CHEMISTRY

2.

JEE-MAIN EXAM APRIL, 2025

Date: - 07-04-2025 (SHIFT-2)

CHEMISTRY

SECTION-A

1. "P" is an optically active compound with molecular formula $C_6H_{12}O$. When 'P' is treated with 2, 4dinitrophenylhydrazine, it gives a positive test. However, in presence of Tollens reagent, "P" gives a negative test. Predict the structure of "P".

(1)
$$CH_3-C-CH_2-CH_2-CH_3$$

(2) $CH_3-C-CH_2-CH_3$
(3) $H-C-CH_2-CH-CH_3$
 CH_2-CH_3
(4) $CH_3-C-CH_2-CH-CH_3$
 CH_3
Match List - I with List - II.
List - I
(A) Solution of chloroform and acetone
(B) Solution of ethanol and water
(C) Solution of benzene and toluene
(D) Solution of acetic acid in benzene
(I) Solution of acetic acid in benzene
(I) $\Delta V_{mix} = 0$

Choose the correct answer from the options given below :

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

3. The hydration energies of K^+ and Cl^- are -x and -y kJ / mol respectively. If lattice energy of KCl is

 $-z \, kJ \, / \, mol$, then the heat of solution of KCl is :

(1) z - (x + y) (2) x + y + z (3) -z - (x + y) (4) +x - y - z

4. $A(g) \rightarrow B(g) + C(g)$ is a first order reaction.

Time	Т	8
P _{system}	P _t	\mathbf{P}_{∞}

The reaction was started with reactant A only. Which of the following expression is correct for rate constant k ?

(1)
$$k = \frac{1}{t} \ln \frac{p_{\infty}}{p_{t}}$$
 (2) $k = \frac{1}{t} \ln \frac{2(p_{\infty} - p_{t})}{p_{t}}$ (3) $k = \frac{1}{t} \ln \frac{p_{\infty}}{(p_{\infty} - p_{t})}$ (4) $k = \frac{1}{t} \ln \frac{p_{\infty}}{2(p_{\infty} - p_{t})}$

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5. The number of optically active products obtained from the complete ozonolysis of the given compound is

$$H_{3}C-CH=CH-CH-CH=CH-CH-CH=CH-CH_{3}$$
(2) 0 (3) 1 (4) 4

(1) 2

6. The correct statement amongst the following is :

(1) $\Delta_f H_{500}^{\theta}$ is zero for $O_2(g)$

- (2) The term 'standard state' implies that the temperature is 0° C.
- (3) $\Delta_f H_{298}^{\theta}$ is zero for O(g)
- (4) The standard state of a pure gas is the pure gas at a pressure of 1 bar and temperature 273 K.
- 7. Given below are two statements :



Match List - I with List - II. 8.

List – I

Conversion



List - II **Reagents, Conditions used**

(I) Warm, H₂O

(II) (a) NaOH, 368K; (b) H_3O^+



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(III) (a) NaOH, 443 K ; (b) H_3O^+

(IV) (a) NaOH, 623K, 300 atm; (b) $H_{3}O^{+}$

Choose the correct answer from the options given below :

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

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

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

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

- **9.** The correct statements from the following are :
 - (A) Tl^{3+} is a powerful oxidising agent
 - (B) Al^{3+} does not get reduced easily
 - (C) Both Al^{3+} and Tl^{3+} are very stable in solution
 - (D) Tl^+ is more stable than Tl^{3+}
 - (E) Al^{3+} and Tl^+ are highly stable

Choose the correct answer from the options given below :

- (1) (A), (B), (C), (D) and (E) (2) (B), (D) and (E) only
- (3) (A), (C) and (D) only (4) (A), (B), (D) and (E) only
- 10. In SO_2 , NO_2^- and N_3^- the hybridizations at the central atom are respectively :

(1) sp^2 , sp^2 and sp (2) sp^2 , sp and sp (3) sp^2 , sp^2 and sp^2 (4) sp, sp^2 and sp

11. Given below are two statements :

1 M aqueous solutions of each of $Cu(NO_3)_2$, $AgNO_3$, $Hg_2(NO_3)_2$; $Mg(NO_3)_2$ are electrolysed using inert electrodes. Given : $E^{\theta}_{Ag^+/Ag} = 0.80 V$, $E^{\theta}_{Hg_2^{2+}/Hg} = 0.79 V$, $E^{\theta}_{Cu^{2+}/Cu} = 0.24 V$ and

$$E_{Mg^{2+}/Mg}^{\theta} = -2.37 \, V.$$

Statement (I): With increasing voltage, the sequence of deposition of metals on the cathode will be Ag, Hg and Cu .

Statement (II) : Magnesium will not be deposited at cathode instead oxygen gas will be evolved at the cathode.

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



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12. Match List - I with List - II.

	List-I Complex	List-II Primary valency and Secondary valency			
(A)	[Co(en) ₂ Cl ₂]Cl	(I)	3	6	
(B)	[Pt(NH ₃) ₂ Cl(NO ₂)]	(II)	3	4	
(C)	Hg[Co(SCN) ₄]	(III)	2	6	
(D)	[Mg(EDTA)] ²⁻	(IV)	2	4	

Choose the correct answer from the options given below :

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

13. 'X' is the number of acidic oxides among $VO_2, V_2O_3, CrO_3, V_2O_5$ and Mn_2O_7 . The primary valency of

cobalt in $\left[Co(H_2NCH_2CH_2NH_2)_3\right]_2(SO_4)_3$ is Y. The value of X + Y is _____. (1) 2 (2) 4 (3) 3 (4) 5

14. Liquid A and B form an ideal solution. The vapour pressures of pure liquids A and B are 350 and 750 mm Hg respectively at the same temperature. If x_A and x_B are the mole fraction of A and B in solution while y_A and y_B are the mole fraction of A and B in vapour phase then,

(1)
$$\frac{x_{\rm A}}{x_{\rm B}} < \frac{y_{\rm A}}{y_{\rm B}}$$
 (2) $(x_{\rm A} - y_{\rm A}) < (x_{\rm B} - y_{\rm B})$ (3) $\frac{x_{\rm A}}{x_{\rm B}} > \frac{y_{\rm A}}{y_{\rm B}}$ (4) $\frac{x_{\rm A}}{x_{\rm B}} = \frac{y_{\rm A}}{y_{\rm B}}$

15. Choose the incorrect trend in the atomic radii (r) of the elements.

(1)
$$r_{At} < r_{CS}$$
 (2) $r_{Br} < r_{K}$ (3) $r_{Mg} < r_{A1}$ (4) $r_{Rb} < r_{CS}$

16. The number of unpaired electrons responsible for the paramagnetic nature of the following complex species are respectively :

$$\begin{bmatrix} Fe(CN)_6 \end{bmatrix}^{3-}, \begin{bmatrix} FeF_6 \end{bmatrix}^{3-}, \begin{bmatrix} CoF_6 \end{bmatrix}^{3-}, \begin{bmatrix} Mn(CN)_6 \end{bmatrix}^{3-}$$
(1) 1,1,4,2 (2) 1,4,4,2 (3) 1,5,4,2 (4) 1,5,5,2

17. The descending order of basicity of following amines is :



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8.	Mixture of 1 g each of chlorobe	nzene, aniline and benzoic acid is dissolved in 50 mL ethyl acetate and
	placed in a separating funnel.	5MNaOH(30mL) was added in the same funnel. The funnel was
	shaken vigorously and then kep	t aside. The ethyl acetate layer in the funnel contains :
	(1) benzoic acid and aniline	(2) benzoic acid and chlorobenzene
	(3) benzoic acid	(4) chlorobenzene and aniline
19.	The extra stability of half-filled s	ubshell is due to :
	(A) Symmetrical distribution of e	electrons
	(B) Smaller coulombic repulsior	energy
	(C) The presence of electrons v	vith the same spin in non-degenerate orbitals
	(D) Larger exchange energy	
	(E) Relatively smaller shielding	of electrons by one another
	Identify the correct statements :	
	(1) (B), (D) and (E) only	(2) (A), (B), (D) and (E) only
	(3) (B), (C) and (D) only	(4) (A), (B) and (D) only
20.	Given below are two statements	5:
	Statement (I) : On hydrolysis, o	ligo peptides give rise to fewer number of $lpha$ -amino acids while proteins
	give rise to a large number of $m eta$	-amino acids.
	Statement (II) : Natural proteins	are denatured by acids which convert the water soluble form of fibrous
	proteins to their water insoluble	form.
	In the light of the above stateme	ents, choose the most appropriate answer from the options given below :
	(1) Statement I is incorrect but S	Statement II is correct
	(2) Both Statement I and Staten	nent II are correct

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

SECTION-B

21. The number of paramagnetic metal complex species among $\left[Co(NH_3)_6\right]^{3+}$, $\left[Co(C_2O_4)_3\right]^{3-}$,

 $\left[MnCl_{6}\right]^{3-}, \left[Mn(CN)_{6}\right]^{3-}, \left[CoF_{6}\right]^{3-}, \left[Fe(CN)_{6}\right]^{3-} \text{ and } \left[FeF_{6}\right]^{3-} \text{ with same number of unpaired electrons is } _____ .$

22. Butane reacts with oxygen to produce carbon dioxide and water following the equation given below.

$$C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l)$$

If 174.0 kg of butane is mixed with 320.0 kg of O_2 , the volume of water formed in liters is_____. (Nearest integer)

 $[\text{Given : (a) Molar mass of C, H, O are } 12,1,16\,gmol^{-1} \text{ respectively, (b) Density of water } = 1\,g\,mL^{-1} \,]$



- 23. In Dumas' method 292 mg of an organic compound released 50 mL of nitrogen gas (N_2) at 300 K temperature and 715 mm Hg pressure. The percentage composition of ' N ' in the organic compound is _____% (Nearest integer) (Aqueous tension at 300 K = 15 mmHg)
- 24. Identify the structure of the final product (D) in the following sequence of the reactions :

$$Ph - C - CH_3 \xrightarrow{PCl_5} A \xrightarrow{3 \text{ eq. NaNH}_2/NH_3} B \xrightarrow{\text{Acidify}} C \xrightarrow{1. B_2H_6} D$$

Total number of sp^2 hybridised carbon atoms in product D is_____.

25. One litre buffer solution was prepared by adding 0.10 mol each of NH_3 and NH_4Cl in deionised water. The change in pH on addition of 0.05 mol of HCl to the above solution is _____ ×10⁻². (Nearest integer)

Given : pK_{b} of $NH_{3} = 4.745$ and $log_{10} 3 = 0.477$

NTA ANSWERS

1.	(2)	2.	(1)	3.	(1)	4.	(4)	5.	(2)	6.	(1)	7.	(2)	
8.	(3)	9.	(4)	10.	(1)	11.	(3)	12.	(4)	13.	(4)	14.	(3)	
15.	(3)	16.	(3)	17.	(1)	18.	(4)	19.	(2)	20.	(4)	21.	(2)	
22.	(138)	23.	(18)	24.	(7)	25.	(48)							

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