JEE-MAIN EXAM JANUARY, 2025

Date: - 28-01-2025 (SHIFT-2)

CHEMISTRY

SECTION-A

1. Identify product [A], [B] and [C] in the following reaction sequence.

$$CH_3-C\equiv CH \xrightarrow[H_2]{Pd/C} [A] \xrightarrow[(ii)\ Zn,H_2O]{(i)\ O_3} [B]+[C]$$

(1) $[A]:CH_2=CH_2,[B]$:[C] : HCHO

(2) $[A]:CH_3CH_2CH_3,[B]:CH_3CHO,[C]:HCHO$

(3) $[A]:CH_3-CH=CH_2,[B]:CH_3CHO,[C]:HCHO$

(4) $[A]:CH_3-CH=CH_2,[B]:CH_3CHO,[C]:CH_3CH_2OH$

2. Identify the inorganic sulphides that are yellow in colour :

(A) $(NH_4)_2S$ (B) PbS (C) CuS (D) As_2S_3

(E) As_2S_5

Choose the correct answer from the options given below :

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

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

3. Identify correct statements :

(A) Primary amines do not give diazonium salts when treated with $NaNO_2$ in acidic condition.

(B) Aliphatic and aromatic primary amines on heating with $CHCl_3$ and ethanolic KOH form carbylamines.

(C) Secondary and tertiary amines also give carbylamine test.

(D) Benzenesulfonyl chloride is known as Hinsberg's reagent.

(E) Tertiary amines reacts with benzenesulfonyl chloride very easily.

Choose the correct answer from the options given below :

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

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

4. Which of the following is/are not correct with respect to energy of atomic orbitals of hydrogen atom?

(A) 1 s $<$ 2 p $<$ 3 d $<$ 4 s (B) $1s<2s=2p<3s=3p$

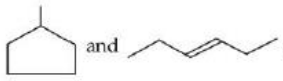
(C) 1 s $<$ 2 s $<$ 2 p $<$ 3 s $<$ 3 p (D) 1 s $<$ 2 s $<$ 4 s $<$ 3d

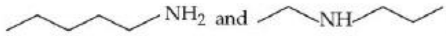
Choose the correct answer from the options given below :

(1) (C) and (D) only (2) (B) and (D) only

(3) (A) and (B) only (4) (A) and (C) only

5. Given below are two statements :

Statement (I) :  and are isomeric compounds.

Statement (II) :  and are functional group isomers.

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) Statement I is true but Statement II is false

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

6. The amphoteric oxide among V_2O_3, V_2O_4 and V_2O_5, upon reaction with alkali leads to formation of an oxide anion. The oxidation state of V in the oxide anion is :

(1) +7 (2) +5 (3) +4 (4) +3

7. Given below are two statements :

Statement (I) : According to the Law of Octaves, the elements were arranged in the increasing order of their atomic number.

Statement (II) : Meyer observed a periodically repeated pattern upon plotting physical properties of certain elements against their respective atomic numbers.

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 false but Statement II is true

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

8. The purification method based on the following physical transformation is :

$$\underset{(X)}{\text{Solid}} \xrightarrow{\text{Heat}} \underset{(X)}{\text{Vapour}} \xrightarrow{\text{Cool}} \underset{(X)}{\text{Solid}}$$

(1) Distillation (2) Sublimation (3) Crystallization (4) Extraction

9. Arrange the following in increasing order of solubility product : $Ca(OH)_2, AgBr, PbS, HgS$

(1) $HgS < AgBr < PbS < Ca(OH)_2$ (2) $HgS < PbS < AgBr < Ca(OH)_2$

(3) $Ca(OH)_2 < AgBr < HgS < PbS$ (4) $PbS < HgS < Ca(OH)_2 < AgBr$

10. Match List - I with List - II.

List - I (Saccharides)	**List - II (Glycosidic-linkages found)**
(A) Sucrose	(I) $\alpha 1-4$
(B) Maltose	(II) $\alpha 1-4$ and $\alpha 1-6$
(C) Lactose	(III) $\alpha 1-\beta 2$
(D) Amylopectin	(IV) $\beta 1-4$

Choose the correct answer from the options given below :

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

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

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

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

11. Match List - I with List - II.

List - I (Complex)	**List - II (Hybridisation of central metal ion)**
(A) $\left[CoF_6\right]^{3-}$	(I) d^2sp^3
(B) $\left[NiCl_4\right]^{2-}$	(II) sp^3
(C) $\left[Co\left(NH_3\right)_6\right]^{3+}$	(III) $sp^3\,d^2$
(D) $\left[Ni(CN)_4\right]^{2-}$	(IV) dsp^2

Choose the correct answer from the options given below :

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

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

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

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

12. Concentrated nitric acid is labelled as 75% by mass. The volume in mL of the solution which contains 30 g of nitric acid is

Given : Density of nitric acid solution is $1.25\,g/mL$.

(1) 45 (2) 40 (3) 55 (4) 32

13. Consider an elementary reaction

$$A(g)+B(g)\rightarrow C(g)+D(g)$$

If the volume of reaction mixture is suddenly reduced to $\frac{1}{3}$ of its initial volume, the reaction rate will become 'x' times of the original reaction rate. The value of x is :

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

14. Identify correct conversion during acidic hydrolysis from the following :

(A) starch gives galactose.

(B) cane sugar gives equal amount of glucose and fructose.

(C) milk sugar gives glucose and galactose.

(D) amylopectin gives glucose and fructose.

(E) amylose gives only glucose.

Choose the correct answer from the options given below :

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

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

15. Assume a living cell with $0.9\%(\omega/\omega)$ of glucose solution (aqueous). This cell is immersed in another solution having equal mole fraction of glucose and water.

(Consider the data upto first decimal place only)

The cell will :

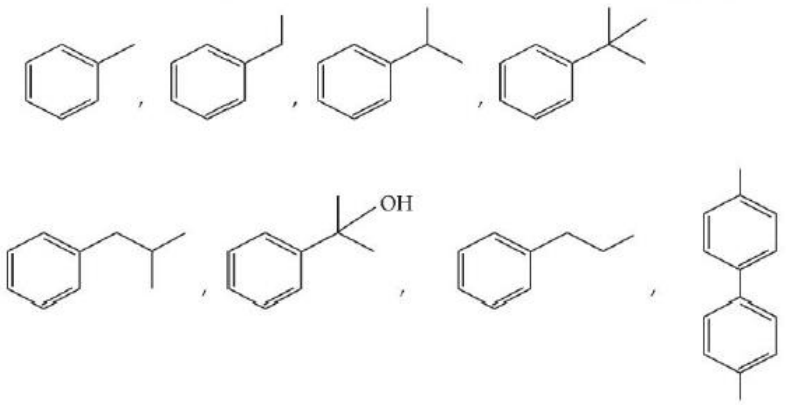
(1) shrink since solution is $0.45\%(\omega/\omega)$ as a result of association of glucose molecules (due to hydrogen bonding)

(2) swell up since solution is $1\%(\omega/\omega)$

(3) shrink since solution is $0.5\%(\omega/\omega)$

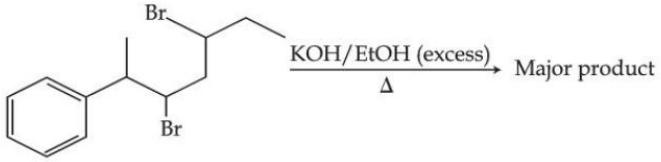
(4) show no change in volume since solution is $0.9\%(\omega/\omega)$

16. The total number of compounds from below when treated with hot $KMnO_4$ giving benzoic acid is :



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

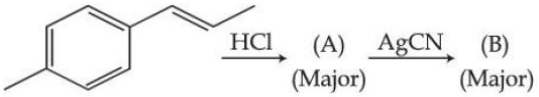
17. The major product of the following reaction is :

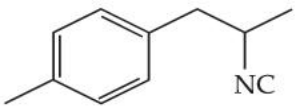


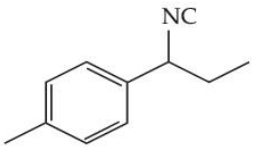
(1) 2-Phenylhepta-2,4-diene (2) 6-Phenylhepta-2,4-diene

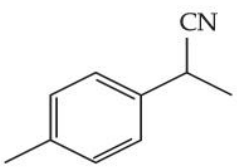
(3) 6-Phenylhepta-3,5-diene (4) 2-Phenylhepta-2,5-diene

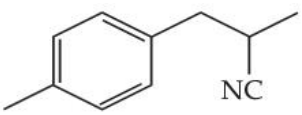
18. The product B formed in the following reaction sequence is :



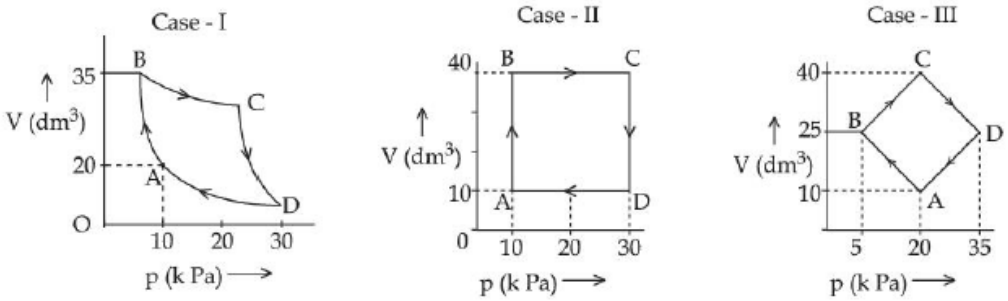
(1) 

(2) 

(3) 

(4) 

19.



An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracing the path $A \rightarrow B \rightarrow C \rightarrow D \rightarrow A$ as shown in the three cases above.

Choose the correct option regarding ΔU :

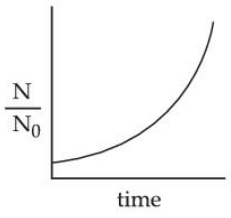
(1) $\Delta U(\text{ Case-I }) > \Delta U(\text{ Case-II }) > \Delta U(\text{ Case-III })$

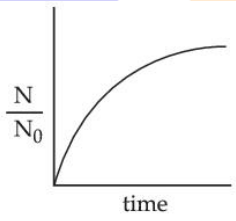
(2) $\Delta U(\text{ Case-I }) > \Delta U(\text{ Case-III }) > \Delta U(\text{ Case-II })$

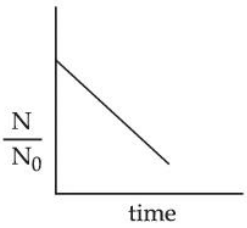
(3) $\Delta U(\text{ Case-I }) = \Delta U(\text{ Case-II }) = \Delta U(\text{ Case-III })$

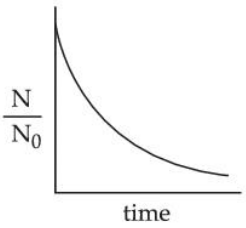
(4) $\Delta U(\text{ Case-III }) > \Delta U(\text{ Case-II }) > \Delta U(\text{ Case-I })$

20. For bacterial growth in a cell culture, growth law is very similar to the law of radioactive decay. Which of the following graphs is most suitable to represent bacterial colony growth ? Where N - Number of Bacteria at any time, N_0 - Initial number of Bacteria.

(1) 

(2) 

(3) 

(4) 

21. A group 15 element forms $d\pi - d\pi$ bond with transition metals. It also forms hydride, which is a strongest base among the hydrides of other group members that form $d\pi - d\pi$ bond. The atomic number of the element is _____ .

22. Consider the following data :

Heat of formation of $CO_2(g) = -393.5\,kJ\,mol^{-1}$

Heat of formation of $H_2O(l) = -286.0\,kJ\,mol^{-1}$

Heat of combustion of benzene $= -3267.0\,kJ\,mol^{-1}$

The heat of formation of benzene is _____ $kJmol-1$. (Nearest integer)

23. Electrolysis of 600 mL aqueous solution of NaCl for 5 min changes the pH of the solution to 12. The current in Amperes used for the given electrolysis is _____ . (Nearest integer).

24. The spin only magnetic moment (μ) value (B.M.) of the compound with strongest oxidising power among Mn_2O_3 , TiO and VO is _____ B.M. (Nearest integer).

25. Total number of molecules/species from following which will be paramagnetic is

$$O_2, O_2^+, O_2^-, NO, NO_2, CO, K_2[NiCl_4], [Co(NH_3)_6]Cl_3, K_2[Ni(CN)_4]$$

NTA ANSWERS

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

**** Qs. 15 Provisional Answer- (4), Final answer by NTA Bonus***