JEE-MAIN EXAM JANUARY, 2025

Date: - 24-01-2025 (SHIFT-2)

CHEMISTRY

SECTION-A

1. $S(g)+\frac{3}{2}O_2(g)\rightarrow SO_3(g)+2x$ kcal

$SO_2(g)+\frac{1}{2}O_2(g)\rightarrow SO_3(g)+y$ kcal

The heat of formation of $SO_2(g)$ is given by :

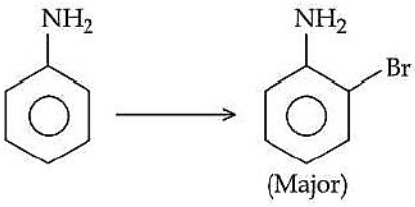
(1) $2x+y$kcal (2) $y-2x$kcal (3) $\frac{2x}{y}$kcal (4) $x+y$kcal

2. The conditions and consequence that favours the $t_{2g}^3e_g^1$ configuration in a metal complex are :

(1) strong field ligand, low spin complex (2) strong field ligand, high spin complex

(3) weak field ligand, high spin complex (4) weak field ligand, low spin complex

3. For reaction



The correct order of set of reagents for the above conversion is:

(1) $H_2SO_4, Ac_2O, Br_2, H_2O(\Delta), NaOH$ (2) $Ac_2O, H_2SO_4, Br_2, NaOH$

(3) $Ac_2O, Br_2, H_2O(\Delta), NaOH$ (4) $Br_2 \mid FeBr_3, H_2O(\Delta), NaOH$

4. When Ethane-1,2-diamine is added progressively to an aqueous solution of Nickel (II) chloride, the sequence of colour change observed will be:

(1) Violet $\rightarrow$ Blue $\rightarrow$ Pale Blue $\rightarrow$ Green (2) Pale Blue $\rightarrow$ Blue $\rightarrow$ Green $\rightarrow$ Violet

(3) Pale Blue $\rightarrow$ Blue $\rightarrow$ Violet $\rightarrow$ Green (4) Green $\rightarrow$ Pale Blue $\rightarrow$ Blue $\rightarrow$ Violet

5. Which of the following mixing of 1 M base and 1 M acid leads to the largest increase in temperature?

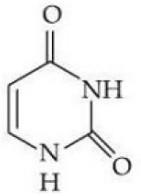
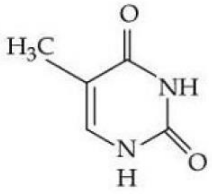
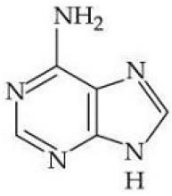
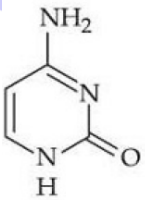
(1) 50 mL HCl and 20 mL NaOH (2) $30\,mL\,CH_3COOH$ and 30 mL NaOH

(3) 30 mL HCl and 30 mL NaOH (4) $45\,mL\,CH_3COOH$ and 25 mL NaOH

6. The successive 5 ionisation energies of an element are 800, 2427, 3658, 25024 and 32824 kJ/mol, respectively. By using the above values predict the group in which the above element is present:

(1) Group 14 (2) Group 4 (3) Group 2 (4) Group 13

7. Match List - I with List - II.

List - I	List - II
(A) Adenine	(I) 
(B) Cytosine	(II) 
(C) Thymine	(III) 
(D) Uracil	(IV) 

Choose the correct answer from the options given below :

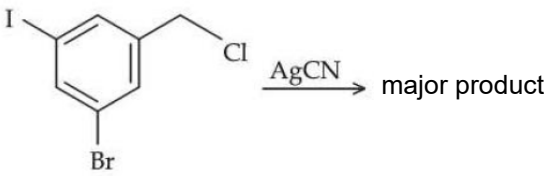
(1) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

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

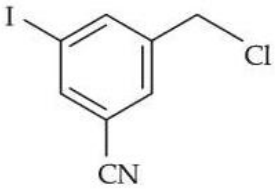
(3) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

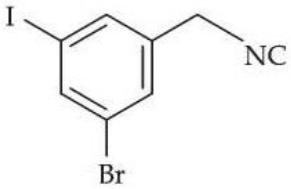
(4) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

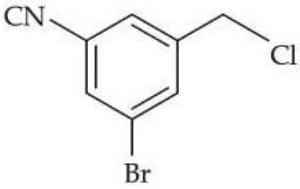
8. The structure of the major product formed in the following reaction is:

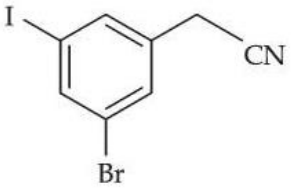


major product

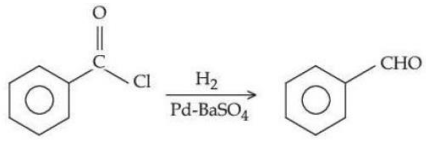
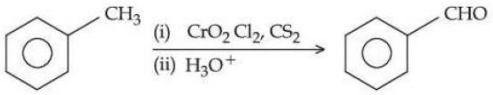
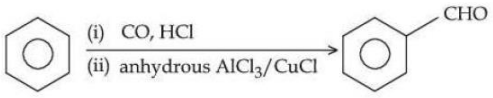
(1) 

(2) 

(3) 

(4) 

9. Match List - I with List - II.

List - I	List - II
(A) $RCN \xrightarrow[(ii)\ H_3O^+]{(i)\ SnCl_2, HCl} RCHO$	(I) Etard reaction
(B) 	(II) Gatterman-Koch reaction
(C) 	(III) Rosenmund reduction
(D) 	(IV) Stephen reaction

Choose the correct answer from the options given below :

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

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

10. Given below are two statements :

Statement (I): Experimentally determined oxygen-oxygen bond lengths in the O_3 are found to be same and the bond length is greater than that of a O = O (double bond) but less than that of a single (O - O) bond.

Statement (II): The strong lone pair-lone pair repulsion between oxygen atoms is solely responsible for the fact that the bond length in ozone is smaller than that of a double bond (O = O) but more than that of a single bond (O - O).

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

(1) Statement I is false but Statement II is true (2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false (4) Both Statement I and Statement II are true

11. For hydrogen atom, the orbital/s with lowest energy is/are :

(A) 4s (B) $3p_x$ (C) $3d_{x^2-y^2}$ (D) $3d_{z^2}$

(E) $4p_z$

Choose the correct answer from the options given below :

(1) (A) and (E) only (2) (A) only

(3) (B) only (4) (B), (C) and (D) only

12. The elemental composition of a compound is 54.2% C, 9.2% H and 36.6% O. If the molar mass of the compound is 132 g\mol^{-1}, the molecular formula of the compound is :

[Given : The relative atomic mass of C : H : O = 12 : 1 : 16]

(1) $C_4H_8O_2$ (2) $C_6H_{12}O_6$ (3) $C_4H_9O_3$ (4) $C_6H_{12}O_3$

13. Given below are two statements :

Statement (I): The first ionization energy of Pb is greater than that of Sn.

Statement (II): The first ionization energy of Ge is greater than that of Si.

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

(1) Both Statement I and Statement II are false

(2) Statement I is true but Statement II is false

(3) Both Statement I and Statement II are true

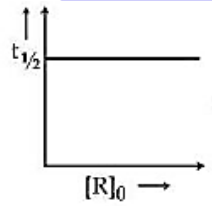
(4) Statement I is false but Statement II is true

14. In the given structure, number of sp and sp^2 hybridized carbon atoms present respectively are:

(1) 4 and 6 (2) 3 and 6 (3) 3 and 5 (4) 4 and 5

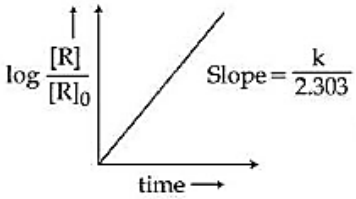
15. Given below are two statements :

Statement (I) :



is valid for first order reaction.

Statement (II) :



is valid for first order reaction.

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

(1) Statement I is true but Statement II is false (2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true (4) Both Statement I and Statement II are false

16. Identify correct statement/s:

(A) $-OCH_3$ and $-NHCOCH_3$ are activating group.

(B) -CN and -OH are meta directing group.

(C) -CN and $-SO_3H$ are meta directing group.

(D) Activating groups act as ortho - and para directing groups.

(E) Halides are activating groups.

Choose the correct answer from the options given below :

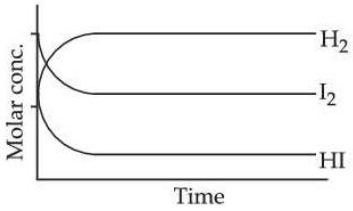
(1) (A), (C) and (D) only (2) (A) and (C) only

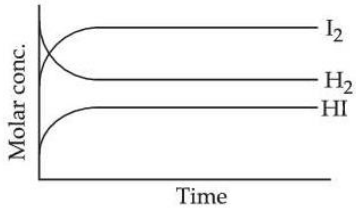
(3) (A), (B) and (E) only (4) (A) only

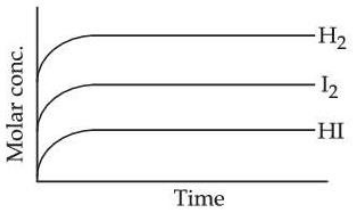
17. For the reaction,

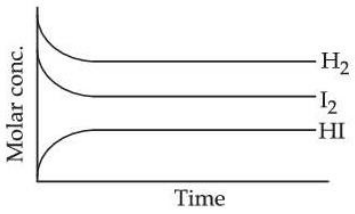
$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$$

Attainment of equilibrium is predicted correctly by :

(1) 

(2) 

(3) 

(4) 

18. Match List - I with List - II.

List - I **(Transition metal ion)**	**List - II** **(Spin only magnetic moment (B.M.))**
(A) Ti^{3+}	(I) 3.87
(B) V^{2+}	(II) 0.00
(C) Ni^{2+}	(III) 1.73
(D) Sc^{3+}	(IV) 2.84

Choose the correct answer from the options given below :

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

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

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

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

19. Find the compound 'A' from the following reaction sequences.

$$A \xrightarrow{\text{aqua-regia}} B \xrightarrow[(2)\ AcOH]{(1)\ KNO_2|NH_4OH} \text{yellow ppt}$$

(1) NiS (2) MnS (3) CoS (4) ZnS

20. Based on the data given below :

$E^{\circ}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33\,V$ $E^{\circ}_{C_2/Cl^{(-)}} = 1.36V$

$E^{\circ}_{MnO_4^-/Mn^{2+}} = 1.51\,V$ $E^{\circ}_{Cr^{3+}/Cr} = -0.74\,V$

the strongest reducing agent is :

(1) Cr (2) Cl^- (3) Mn^{2+} (4) MnO_4^-

SECTION-B

21. The possible number of stereoisomers for 5-phenylpent-4-en-2-ol is _____.

22. The hydrocarbon (X) with molar mass $80\,g\,mol^{-1}$ and 90% carbon has_____ degree of unsaturation.

23. Consider a complex reaction taking place in three steps with rate constants k_1, k_2 and k_3 respectively. The overall rate constant k is given by the expression $k = \sqrt{\frac{k_1 k_3}{k_2}}$. If the activation energies of the three steps are 60,30 and $10\,kJ\,mol^{-1}$ respectively, then the overall energy of activation in $kJmol^{-1}$ is _____ . (Nearest integer)

24. The observed and normal molar masses of compound MX_2 are 65.6 and 164 respectively. The percent degree of ionisation of MX_2 is _____ %. (Nearest integer)

25. In Carius method of estimation of halogen, 0.25 g of an organic compound gave 0.15 g of silver bromide (AgBr). The percentage of Bromine in the organic compound is _____ $\times 10^{-1}\%$ (Nearest integer).

(Given : Molar mass of Ag is 108 and Br is $80\,g\,mol^{-1}$)

NTA ANSWERS

1.	(2)	2.	(3)	3.	(1)	4.	(4)	5.	(3)	6.	(4)	7.	(3)
8.	(2)	9.	(1)	10.	(3)	11.	(4)	12.	(4)	13.	(2)	14.	(3)
15.	(1)	16.	(1)	17.	(4)	18.	(4)	19.	(3)	20.	(1)	21.	(4)
22.	(3)	23.	(20)	24.	(75)	25.	(255)						