JEE-MAIN EXAM APRIL, 2025

Date: - 04-04-2025 (SHIFT-2)

CHEMISTRY

SECTION-A

1. Given below are two statements :

Statement (I): The first ionisation enthalpy of group 14 elements is higher than the corresponding elements of group 13.

Statement (II) : Melting points and boiling points of group 13 elements are in general much higher than those of corresponding elements of group 14.

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 incorrect

(2) Both Statement I and Statement II are correct

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

2. The correct order of $[FeF_6]^{3-}$, $[CoF_6]^{3-}$, $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$ complex species based on the number of unpaired electrons present is :

(1) $[Ni(CN)_4]^{2-} > [FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CO)_4]$

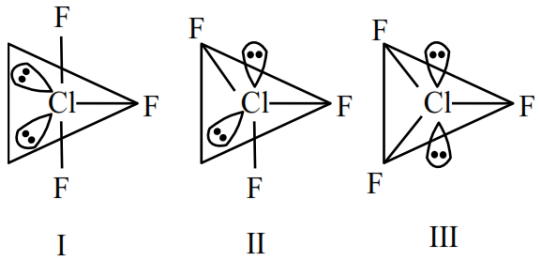
(2) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CN)_4]^{2-} > [Ni(CO)_4]$

(3) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CN)_4]^{2-} = [Ni(CO)_4]$

(4) $[CoF_6]^{3-} > [FeF_6]^{3-} > [Ni(CO)_4] > [Ni(CN)_4]^{2-}$

3. Given below are two statements :

Statement (I) : For $\ddot{\underset{\ddot{}}{Cl}}F_3$, all three possible structures may be drawn as follows.



I II III

Statement (II) : Structure III is most stable, as the orbitals having the lone pairs are axial, where the lp - bp repulsion is minimum.

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

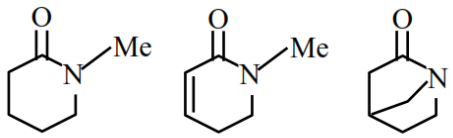
(1) Both Statement I and Statement II are correct

(2) Statement I is correct but Statement II is incorrect

(3) Both Statement I and Statement II are incorrect

(4) Statement I is incorrect but Statement II is correct

4. The correct order of basicity for the following molecules is :



(P) (Q) (R)

(1) R > P > Q (2) R > Q > P (3) P > Q > R (4) Q > P > R

5. Match List - I with List - II.

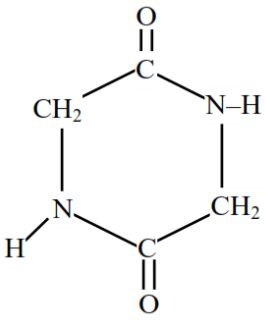
List – I (Separation of)	**List - II (Separation Technique)**
(A) Aniline from aniline-water mixture	(I) Simple distillation
(B) Glycerol from spent-lye in soap industry	(II) Fractional distillation
(C) Different fractions of crude oil in petroleum industry	(III) Distillation at reduced pressure
(D) Chloroform-Aniline mixture	(IV) Steam distillation

Choose the correct answer from the options given below :

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

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

6. A dipeptide, "x" on complete hydrolysis gives "y" and "z". "y" on treatment with aq. HNO_2 produces lactic acid. On the other hand "z" on heating gives the following cyclic molecule.



Based on the information given, the dipeptide X is :

(1) valine-leucine (2) alanine-glycine (3) valine-glycine (4) alanine-alanine

7. The elements of Group 13 with highest and lowest first ionisation enthalpies are respectively :

(1) B & In (2) B & Ga (3) Tl & B (4) B & Tl

8. Consider the given data :

(a) $HCl(g) + 10H_2O(l) \rightarrow HCl.10H_2O \quad \Delta H = -69.01\,kJ\,mol^{-1}$

(b) $HCl(g) + 40H_2O(l) \rightarrow HCl.40H_2O \quad \Delta H = -72.79\,kJ\,mol^{-1}$

Choose the correct statement :

(1) The heat of solution depends on the amount of solvent.

(2) The heat of dilution for the $HCl\left(HCl.10H_2O \text{ to } HCl.40H_2O\right)$ is $3.78\,kJ\,mol^{-1}$.

(3) Dissolution of gas in water is an endothermic process.

(4) The heat of formation of HCl solution is represented by both (a) and (b).

9. The incorrect relationship in the following pairs in relation to ionisation enthalpies is :

(1) $Mn^{2+} < Fe^{2+}$ (2) $Mn^{+} < Cr^{+}$ (3) $Fe^{2+} < Fe^{3+}$ (4) $Mn^{+} < Mn^{2+}$

10. Given below are two statements :

Statement (I) : Alcohols are formed when alkyl chlorides are treated with aqueous potassium hydroxide by elimination reaction.

Statement (II) : In alcoholic potassium hydroxide, alkyl chlorides form alkenes by abstracting the hydrogen from the β-carbon.

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

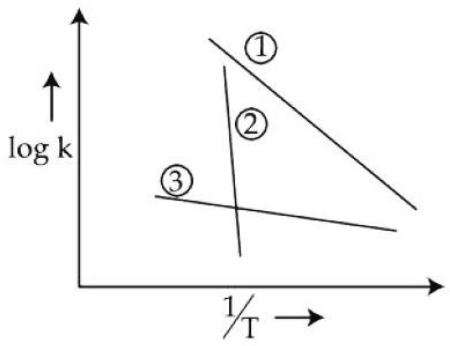
(1) Both Statement I and Statement II are incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Statement I is correct but Statement II is incorrect

11. Consider the following plots of $\log$ of rate constant $k(\log k)$ vs $\frac{1}{T}$ for three different reactions. The correct order of activation energies of these reactions is :



(1) $Ea_2 > Ea_1 > Ea_3$ (2) $Ea_3 > Ea_2 > Ea_1$

(3) $Ea_1 > Ea_3 > Ea_2$ (4) $Ea_1 > Ea_2 > Ea_3$

12. Half life of zero order reaction $A \rightarrow$ product is 1 hour, when initial concentration of reactant is $2.0\,mol\,L^{-1}$. The time required to decrease concentration of A from 0.50 to $0.25\,mol\,L^{-1}$ is :

(1) 1.0 .5 hour (2) 15 min (3) 4 hour (4) 60 min

13. A toxic compound "A" when reacted with NaCN in aqueous acidic medium yields an edible cooking component and food preservative "B". "B" is converted to "C" by diborane and can be used as an additive to petrol to reduce emission. "C" upon reaction with oleum at $140^{\circ}C$ yields an inhalable anesthetic "D". Identify "A", "B", "C" & "D", respectively :

(1) Ethanol; acetonitrile; ethylamine; ethylene

(2) Methanol; formaldehyde; methyl chloride; chloroform

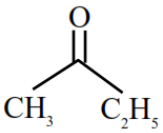
(3) Acetaldehyde; 2-hydroxypropanoic acid; propanoic acid; dipropyl ether

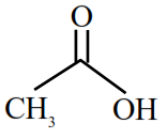
(4) Methanol; acetic acid; ethanol; diethyl ether

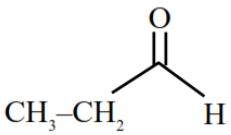
14. Which among the following compounds give yellow solid when reacted with $NaOI / NaOH$?

(A) $CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-C_2H_5$

(B) $CH_3-CH_2-CH_2-OH$

(C) 

(D) 

(E) 

Choose the correct answer from the options given below :

(1) (A) and (C) Only

(2) (A), (C) and (D) Only

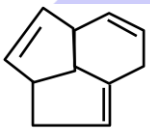
(3) (B), (C) and (E) Only

(4) (C) and (D) Only

15. 'X' is the number of electrons in t_{2g} orbitals of the most stable complex ion among $\left[Fe(NH_3)_6\right]^{3+}$, $\left[FeCl_6\right]^{3-}$, $\left[Fe(C_2O_4)_3\right]^{3-}$ and $\left[Fe(H_2O)_6\right]^{3+}$. The nature of oxide of vanadium of the type V_2O_X is :

(1) Neutral (2) Basic (3) Acidic (4) Amphoteric

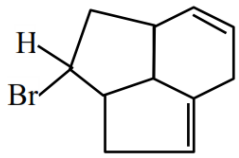
16. Consider the following molecule (X).

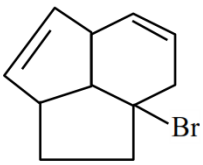


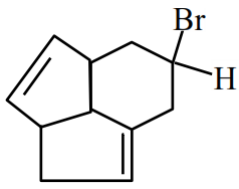
(X)

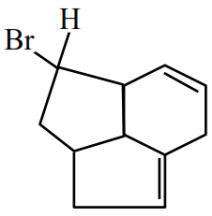
The structure of X is

The major product formed when the given molecule (X) is treated with $HBr\ (1\ eq)$ is :

(1) 

(2) 

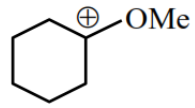
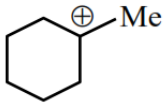
(3) 

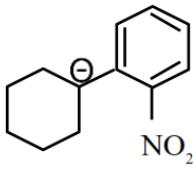
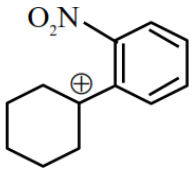
(4) 

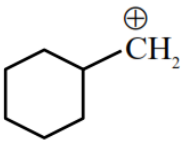
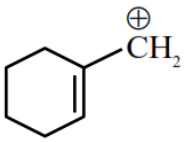
17. Consider the ground state of chromium atom $(Z=24)$. How many electrons are with Azimuthal quantum number $l=1$ and $l=2$ respectively ?

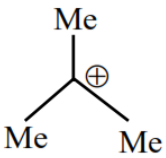
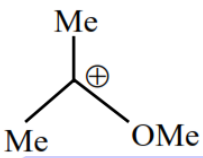
(1) 16 and 4 (2) 16 and 5 (3) 12 and 4 (4) 12 and 5

18. In which pairs, the first ion is more stable than the second?

(A)  & 

(B)  & 

(C)  & 

(D)  & 

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

19. Given below are two statements :

Statement (I): Molal depression constant K_f is given by $\frac{M_1RT_f}{\Delta S_{fus}}$, where symbols have their usual meaning.

Statement (II) : K_f for benzene is less than the K_f for water.

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

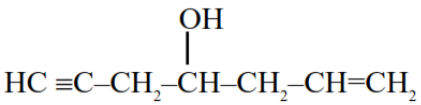
(1) Statement I is correct but Statement II is incorrect

(2) Both Statement I and Statement II are correct

(3) Statement I is incorrect but Statement II is correct

(4) Both Statement I and Statement II are incorrect

20. The IUPAC name of the following compound is :



(1) 4-Hydroxyhept-1-en-6-yne (2) 4-Hydroxyhept-6-en-1-yne

(3) Hept-1-en-6-yn-4-ol (4) Hept-6-en-1-yn-4-ol

SECTION-B

21. The amount of calcium oxide produced on heating 150 kg limestone (75% pure) is _____ kg. (Nearest integer)

Given: Molar mass (in $gmol^{-1}$) of $Ca-40, O-16, C-12$

22. The molar conductance of an infinitely dilute solution of ammonium chloride was found to be $185\ \mathrm{Scm^2\,mol^{-1}}$ and the ionic conductance of hydroxyl and chloride ions are 170 and $70\,\mathrm{Scm^2\,mol^{-1}}$, respectively. If molar conductance of 0.02 M solution of ammonium hydroxide is $85.5\,\mathrm{Scm^2\,mol^{-1}}$, its degree of dissociation is given by $x\times10^{-1}$.

The value of x is _____ . (Nearest integer)

23. Sea water, which can be considered as a 6 molar (6 M) solution of NaCl, has a density of $2\,\mathrm{g\,mL^{-1}}$. The concentration of dissolved oxygen $\left(\mathrm{O_2}\right)$ in sea water is 5.8 ppm. Then the concentration of dissolved oxygen $\left(\mathrm{O_2}\right)$ in sea water, is $x\times10^{-4}\,\mathrm{m}$.

24. A metal complex with a formula $\mathrm{MCl_4\cdot3NH_3}$ is involved in $\mathrm{sp^3d^2}$ hybridisation. It upon reaction with excess of $\mathrm{AgNO_3}$ solution gives ' x ' moles of AgCl . Consider ' x ' is equal to the number of lone pairs of electron present in central atom of $\mathrm{BrF_5}$. Then the number of geometrical isomers exhibited by the complex is _____.

25. $x\mathrm{mg}$ of $\mathrm{Mg(OH)_2}$(molar mass $=58$) is required to be dissolved in 1.0 L of water to produce a pH of 10.0 at 298 K . The value of x is _____. mg. (Nearest integer)

(Given : $\mathrm{Mg(OH)_2}$ is assumed to dissociate completely in $\mathrm{H_2O}$]

NTA ANSWERS

1.	**(3)**	**2.**	**(3)**	**3.**	**(2)**	**4.**	**(2)**	**5.**	**(2)**	**6.**	**(2)**	**7.**	**(1)**
8.	**(1)**	**9.**	**(1)**	**10.**	**(2)**	**11.**	**(1)**	**12.**	**(2)**	**13.**	**(4)**	**14.**	**(1)**
15.	**(4)**	**16.**	**(2)**	**17.**	**(4)**	**18.**	**(1)**	**19.**	**(1)**	**20.**	**(3)**	**21.**	**(63)**
22.	**(3)**	**23.**	**(2)**	**24.**	**(2)**	**25.**	**(3)**						