JEE-MAIN EXAM APRIL, 2025

Date: - 04-04-2025 (SHIFT-1)

CHEMISTRY

SECTION-A

1. Identify the pair of reactants that upon reaction, with elimination of HCl will give rise to the dipeptide Gly-Ala.

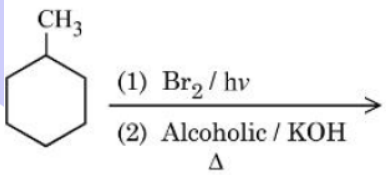
(1) $NH_2–CH_2–COOH$ and $NH_2–\underset{\displaystyle CH_3}{\underset{|}{CH}}–COCl$

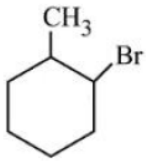
(2) $NH_2–CH_2–COCl$ and $NH_2–\underset{\displaystyle CH_3}{\underset{|}{CH}}–COOH$

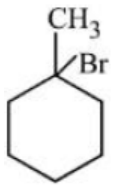
(3) $NH_2–CH_2–COOH$ and $NH_2–\underset{\displaystyle CH_3}{\underset{|}{CH}}–COOH$

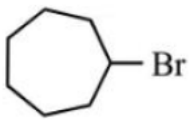
(4) $NH_2–CH_2–COCl$ and $\overset{\oplus}{N}H_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–COCl$

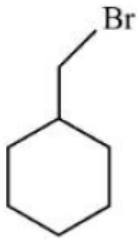
2. Predict the major product of the following reaction sequence:-



(1) 

(2) 

(3) 

(4) 

3. Rate law for a reaction between A and B is given by

$r = k[A]^n[B]^m$

If concentration of A is doubled and concentration of B is halved from their initial value, the ratio of new rate of reaction to the initial rate of reaction $\left(\frac{r_2}{r_1}\right)$ is

(1) $(n-m)$ (2) $(m+n)$ (3) $\frac{1}{2^{m+n}}$ (4) $2^{(n-m)}$

4. Number of stereoisomers possible for the complexes, $[CrCl_3(py)_3]$ and $[CrCl_2(ox)_2]^{3-}$ are respectively (py = pyridine, ox = oxalate)

(1) 2 & 3 (2) 2 & 2 (3) 3 & 3 (4) 1 & 2

5. For $A_2 + B_2 \rightleftharpoons 2AB$

E_a for forward and backward reaction are 180 and $200\,kJ\,mol^{-1}$ respectively

If catalyst lowers E_a for both reaction by $100\,kJ\,mol^{-1}$.

Which of the following statement is correct?

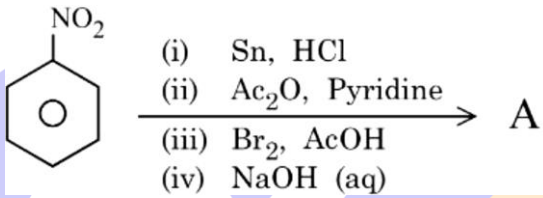
(1) Catalyst can cause non-spontaneous reactions to occur.

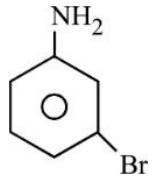
(2) Catalyst does not alter the Gibbs energy change of a reaction.

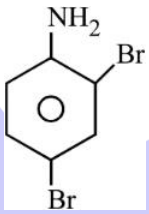
(3) The enthalpy change for the catalysed reaction is different from that of uncatalysed reaction.

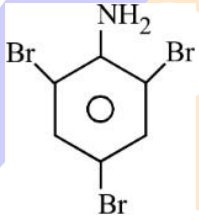
(4) The enthalpy change for the reaction is $+20\,kJ\,mol^{-1}$.

6. The major product (A) formed in the following reaction sequence is



(1) 

(2) 

(3) 

(4) 

7. On charging the lead storage battery, the oxidation state of lead changes from x_1 to y_1 at the anode and from x_2 to y_2 at the cathode. The values of x_1, y_1, x_2, y_2 are respectively :

(1) $+2, 0, 0, +4$ (2) $+2, 0, +2, +4$ (3) $0, +2, +4, +2$ (4) $+4, +2, 0, +2$

8. An organic compound (X) with molecular formula C_3H_6O is not readily oxidised. On reduction it gives $C_3H_8O(Y)$ which reacts with HBr to give a bromide (Z) which is converted to Grignard reagent. This Grignard reagent on reaction with (X) followed by hydrolysis give 2,3-dimethylbutan-2-ol. Compounds $(X), (Y)$ and (Z) respectively are:

(1) $CH_3CH_2CHO, CH_3CH_2CH_2OH, CH_3CH_2CH_2Br$

(2) $CH_3CH_2CHO, CH_3CH=CH_2, CH_3CH(Br)CH_3$

(3) $CH_3COCH_3, CH_3CH_2CH_2OH, CH_3CH(Br)CH_3$

(4) $CH_3COCH_3, CH_3CH(OH)CH_3, CH_3CH(Br)CH_3$

9. Let us consider a reversible reaction at temperature, T.

In this reaction, both ΔH and ΔS were observed to have positive values. If the equilibrium temperature is Te, then the reaction becomes spontaneous at:

(1) $T > Te$ (2) $Te = 5T$ (3) $Te > T$ (4) $T = Te$

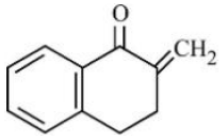
10. Which one of the following complexes will have $\Delta_0 = 0$ and $\mu = 5.96$ B.M?

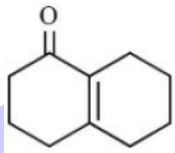
(1) $\left[FeF_6\right]^{4-}$ (2) $\left[Fe(CN)_6\right]^{4-}$ (3) $\left[Co\left(NH_3\right)_6\right]^{3+}$ (4) $\left[Mn(SCN)_6\right]^{4-}$

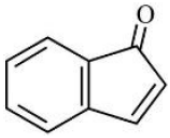
11. Pair of transition metal ions having the same number of unpaired electrons is

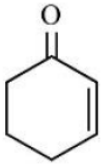
(1) Ti^{2+}, Co^{2+} (2) V^{2+}, Co^{2+} (3) Fe^{3+}, Cr^{2+} (4) Ti^{3+}, Mn^{2+}

12. Aldol condensation is a popular and classical method to prepare α,β-unsaturated carbonyl compounds. This reaction can be both intermolecular and intramolecular. Predict which one of the following is not a product of intramolecular aldol condensation?

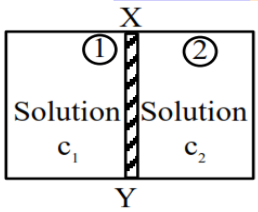
(1) 

(2) 

(3) 

(4) 

13. XY is the membrane/partition between two chambers 1 and 2 containing sugar solutions of concentration c_1 and $c_2 \left(c_1 > c_2\right) molL^{-1}$. For the reverse osmosis to take place identify the correct condition. (Here p_1 and p_2 are pressures applied on chamber 1 and 2).



A. Membrane/Partition : Cellophane, $p_1 > \pi$

B. Membrane/Partition : Porous, $p_2 > \pi$

C. Membrane/Partition : Parchment paper, $p_1 > \pi$

D. Membrane/Partition : Cellophane, $p_2 > \pi$

Choose the correct answer from the option given below:

(1) B and D Only (2) A and C Only (3) C Only (4) A and D Only

14. Which one of the following about an electron occupying the 1 s orbital in a hydrogen atom is incorrect? (Bohr's radius is represented by a_0)

(1) The electron can be found at a distance $2a_0$ from the nucleus

(2) The probability density of finding the electron is maximum at the nucleus

(3) The 1s orbital is spherically symmetrical

(4) The total energy of the electron is maximum when it is at a distance a_0 from the nucleus

15. Given below are the pairs of group 13 elements showing their relation in terms of atomic radius.

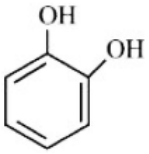
$(B < Al), (Al < Ga), (Ga < In)$ and $(In < Tl)$

Identify the elements present in the incorrect pair and in that pair find out the element (X) that has higher ionic radius $\left(M^{3+}\right)$ than the other one. The atomic number of the element (X) is

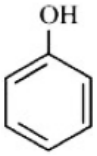
(1) 81 (2) 31 (3) 13 (4) 49

16. Benzene is treated with oleum to produce compound (X) which when further heated with molten sodium hydroxide followed by acidification produces compound (Y). The compound Y is treated with zinc metal to produce compound (Z). Identify the structure of compound (Z) from the following option.

(1) 

(2) 

(3) 

(4) 

17. Given below are two statements.

Statement I: The dipole moment of $\overset{4}{C}H_3-\overset{3}{C}H=\overset{2}{C}H-\overset{1}{C}H=O$ is greater than $\overset{4}{C}H_3-\overset{3}{C}H_2-\overset{2}{C}H_2-\overset{1}{C}H=O$

Statement II: C_1-C_2 bond length of $\underset{4}{CH_3}-\underset{3}{CH}=\underset{2}{CH}-\underset{1}{CH}=O$ is greater than C_1-C_2 bond length of $\underset{4}{CH_3}-\underset{3}{CH_2}-\underset{2}{CH_2}-\underset{1}{CH}=O$

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) Both Statement I and Statement II are false

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

18. Which of the following molecule(s) show/s paramagnetic behavior?

A. O_2 B. N_2 C. F_2 D. S_2 E. Cl_2

Choose the **correct** answer from the options given below:

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

19. One mole of an ideal gas expands isothermally and reversibly from $10dm^3$ to $20dm^3$ at 300 K. $\Delta U, q$ and work done in the process respectively are

Given: $R = 8.3 J K^{-1} mol^{-1}$

$\ln 10 = 2.3$

$\log 2 = 0.30$

$\log 3 = 0.48$

(1) $0, -17.18kJ, 1.718J$ (2) $0, 21.84kJ, 21.84kJ$

(3) $0, 21.84kJ, -1.726J$ (4) $0, 1.718kJ, -1.718kJ$

20. Given below are two statements:

Statement I: Nitrogen forms oxides with +1 to +5 oxidation states due to the formation of $p\pi - p\pi$ bond with oxygen.

Statement II: Nitrogen does not form halides with +5 oxidation state due to the absence of d-orbital in it.

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

(1) Both Statement I and Statement II are False

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

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

(4) Both Statement I and Statement II are true

SECTION-B

21. In Dumas' method for estimation of nitrogen 1 g of an organic compound gave 150 mL of nitrogen collected at 300 K temperature and 900 mm Hg pressure. The percentage composition of nitrogen in the compound is _____ % (nearest integer)

(Aqueous tension at $300\,\text{K} = 15\,\text{mm Hg}$)

22. The total number of hydrogen bonds of a DNA-double Helix strand whose one strand has the following sequence of bases is _____

$5'\text{G}-\text{G}-\text{C}-\text{A}-\text{A}-\text{A}-\text{T}-\text{C}-\text{G}-\text{G}-\text{C}-\text{T}-\text{A}-3'$

23. The pH of a 0.01 M weak acid $\text{HX}\left(\text{K}_a = 4\times10^{-10}\right)$ is found to be 5. Now the acid solution is diluted with excess of water so that the pH of the solution changes to 6. The new concentration of the diluted weak acid is given as $x \times 10^{-4}\,\text{M}$. The value of x is _____ (nearest integer)

24. Fortification of food with iron is done using $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. The mass in grams of the $\text{FeSO}_4 .\ 7\text{H}_2\text{O}$ required to achieve 12 ppm of iron in 150 kg of wheat is _____ (Nearest integer)

[Given: Molar mass of Fe, S and and O respectively are 56, 32 and $16\,\text{g mol}^{-1}$]

25. KMnO_4 acts as an oxidising agent in acidic medium. 'X' is the difference between the oxidation states of Mn in reactant and product. 'Y' is the number of 'd' electrons present in the brown red precipitate formed at the end of the acetate ion test with neutral ferric chloride. The value of $\text{X}+\text{Y}$ is _____

NTA ANSWERS

1.	**(2)**	**2.**	**(1)**	**3.**	**(4)**	**4.**	**(1)**	**5.**	**(2)**	**6.**	**(4)**	**7.**	**(2)**
8.	**(4)**	**9.**	**(1)**	**10.**	**(4)**	**11.**	**(2)**	**12.**	**(1)**	**13.**	**(2)**	**14.**	**(4)**
15.	**(2)**	**16.**	**(1)**	**17.**	**(1)**	**18.**	**(4)**	**19.**	**(4)**	**20.**	**(4)**	**21.**	**(20)**
22.	**(33)**	**23.**	**(25)**	**24.**	**(9)**	**25.**	**(10)**						