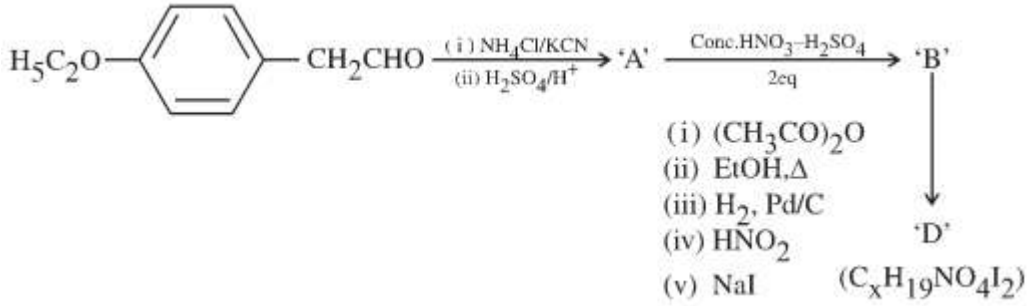
140. In the given reaction
$[Image]$
the number of sp^2 hybridised carbon (s) in compound ' X ' is …..



141. 4.7 g of phenol is heated with Zn to give product X. If this reaction goes to 60% completion then the number of moles of compound X formed will be _____ $\times 10^{-2}$. (Nearest Integer) (Given molar mass in g mol^{-1}: H:1, C:12, O:16)

142. In the Claisen-Schmidt reaction to prepare 351 g of dibenzalacetone using 87 g of acetone, the amount of benzaldehyde required is _____ g. (Nearest integer)

143. The value of x in compound ' D ' is …….

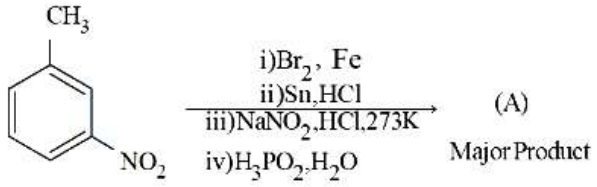


144. $C_6H_{12}O_6 \xrightarrow{\text{Zymase}} A \xrightarrow[\Delta]{NaOI} B + CHI_3$
The number of carbon atoms present in the product B is …..

145. Xg of benzoic acid on reaction with aq $NaHCO_3$ released CO_2 that occupied 11.2 L volume at STP.
X is _____ g.

146. X of enthanamine was subjected to reaction with $NaNO_2/HCl$ followed by hydrolysis to liberate N_2 and HCl. The HCl generated was completely neutralised by 0.2 moles of NaOH . X is _____ g.

147. Consider the following sequence of reactions to produce major product (A)



Molar mass of product (A) is _____ $gmol^{-1}$.
(Given molar mass in $gmol^{-1}$ of $C : 12, H : 1, O : 16, Br : 80,\ N : 14, P : 31$)

148. A short peptide on complete hydrolysis produces 3 moles of glycine (G), two moles of leucine (L) and two moles of valine (V) per mole of peptide. The number of peptide linkages in it are .....

149. The number of tripeptides formed by three different amino acids using each amino acid once is _____.

150. A group 15 element forms $d\pi - d\pi$ bond with transition metals. It also forms hydride, which is a strongest base among the hydrides of other group members that form $d\pi - d\pi$ bond. The atomic number of the element is ____.