

NEET(UG)-2024 (EXAMINATION)

(Held On Sunday 5th MAY, 2024)

CHEMISTRY

TEST PAPER WITH ANSWER AND SOLUTION

Chemistry : Section-A (Q. No. 51 to 85)

51. 'Spin only' magnetic moment is same for which of the following ions ?

- A. Ti^{3+} B. Cr^{2+}
C. Mn^{2+} D. Fe^{2+}
E. Sc^{3+}

Choose the most appropriate answer from the options given below :

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

Ans. (1)

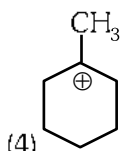
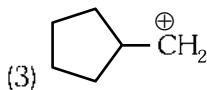
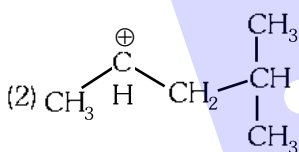
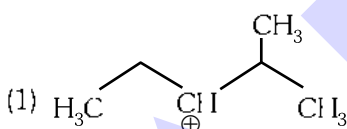
Sol. $\mu_{spin} \text{ only} = \sqrt{n(n+2)}$

where n = no. of unpaired e^-

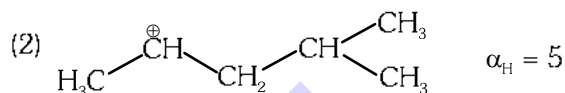
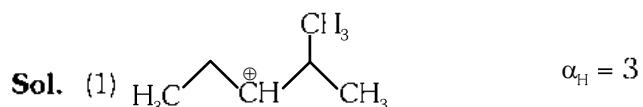
- (A) $Ti^{3+} \rightarrow 3d^1$ $n = 1$
(B) $Cr^{2+} \rightarrow 3d^4$ $n = 4$
(C) $Mn^{2+} \rightarrow 3d^5$ $n = 5$
(D) $Fe^{2+} \rightarrow 3d^6$ $n = 4$
(E) $Sc^{3+} \rightarrow 3d^0$ $n = 0$

Since (B) and (D) contain same number of unpaired e^- so they have same spin only magnetic moment.

52. The most stable carbocation among the following is :



Ans. (4)



53. Given below are two statements :

Statement-I : The boiling point of hydrides of Group-16 elements follow the order



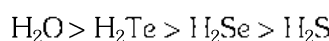
Statement-II : On the basis of molecular mass, H_2O is expected to have lower boiling point than the other members of the group but due to the presence of extensive H-bonding in H_2O , it has higher boiling point.

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

- (1) Both statement-I and Statement-II are true.
(2) Both statement-I and Statement-II are false.
(3) Statement-I is the true but Statement-II is false.
(4) Statement-I is false but Statement-II is true.

Ans. (1)

Sol. Boiling point order



$\Rightarrow$ Water has max. bpt due to presence of high extent of H-Bonding even though its molecular mass is minimum among these hydrides.



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54. Match List I with List II.

List I (Compound)	List II (Shape/geometry)
(A) NI_3	(I) Trigonal Pyramidal
(B) BrF_5	(II) Square Planar
(C) XeF_4	(III) Octahedral
(D) SF_6	(IV) Square Pyramidal

Choose the correct answer from the options given below :

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

Ans. (1)

Sol. A-I, B-IV, C-II, D-III

- (A) NI_3 - sp^3 + 1LP $\rightarrow$ Trigonal Pyramidal - (I)
(B) BrF_5 - sp^3d^2 + 1LP $\rightarrow$ Square Pyramidal - (IV)
(C) XeF_4 - sp^3d^2 + 2LP $\rightarrow$ Square Planar - (II)
(D) SF_6 - sp^3d^2 $\rightarrow$ Octahedral - (III)

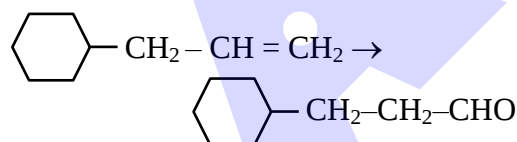
55. The highest number of helium atoms is in :

- (1) 4 mol of helium
(2) 4 u of helium
(3) 4 g of helium
(4) 2.271098 L of helium at STP

Ans. (1)

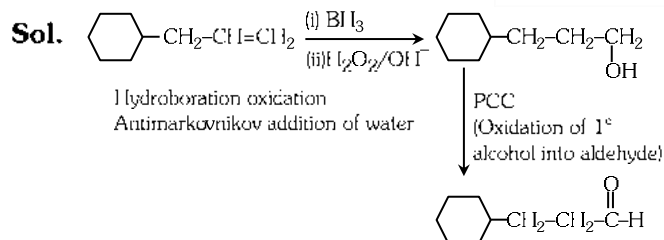
- Sol. (1) 4 mol of He ; Number of He atom = $4 \times N_A$
(2) 4u of He ; Number of He atom = 1
(3) 4 g of He ; Number of He atom = N_A
(4) 0.1 mol of He ; Number of He atom = $0.1 N_A$

56. Identify the correct reagents that would bring about the following transformation



- (1) (i) $\text{H}_2\text{O}/\text{H}^+$ (ii) CrO_3
(2) (i) BI_3 (ii) $\text{H}_2\text{O}_2 / \text{OH}^-$ (iii) PCC
(3) (i) BI_3 (ii) $\text{H}_2\text{O}_2 / \text{OH}^-$ (iii) Alk. KMnO_4 (iv) H_3O^+
(4) (i) $\text{H}_2\text{O}/\text{H}^+$ (ii) PCC

Ans. (2)



57. Match List I with List II.

List-I (Process)	List-II (Conditions)
A. Isothermal process	I. No heat exchange
B. Isochoric process	II. Carried out at constant temperature
C. Isobaric process	III. Carried out at constant volume
D. Adiabatic process	IV. Carried out at constant pressure

Choose the correct answer from the options given below :

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

Ans. (4)

- Sol. (A) Isothermal process $\rightarrow$ Temperature is constant(III)
(B) Isochoric process $\rightarrow$ Volume is constant(III)
(C) Isobaric process $\rightarrow$ Pressure is constant(IV)
(D) Adiabatic process $\rightarrow$ No exchange of heat(I)

58. Which one of the following alcohols reacts instantaneously with Lucas reagent ?

- (1) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2\text{OH}$
(2) $\text{CH}_3 - \text{CH}_2 - \underset{\text{CH}_3}{\text{CH}} - \text{OH}$
(3) $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2\text{OH}$
(4) $\text{CH}_3 - \underset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}} - \text{OH}$

Ans. (4)



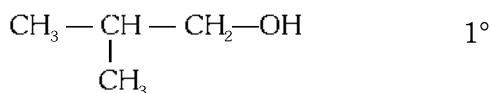
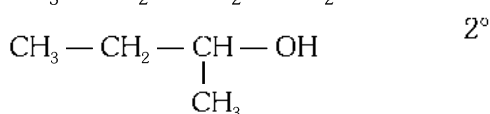
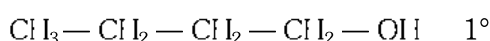
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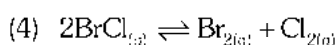
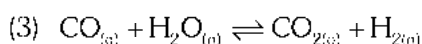
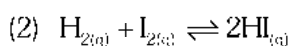
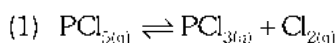
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Sol. Reactivity order of alcohols towards Lucas' reagent

$3^\circ \text{ alcohol} > 2^\circ \text{ alcohol} > 1^\circ \text{ alcohol}$



59. In which of the following equilibria, K_p and K_c are **NOT** equal?

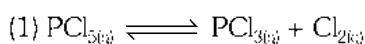


Ans. (1)

Sol. $K_p = K_c (\text{RT})^{\Delta n_g}$

when $\Delta n_g = 0$ then $K_p = K_c$

$\Delta n_g \neq 0$ $K_p \neq K_c$



$\Delta n_g \neq 0$

$K_p \neq K_c$

60. Match List I with List II.

List I
Quantum Number

A. m_ℓ

B. m_s

C. ℓ

D. n

List II
Information provided

I. shape of orbital

II. size of orbital

III. orientation of orbital

IV. orientation of spin of electron

Choose the correct answer from the options given below :

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

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

Ans. (2)

Sol. $m_\ell \rightarrow$ orientation of orbital

$m_s \rightarrow$ orientation of spin of e^-

$\ell \rightarrow$ shape of orbital

$n \rightarrow$ size of orbital

61. Given below are two statements :

Statement I : Aniline does not undergo Friedel-Crafts alkylation reaction

Statement II : Aniline cannot be prepared through Gabriel synthesis.

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

(1) Both Statement I and Statement II are true.

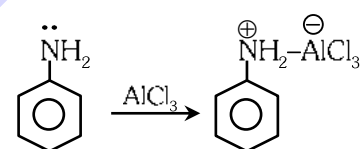
(2) Both Statement I and Statement II are false.

(3) Statement I is correct but Statement II is false.

(4) Statement I is incorrect but Statement II is true.

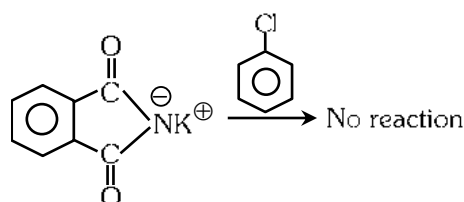
Ans. (1)

Sol. Statement-I Explanation : Aniline forms complex with lewis acid (AlCl_3),



So statement-I is correct.

Statement-II Explanation : Aryl halide are not good substrate for nucleophilic substitution reaction so aniline does not give Gabriel synthesis.



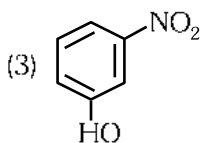
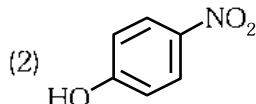
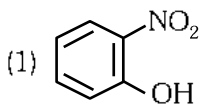
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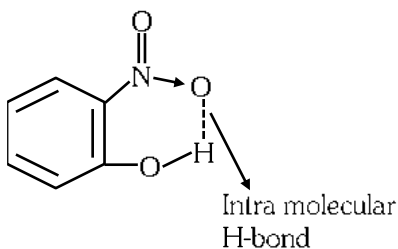
62. Intramolecular hydrogen bonding is present in :



(4) HF

Ans. (1)

Sol. O-nitrophenol will show intra molecular H-Bonding



63. On heating, some solid substances change from solid to vapour state without passing through liquid state. The technique used for the purification of such solid substances based on the above principle is known as :

- (1) Crystallization (2) Sublimation
(3) Distillation (4) Chromatography

Ans. (2)

Sol. Sublimation

64. In which of the following processes entropy increases ?

- A. A liquid evaporates to vapour
B. Temperature of a crystalline solid lowered from 130 K to 0K.
C. $2\text{NaHCO}_3(s) \rightarrow \text{Na}_2\text{CO}_3(s) + \text{CO}_2(g) + \text{H}_2\text{O}(g)$
D. $\text{Cl}_2(g) \rightarrow 2\text{Cl}(g)$

Choose the correct answer from the options given below :

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

Ans. (3)

Sol. (A) When liquid evaporates to vapour, randomness increases hence entropy increases.

(B) Temperature decreases $\Rightarrow$ entropy decreases

(C) $\Delta n_g = 2 - 0 = 2$

$\Delta n_g = +ve \rightarrow \Delta S = +ve \Rightarrow$ entropy increases

(D) $\Delta n_g = 2 - 1 = 1$

$\Delta n_g = +ve \rightarrow \Delta S = +ve \Rightarrow$ entropy increases

(A), (C), (D) are correct.

65. Among Group 16 elements, which one does NOT show -2 oxidation state ?

- (1) O (2) Se
(3) Te (4) Po

Ans. (4)

Sol. Po does not show -2 oxidation state due to its metallic nature

66. Match List-I with List-II.

List-I (Conversion)	List-II (Number of Faraday required)
(A) 1 mol of I_2O to O_2	(I) 3F
(B) 1 mol of MnO_4^- to Mn^{2+}	(II) 2F
(C) 1.5 mole of Ca from molten CaCl_2	(III) 1F
(D) 1 mol of FeO to Fe_2O_3	(IV) 5F
(1) A-II, B-IV, C-I, D-III	
(2) A-III, B-IV, C-I, D-II	
(3) A-II, B-III, C-I, D-IV	
(4) A-III, B-IV, C-II, D-I	

Ans. (1)

Sol. (A) $2\text{I}_2\text{O} \rightarrow \text{O}_2 + 4\text{I}^+ + 4\text{e}^-$

1 mol I_2O will req. 2F charge

(B) $8\text{I}^+ + \text{MnO}_4^- + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{I}_2\text{O}$

1 mole MnO_4^- will req. 5F charge.

(C) $\text{CaCl}_2 + 2\text{e}^- \rightarrow \text{Ca} + 2\text{Cl}^-$

1.5 mole Ca will req. 3F charge.

(D) $2\text{FeO} + \text{I}_2\text{O} \rightarrow \text{Fe}_2\text{O}_3 + 2\text{I}^+ + 2\text{e}^-$

1 mole FeO will req. 1 F charge.

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

67. Arrange the following elements in increasing order of electronegativity.

N, O, F, C, Si

Choose the correct answer from the options given below :

- (1) $\text{Si} < \text{C} < \text{N} < \text{O} < \text{F}$ (2) $\text{Si} < \text{C} < \text{O} < \text{N} < \text{F}$
(3) $\text{O} < \text{F} < \text{N} < \text{C} < \text{Si}$ (4) $\text{F} < \text{O} < \text{N} < \text{C} < \text{Si}$

Ans. (1)

Sol. EN order (Pauling scale value)

$\text{Si} < \text{C} < \text{N} < \text{O} < \text{F}$

$1.8 < 2.5 < 3.0 < 3.5 < 4$



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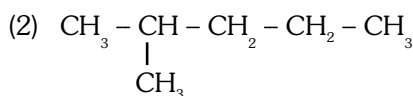
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68. A compound with a molecular formula of C_6H_{14} has two tertiary carbons. Its IUPAC name is :

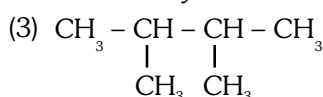
- (1) n-hexane (2) 2-methylpentane
(3) 2, 3-dimethylbutane (4) 2, 2-dimethylbutane

Ans. (3)

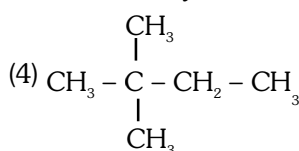
Sol. (1) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$
No tertiary carbon



One tertiary carbon



Two tertiary carbon



No tertiary carbon

69. Fehling's solution 'A' is

- (1) aqueous copper sulphate
(2) alkaline copper sulphate
(3) alkaline solution of sodium potassium tartrate (Rochelle's salt)
(4) aqueous sodium citrate

Ans. (1)

Sol. Fehling reagent comprises of two solution
Fehling A $\rightarrow$ aq. solution of $CuSO_4$
Fehling B $\rightarrow$ alkaline sodium potassium tartrate (Rochelle salt)

70. Activation energy of any chemical reaction can be calculated if one knows the value of

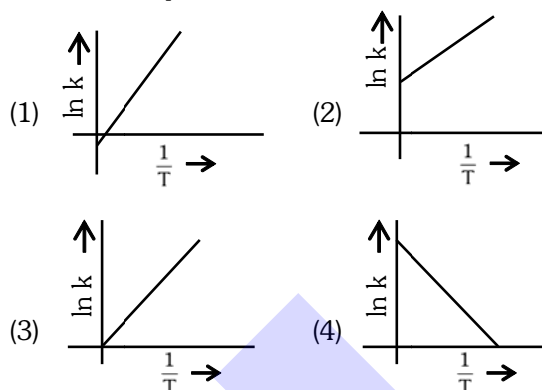
- (1) rate constant at standard temperature.
(2) probability of collision.
(3) orientation of reactant molecules during collision.
(4) rate constant at two different temperatures.

Ans. (4)

Sol. $\log_{10} \left(\frac{k_2}{k_1} \right) = \frac{E_a}{2.303R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$

Here k_1 is rate constant at T_1 .
 k_2 is rate constant at T_2 .

71. Which plot of $\ln k$ vs $\frac{1}{T}$ is consistent with Arrhenius equation?



Ans. (4)

Sol. $k = A \cdot e^{-E_a/RT}$

$$\ln k = \ln A - \frac{E_a}{RT}$$

$$\ln k = \frac{-E_a}{R} \left(\frac{1}{T} \right) + \ln A$$

$$y = mx + c$$

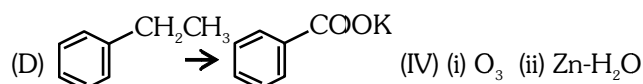
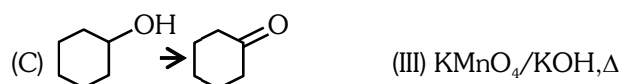
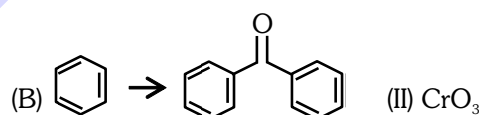
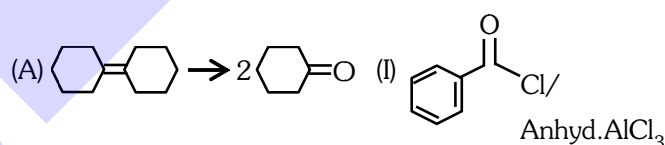
On comparing $\Rightarrow \ln k \rightarrow y ; \frac{1}{T} \rightarrow x$

This is a equation of straight line with negative slope.

72. Match List I with List II.

List I
(Reaction)

List II
(Reagents/Condition)



Choose the correct answer from the options given below :

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

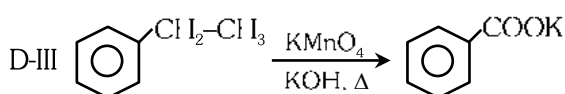
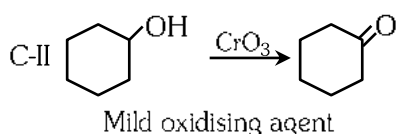
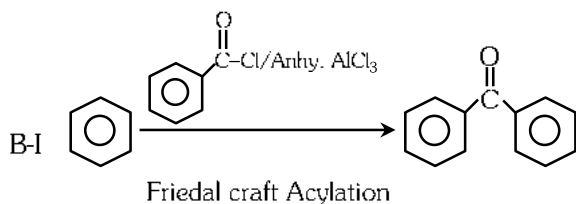
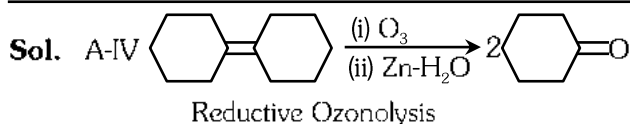
Ans. (3)



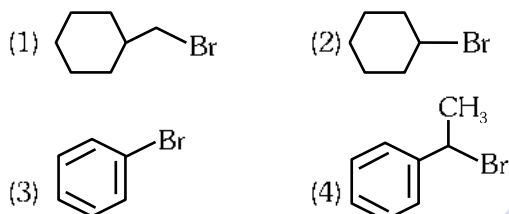
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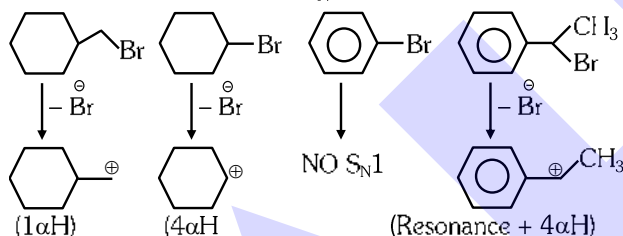


73. The compound that will undergo S_N1 reaction with the fastest rate is :

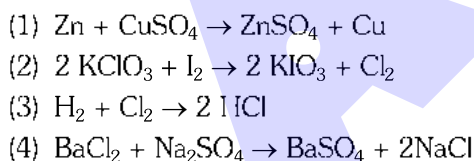


Ans. (4)

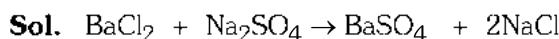
Sol. Reactivity towards $S_N1 \propto$ stability of carbocation



74. Which reaction is **NOT** a redox reaction ?



Ans. (4)



As there is no change in oxidation state of any element therefore this is not a redox reaction.

75. Given below are two statements :

Statement I : The boiling point of three isomeric pentanes follows the order
n-pentane > isopentane > neopentane

Statement II : When branching increases, the molecule attains a shape of sphere. This results in smaller surface area for contact, due to which the intermolecular forces between the spherical molecules are weak, thereby lowering the boiling point.

In the light of the above statements, choose the *most appropriate* answer from the options given below :

- (1) Both statement I and Statement II are correct
- (2) Both Statement I and Statement II are incorrect
- (3) Statement I is correct but Statement II is incorrect
- (4) Statement I is incorrect but Statement II is correct

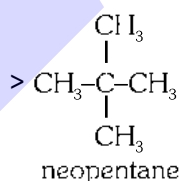
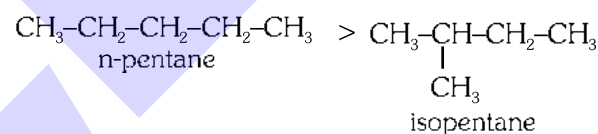
Ans. (1)

Sol. For alkanes

Boiling point $\propto$ molecular mass

$$\propto \frac{1}{\text{Branching}} \quad (\text{if molecular mass is same})$$

Boiling point



76. Given below are two statements :

Statement I : Both $[\text{Co}(\text{NH}_3)_6]^{+3}$ and $[\text{CoF}_6]^{3-}$ complexes are octahedral but differ in their magnetic behaviour.

Statement II : $[\text{Co}(\text{NH}_3)_6]^{3+}$ is diamagnetic whereas $[\text{CoF}_6]^{3-}$ is paramagnetic.

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

- (1) Both statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true

Ans. (1)

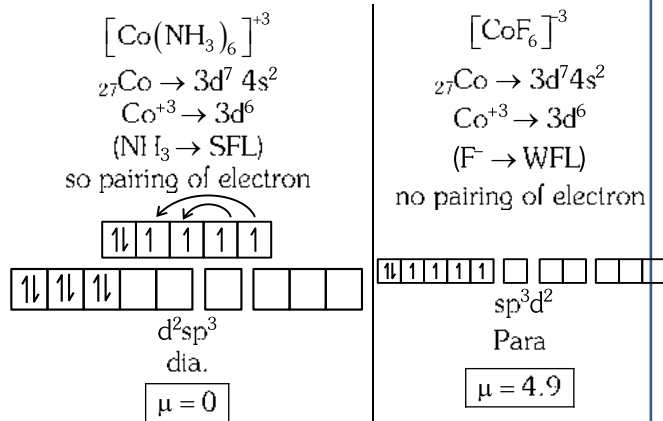


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Sol.



77. Match List I with List II.

List-I
(Molecule)

List-II
(Number and types of bond/s between two carbon atoms)

- | | |
|----------------------------------|--|
| A. ethane | I. one σ -bond and two π -bonds |
| B. ethene | II. two π -bonds |
| C. carbon molecule, C_2 | III. one σ -bond |
| D. ethyne | IV. one σ -bond and one π -bond |

Choose the correct answer from the options given below :

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

Ans. (3)

- Sol.** (A) ethane 1σ
- (B) ethene $1\sigma, 1\pi$
- (C) C_2 $\text{C} \equiv \text{C}$ 2π (as per MOT)
- (D) ethyne $-\text{C} \equiv \text{C}-$ $1\sigma, 2\pi$

78. The Henry's law constant (K_H) values of three gases (A, B, C) in water are 145, 2×10^{-5} and 35 kbar, respectively. The solubility of these gases in water follow the order :

- (1) $B > A > C$ (2) $B > C > A$
(3) $A > C > B$ (4) $A > B > C$

Ans. (2)

Sol. Solubility $\propto \frac{1}{K_H}$

$K_H \downarrow \rightarrow \text{Solubility} \uparrow$

$B > C > A$

79. The energy of an electron in the ground state ($n = 1$) for He^+ ion is $-xJ$, then that for an electron in $n = 2$ state for Be^{3+} ion in J is :

- (1) $-x$ (2) $-\frac{x}{9}$
(3) $-4x$ (4) $-\frac{4}{9}x$

Ans. (1)

Sol. $E \propto \frac{Z^2}{n^2}$

$$\frac{E_1}{E_2} = \frac{Z_1^2}{n_1^2} \times \frac{n_2^2}{Z_2^2}$$

$$\text{He}^+ \rightarrow n_1 = 1 \text{ \& } Z_1 = 2$$

$$\text{Be}^{3+} \rightarrow n_2 = 2 \text{ \& } Z_2 = 4$$

$$\frac{E_1}{E_2} = \frac{2^2}{1^2} \times \frac{2^2}{4^2} = 1$$

$$E_1 = E_2$$

80. The E° value for the $\text{Mn}^{3+}/\text{Mn}^{2+}$ couple is more positive than that of $\text{Cr}^{3+}/\text{Cr}^{2+}$ or $\text{Fe}^{3+}/\text{Fe}^{2+}$ due to change of

- (1) d^5 to d^4 configuration (2) d^5 to d^2 configuration
(3) d^4 to d^5 configuration (4) d^3 to d^5 configuration

Ans. (3)

Sol. $\text{Mn}^{3+}/\text{Mn}^{2+}$ $E^\circ = +ve$

$$_{25}\text{Mn} \rightarrow 3d^5 4s^2$$

$$\text{Mn}^{+2} \rightarrow 3d^5$$

$$\text{Mn}^{+3} \rightarrow 3d^4$$

81. The reagents with which glucose does **not** react to give the corresponding tests/products are

- A. Tollens' reagent B. Schiff's reagent
C. HCN D. Ni_2OI
E. NaHSO_3

Choose the correct options from the given below :

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

Ans. (3)



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Sol. Glucose	(A) Tollens' reagent	Silver mirror
	(B) Schiff's reagent	No reaction
	(C) HCN	Cyanohydrin formation
	(D) NI_2OH	Oxime formation
	(E) NaHSO_3	No reaction

82. Match List I with List II.

List-I (Complex)	List-II (Type of isomerism)
A. $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$	I. Solvate isomerism
B. $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$	II. Linkage isomerism
C. $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	III. Ionization isomerism
D. $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	IV. Coordination isomerism

Choose the correct answer from the options given below :

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

Ans. (1)

Sol.

(A)	$[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$	Linkage
	NO_2^- can be converted into ONO^-	
(B)	$[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$	Ionisation
(C)	$[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	Coordination
(D)	$[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	Solvate

83. Arrange the following elements in increasing order of first ionization enthalpy :

Li, Be, B, C, N

Choose the correct answer from the options given below :

- (1) $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N}$
 (2) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N}$
 (3) $\text{Li} < \text{Be} < \text{C} < \text{B} < \text{N}$
 (4) $\text{Li} < \text{Be} < \text{N} < \text{B} < \text{C}$

Ans. (2)

Sol. $\text{Li} < \text{Be} > \text{B} < \text{C} < \text{N}$
 $2s^1 \quad 2s^2 \quad 2s^2 2p^1 \quad 2s^2 2p^2 \quad 2p^2 2p^3$
 $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N}$

84. 1 gram of sodium hydroxide was treated with 25 mL of 0.75 M HCl solution, the mass of sodium hydroxide left unreacted is equal to

- (1) 750 mg (2) 250 mg
 (3) Zero mg (4) 200 mg

Ans. (2)

Sol. $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

Given $\Rightarrow$ 1g (0.75 M, 25 ml)

moles of NaOH = $\frac{1}{40} \text{ mol} = 0.025 \text{ mol}$

moles of HCl = $\frac{0.75 \times 25}{1000} = 0.01875 \text{ mol}$

now find the L.R. $\Rightarrow$ Value = $\frac{\text{given amount}}{\text{S.C}}$

$$\begin{array}{ccc} \text{NaOH} & ; & \text{HCl} \\ \frac{0.025}{1} & > & \frac{0.01875}{1} \end{array}$$

So, L.R will be HCl

Unreacted moles of NaOH = $0.025 - 0.01875$

= 0.00625 mol

Unreacted mass = $0.00625 \times 40 \text{ g}$

= 0.25 g

= 250 mg



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85. For the reaction $2A \rightleftharpoons B + C$, $K_c = 4 \times 10^{-3}$. At a given time, the composition of reaction mixture is: $[A] = [B] = [C] = 2 \times 10^{-3} \text{ M}$.

Then, which of the following is correct ?

- (1) Reaction is at equilibrium.
- (2) Reaction has a tendency to go in forward direction.
- (3) Reaction has a tendency to go in backward direction.
- (4) Reaction has gone to completion in forward direction.

Ans. (3)

Sol. $2A \rightleftharpoons B + C$; $K_c = 4 \times 10^{-3}$

At a given time $\Rightarrow [A] = [B] = [C] = 2 \times 10^{-3} \text{ M}$

$$Q_c = \frac{[B][C]}{[A]^2}$$

$$Q_c = 1$$

as $Q_c > K_c$

Reaction has a tendency to go in backward direction.

Chemistry : Section-B (Q. No. 86 to 100)

86. Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing group number from 0 to VI.

- | | |
|---------------------|---------------------|
| A. Al^{3+} | B. Cu^{2+} |
| C. Ba^{2+} | D. Co^{2+} |
| E. Mg^{2+} | |

Choose the correct answer from the options given below:

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

Ans. (1)

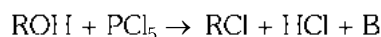
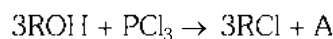
Sol. **Basic Radicals**

Group Number

- | | |
|---------------------|-----|
| B. Cu^{2+} | II |
| A. Al^{3+} | III |
| D. Co^{2+} | IV |
| C. Ba^{2+} | V |
| E. Mg^{2+} | VI |

Ans. (1) B, A, D, C, E

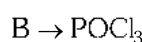
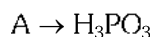
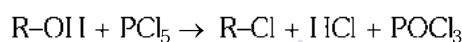
87. The products A and B obtained in the following reactions, respectively, are



- | | |
|---|---|
| (1) POCl_3 and H_3PO_3 | (2) POCl_3 and H_3PO_4 |
| (3) H_3PO_4 and POCl_3 | (4) H_3PO_3 and POCl_3 |

Ans. (4)

Sol. $3\text{R-OH} + \text{PCl}_3 \rightarrow 3\text{RCl} + \text{H}_3\text{PO}_3$



88. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is:

(Given : Molar mass of Cu : 63 g mol^{-1} , $1F = 96487 \text{ C}$)

- | | |
|------------|--------------|
| (1) 3.15 g | (2) 0.315 g |
| (3) 31.5 g | (4) 0.0315 g |

Ans. (2)

Sol. $W = \frac{E_{\text{it}}}{96487}$

$$W = \frac{63}{2} \times \frac{9.6487 \times 100}{96487}$$

$$W = 0.315 \text{ g of Cu}$$

89. The plot of osmotic pressure (Π) vs concentration (mol L^{-1}) for a solution gives a straight line with slope $25.73 \text{ L bar mol}^{-1}$. The temperature at which the osmotic pressure measurement is done is:

(Use $R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

- | | |
|---------------------------|---------------------------|
| (1) 37°C | (2) 310°C |
| (3) 25.73°C | (4) 12.05°C |

Ans. (1)

Sol. $\pi = \frac{C}{M} RT$

On comparing with $y = mx$

$$\text{Slope (m)} = RT$$

$$25.73 = 0.083 \times T$$

$$T = 310 \text{ K} = 37^\circ\text{C}$$



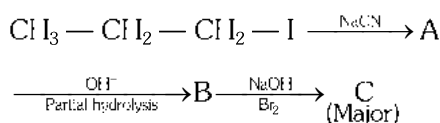
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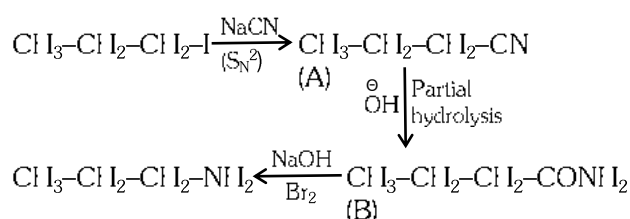
90. Identify the major product C formed in the following reaction sequence:



- (1) propylamine
- (2) butylamine
- (3) butanamide
- (4) α - bromobutanoic acid

Ans. (1)

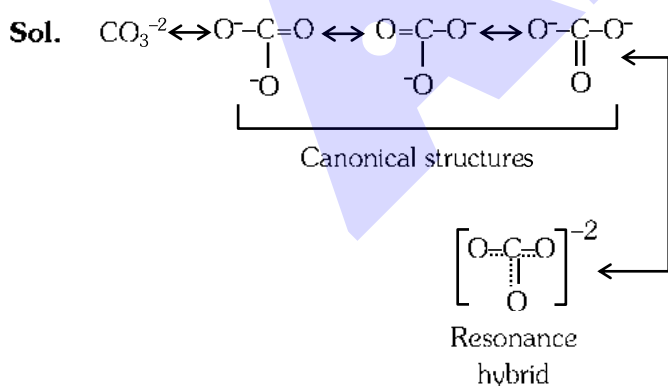
Sol.



91. Identify the **correct** answer.

- (1) Three resonance structures can be drawn for ozone
- (2) BF_3 has non-zero dipole moment
- (3) Dipole moment of NF_3 is greater than that of NH_3
- (4) Three canonical forms can be drawn for CO_3^{2-} ion.

Ans. (4)



92. Given below are two statements :

Statement I : $[\text{Co}(\text{NH}_3)_6]^{3+}$ is a homoleptic complex whereas $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is a heteroleptic complex.

Statement II : Complex $[\text{Co}(\text{NH}_3)_6]^{3+}$ has only one kind of ligands but $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ has more than one kind of ligands.

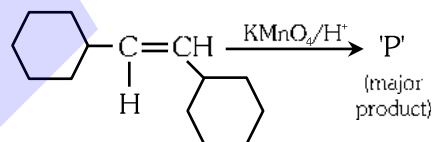
In the light of the above statements, choose the correct answer from the options given below.

- (1) Both Statement I and Statement II are true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is true but Statement II is false.
- (4) Statement I is false but Statement II is true.

Ans. (1)

Sol. In homoleptic complex only one kind of ligands are present. While in heteroleptic complex more than one kind of ligands are present in coordination sphere.

93. For the given reaction



'P' is

- (1) Cyclohexyl-CHO
- (2) Cyclohexyl-COOH
- (3) Cyclohexyl-CH(OH)-CH(OH)-Cyclohexyl
- (4) Cyclohexyl-C(=O)-C(=O)-Cyclohexyl

Ans. (2)

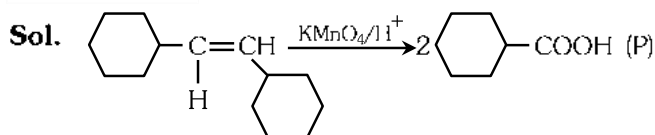


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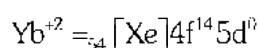
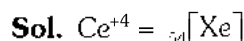
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94. The pair of lanthanoid ions which are diamagnetic is

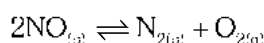
- (1) Ce^{4+} and Yb^{2+} (2) Ce^{3+} and Eu^{2+}
(3) Gd^{3+} and Eu^{3+} (4) Pm^{3+} and Sm^{3+}

Ans. (1)



Both species do not contain any unpaired electron. Hence, they are diamagnetic.

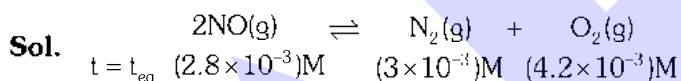
95. Consider the following reaction in a sealed vessel at equilibrium with concentrations of $\text{N}_2 = 3.0 \times 10^{-3} \text{ M}$, $\text{O}_2 = 4.2 \times 10^{-3} \text{ M}$ and $\text{NO} = 2.8 \times 10^{-3} \text{ M}$.



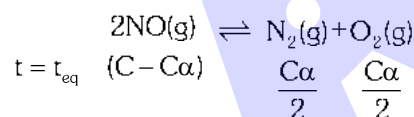
If 0.1 mol L^{-1} of $\text{NO}_{(g)}$ is taken in a closed vessel, what will be degree of dissociation (α) of $\text{NO}_{(g)}$ at equilibrium?

- (1) 0.00889 (2) 0.0889
(3) 0.8889 (4) 0.717

Ans. (4)



$$K_c = \frac{3 \times 10^{-3} \times 4.2 \times 10^{-3}}{(2.8 \times 10^{-3})^2} = \frac{3 \times 4.2}{2.8 \times 2.8} = 1.60$$



$$K_c = \frac{(C\alpha)^2}{4C^2(1-\alpha)^2}$$

$$\left(\frac{\alpha}{1-\alpha}\right)^2 = 4 \times 1.6$$

$$\frac{\alpha}{1-\alpha} = 2 \times 1.26$$

$$\frac{\alpha}{1-\alpha} = 2.52$$

$$\Rightarrow \alpha = 2.52 - 2.52\alpha$$

$$\Rightarrow \alpha = \frac{2.52}{3.52} = 0.717$$

96. A compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is :

(Given atomic masses of A = 64; B = 40; C = 32 u)

- (1) A_2BC_2 (2) ABC_3
(3) AB_2C_2 (4) ABC_4

Ans. (2)

Sol.	Element	%	Moles	Simple Ratio
	A	32	$\frac{32}{64} = \frac{1}{2}$	1
	B	20	$\frac{20}{40} = \frac{1}{2}$	1
	C	48	$\frac{48}{32} = \frac{3}{2}$	3

Empirical formula = ABC_3

97. The work done during reversible isothermal expansion of one mole of hydrogen gas at 25°C from pressure of 20 atmosphere to 10 atmosphere is :

(Given $R = 2.0 \text{ cal K}^{-1} \text{ mol}^{-1}$)

- (1) 0 calorie
(2) -413.14 calories
(3) 413.14 calories
(4) 100 calories

Ans. (2)

Sol. In Reversible Isothermal process,

$$W = -2.303 nRT \log_{10} \left(\frac{P_1}{P_2} \right)$$

$$= -2.303 \times 1 \times 2 \times 298 \log_{10} \left(\frac{20}{10} \right)$$

$$= -413.14 \text{ calories}$$



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98. During the preparation of Mohr's salt solution (Ferrous ammonium sulphate), Which of the following acid is added to prevent hydrolysis of Fe^{2+} ion?

- (1) dilute hydrochloric acid
- (2) concentrated sulphuric acid
- (3) dilute nitric acid
- (4) dilute sulphuric acid

Ans. (4)

Sol. Dil. H_2SO_4 do not acts as oxidising agent which prevent oxidation of Fe^{+2} into Fe^{+3} . While concentrated H_2SO_4 will oxidise Fe^{+2} into Fe^{+3}

99. The rate of a reaction quadruples when temperature changes from 27°C to 57°C .

Calculate the energy of activation.

Given $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $\log 4 = 0.6021$

- (1) 38.04 kJ/mol
- (2) 380.4 kJ/mol
- (3) 3.80 kJ/mol
- (4) 3804 kJ/mol

Ans. (1)

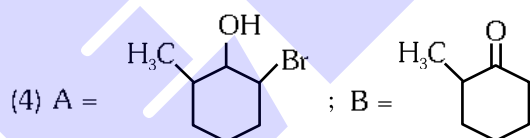
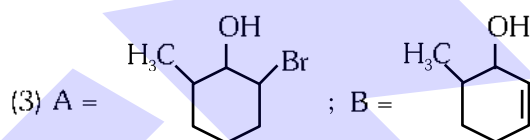
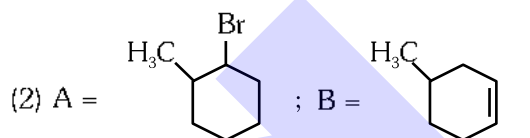
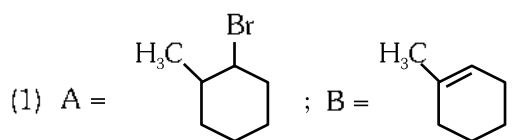
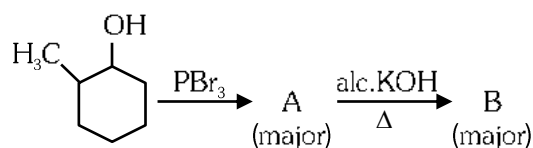
Sol. $\frac{r_2}{r_1} = 4 = \frac{k_2}{k_1}$

$$\log_{10} \left(\frac{k_2}{k_1} \right) = \frac{E_a}{2.303R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

$$\log_{10} (4) = \frac{E_a \times 1000}{2.303 \times 8.314} \left(\frac{1}{300} - \frac{1}{330} \right)$$

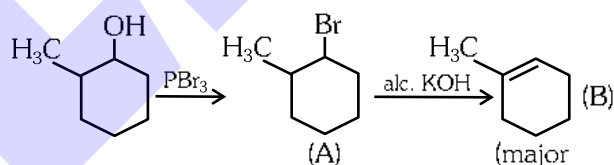
$$E_a = 38.04 \text{ kJ/mol}$$

100. Major products A and B formed in the following reaction sequence, are



Ans. (1)

Sol.



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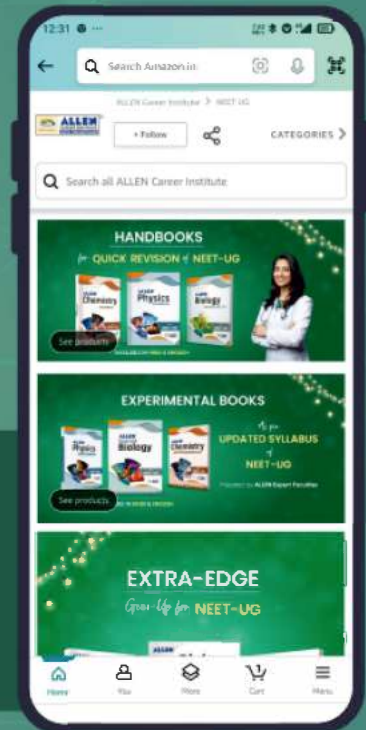
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