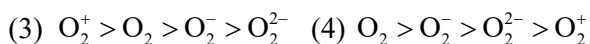
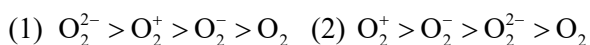


CHEMISTRY

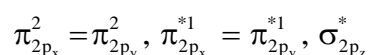
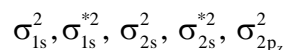
SECTION-A

1. In the following the correct bond order sequence is:



Official Ans. by NTA (3)

Sol. O_2 (16 electrons)



Bond order of $O_2 \Rightarrow 2$

Bond order of $O_2^- \Rightarrow 1.5$

Bond order of $O_2^{2-} \Rightarrow 1$

Bond order of $O_2^+ \Rightarrow 2.5$

2. A biodegradable polyamide can be made from:

- (1) Glycine and isoprene
- (2) Hexamethylene diamine and adipic acid
- (3) Glycine and aminocaproic acid
- (4) Styrene and caproic acid

Official Ans. by NTA (3)

Sol. A biodegradable polyamide nylon-2-Nylon-6 is made from glycine and amino caproic acid

3. Match List I with List II :

	List-I Elements		List-II Properties
(a)	Li	(i)	Poor water solubility of I^- salt
(b)	Na	(ii)	Most abundant element in cell fluid
(c)	K	(iii)	Bicarbonate salt used in fire extinguisher
(d)	Cs	(iv)	Carbonate salt decomposes easily on heating

Choose the correct answer from the options given below :

- (1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
- (2) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
- (3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
- (4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

Official Ans. by NTA (1)

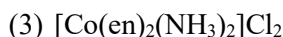
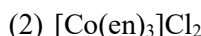
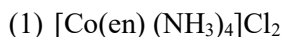
Sol. (a) CsI salt is poor water soluble due to its low hydration energy

(b) $NaHCO_3$ is used in fire extinguisher

(c) K is most abundant element in cell fluid

(d) Li_2CO_3 decomposes easily due to high covalent character caused by small size Li^+ cation.

4. Which one of the following metal complexes is most stable?



Official Ans. by NTA (2)

Sol. Complex $[Co(en)_3]Cl_2$ is most stable complex among the given complex compounds because more number of chelate rings are present in this complex as compare to others.



5. Match List I with List II : (Both having metallurgical terms)

	List-I		List-II
(a)	Concentration of Ag ore	(i)	Reverberatory furnace
(b)	Blast furnace	(ii)	Pig iron
(c)	Blister copper	(iii)	Leaching with dilute NaCN solution
(d)	Froth floatation method	(iv)	Sulfide ores

Choose the correct answer from the options given below :

- (1) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
- (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (3) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
- (4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Official Ans. by NTA (1)

- Sol.** (a) Concentration of Ag is performed by leaching with dilute NaCN solution
 (b) Pig iron is formed in blast furnace
 (c) Blister Cu is produced in Bessemer converter
 (d) Froth floatation method is used for sulphide ores.

Note : During extraction of Cu reverberatory furnace is involved.

6. The ionic radii of F^- and O^{2-} respectively are 1.33 Å and 1.4 Å, while the covalent radius of N is 0.74 Å.

The correct statement for the ionic radius of N^{3-} from the following is :

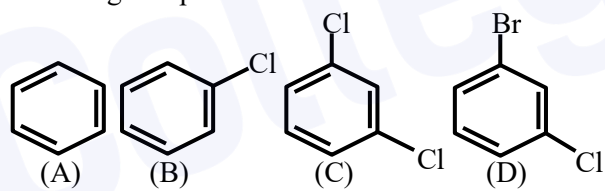
- (1) It is smaller than F^- and N
- (2) It is bigger than O^{2-} and F^-
- (3) It is bigger than F^- and N, but smaller than of O^{2-}
- (4) It is smaller than O^{2-} and F^- , but bigger than of N

Official Ans. by NTA (2)

- Sol.** F^- , O^{2-} and N^{3-} all are isoelectronic species in which N^{3-} have least number of protons due to which it's size increases as least nuclear attraction is experienced by the outer shell electrons.

Size order $N^{3-} > O^{2-} > F^-$

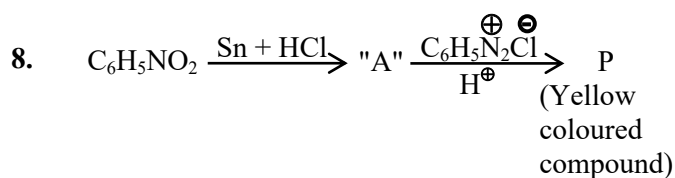
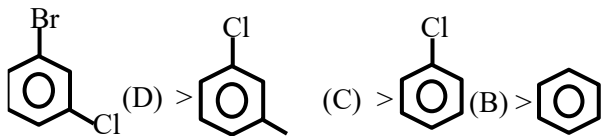
7. The correct decreasing order of densities of the following compounds is :



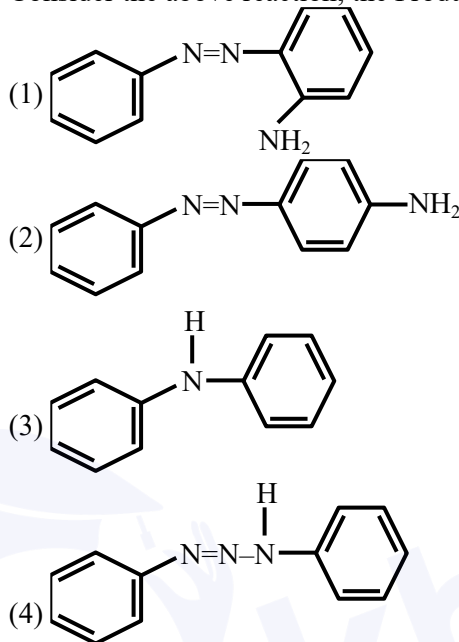
- (1) (D) > (C) > (B) > (A)
- (2) (C) > (D) > (A) > (B)
- (3) (C) > (B) > (A) > (D)
- (4) (A) > (B) > (C) > (D)

Official Ans. by NTA (1)

7. The density order

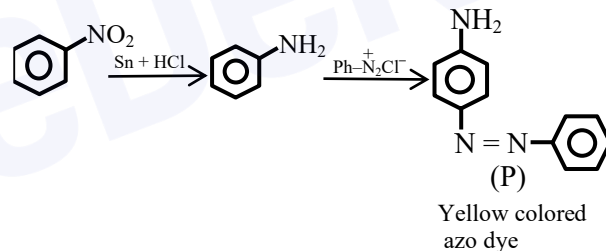


Consider the above reaction, the Product "P" is :



Official Ans. by NTA (2)

Sol.

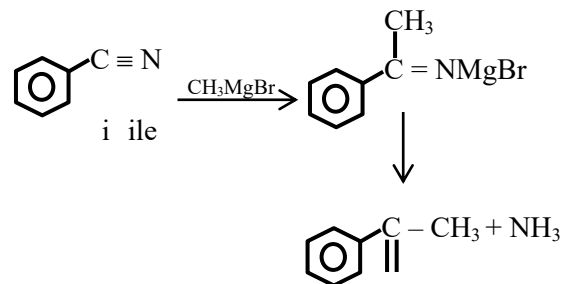


9. A reaction of benzonitrile with one equivalent CH_3MgBr followed by hydrolysis produces a yellow liquid "P". The compound "P" will give positive _____.

- (1) Iodoform test
- (2) Schiff's test
- (3) Ninhydrin's test
- (4) Tollen's test

Official Ans. by NTA (1)

Sol.

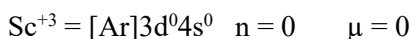
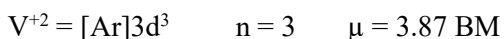
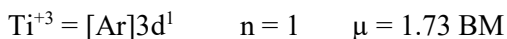


10. The spin only magnetic moments (in BM) for free Ti^{3+} , V^{2+} and Sc^{3+} ions respectively are
(At.No. Sc : 21, Ti : 22, V : 23)

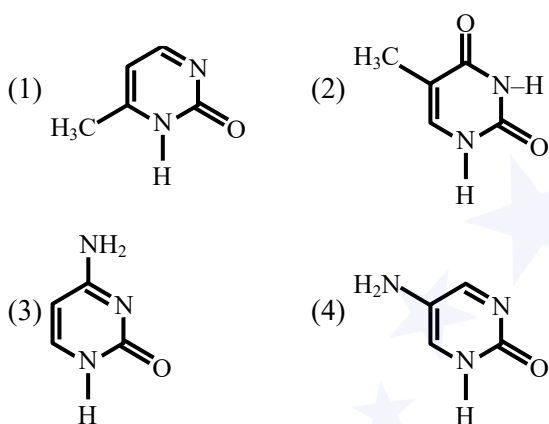
- (1) 3.87, 1.73, 0 (2) 1.73, 3.87, 0
(3) 1.73, 0, 3.87 (4) 0, 3.87, 1.73

Official Ans. by NTA (2)

Sol. $\mu = \sqrt{n(n+2)}$ BM

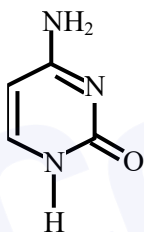


11. Which one of the following is correct structure for cytosine ?



Official Ans. by NTA (3)

Sol. The correct structure of cytosine

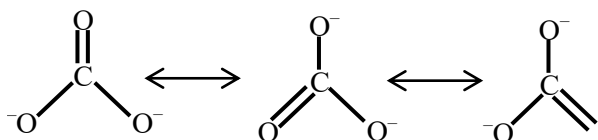


12. Identify the species having one π -bond and maximum number of canonical forms from the following :

- (1) SO_3 (2) O_2 (3) SO_2 (4) CO_3^{2-}

Official Ans. by NTA (4)

Sol. Among SO_3 , O_2 , SO_2 and CO_3^{2-} , only O_2 and CO_3^{2-} has only one π -bond

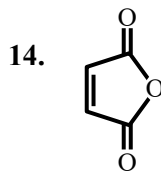


13. Which one of the following metals forms interstitial hydride easily ?

- (1) Cr (2) Fe (3) Mn (4) Co

Official Ans. by NTA (1)

Sol. Elements of group 7,8,9 do not form hydrides thus Cr will only form hydride among the given elements (Fe, Mn, Co)



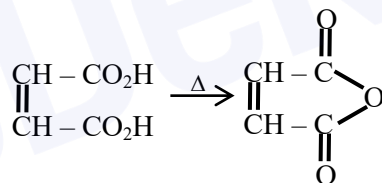
Maleic anhydride

Maleic anhydride can be prepared by :

- (1) Heating trans-but-2-enedioic acid
(2) Heating cis-but-2-enedioic acid
(3) Treating cis-but-2-enedioic acid with alcohol and acid
(4) Treating trans-but-2-enedioic acid with alcohol and acid

Official Ans. by NTA (2)

Sol. Cis but 2-enoic acid



Maleic anhydride

15. Given below are two statements :

Statement I : Chlorofluoro carbons breakdown by radiation in the visible energy region and release chlorine gas in the atmosphere which then reacts with stratospheric ozone.

Statement II : Atmospheric ozone reacts with nitric oxide to give nitrogen and oxygen gases, which add to the atmosphere.

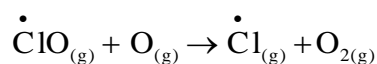
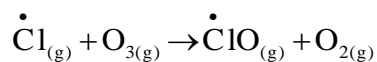
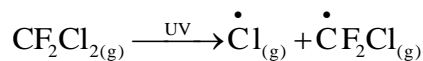
For the above statements choose the correct answer from the options given below :

- (1) **Statement I** is incorrect but **statement II** is true
(2) Both **statement I** and **II** are false
(3) **Statement I** is correct but **statement II** is false
(4) Both **statement I** and **II** are correct

Official Ans. by NTA (2)

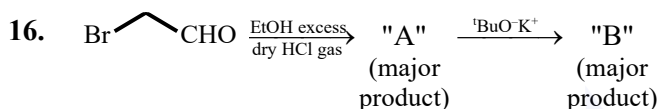
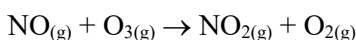
Sol. Statement (1)

CFCs are broken down by powerful UV radiation and releases chlorine free radical which reacts with ozone and start chain reaction.



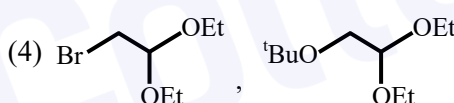
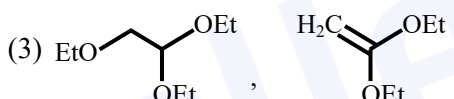
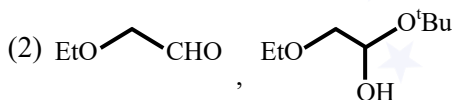
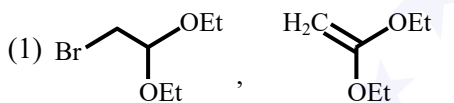
Statement (2)

Atmosphere ozone reacts with nitric oxide to produce nitrogen dioxide and oxygen.



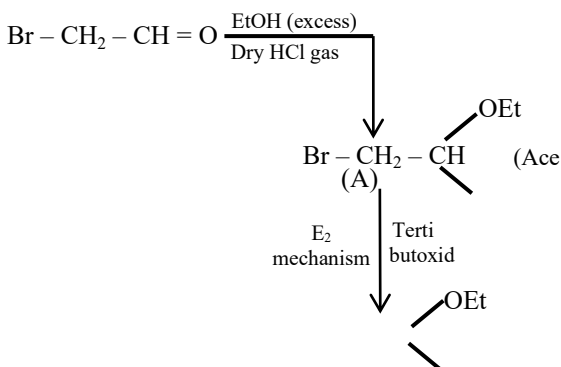
[where Et \Rightarrow $-C_2H_5$ 'Bu \Rightarrow $(CH_3)_3C-$]

Consider the above reaction sequence, Product "A" and Product "B" formed respectively are :



Official Ans. by NTA (1)

Sol.



17. Match List I with List II :

List-I	List-II
Example of colloids	Classification
(a) Cheese	(i) dispersion of liquid in liquid
(b) Pumice stone	(ii) dispersion of liquid in gas
(c) Hair cream	(iii) dispersion of gas in solid
(d) Cloud	(iv) dispersion of liquid in solid

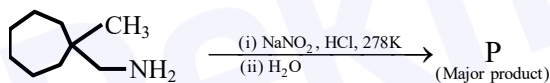
Choose the most appropriate answer from the options given below

- (1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (2) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
 (3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
 (4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

Official Ans. by NTA (4)

17. Cheese \rightarrow liquid in solid
 Pumice stone \rightarrow gas in solid
 Hair cream \rightarrow liquid in liquid
 Cloud \rightarrow liquid in gas

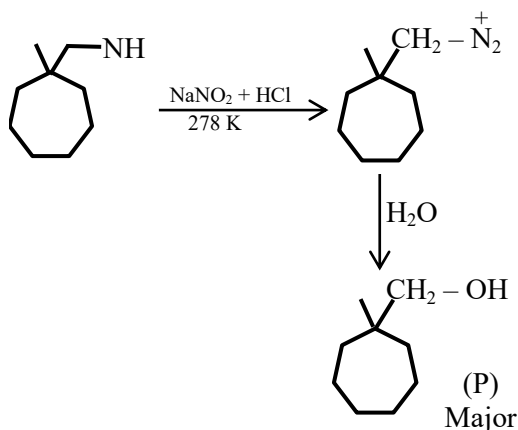
18. What is the major product "P" of the following reaction ?



- (1) $\text{Cyclohexane ring with } CH_3 \text{ and } CH_2CH_3 \text{ substituents}$
 (2) $\text{Cyclohexane ring with } CH_3 \text{ and } CH_2Cl \text{ substituents}$
 (3) $\text{Cyclohexane ring with } OH \text{ and } CH_2N_2^+Cl^- \text{ substituents}$
 (4) $\text{Cyclohexane ring with } CH_3 \text{ and } CH_2OH \text{ substituents}$

Official Ans. by NTA (4)

Sol.



6. The number of significant figures in 0.00340 is _____.

Official Ans. by NTA (3)

Sol. Number of significant figures = 3

7. Assuming that $\text{Ba}(\text{OH})_2$ is completely ionised in aqueous solution under the given conditions the concentration of H_3O^+ ions in 0.005 M aqueous solution of $\text{Ba}(\text{OH})_2$ at 298 K is _____ $\times 10^{-12} \text{ mol L}^{-1}$. (Nearest integer)

Official Ans. by NTA (1)

Sol. $\text{Ba}(\text{OH})_2 \rightarrow \text{Ba}^{+2} + 2\text{OH}^-$



$$2 \times 0.005 = 0.01 = 10^{-2}$$

At 298 K : in aq. solution $[\text{H}_3\text{O}^+][\text{OH}^-] = 10^{-14}$

$$[\text{H}_3\text{O}^+] = \frac{10^{-14}}{10^{-2}} = 10^{-12}$$

8. 0.8 g of an organic compound was analysed by Kjeldahl's method for the estimation of nitrogen. If the percentage of nitrogen in the compound was found to be 42%, then _____ mL of 1 M H_2SO_4 would have been neutralized by the ammonia evolved during the analysis.

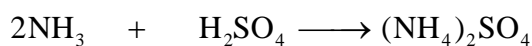
Official Ans. by NTA (12)

Sol. Organic compound : 0.8 gm

$$\text{wt. of N} = \left(\frac{42}{100} \times 0.8 \right) \text{ gm}$$

$$\text{mole of N} = \frac{42 \times 0.8}{100 \times 14} = \frac{2.4}{100} \text{ mol}$$

$$\text{moles of NH}_3 = \frac{2.4}{100}$$



$$\frac{2.4}{100} \text{ mole} \quad \frac{1.2}{100} \text{ mole}$$

$$\frac{1.2}{100} = 1 \times V(\ell)$$

$$\Rightarrow V_{\text{H}_2\text{SO}_4} = \frac{1.2}{100} \ell$$

9. When 3.00 g of a substance 'X' is dissolved in 100 g of CCl_4 , it raises the boiling point by 0.60 K. The molar mass of the substance 'X' is _____ g mol^{-1} . (Nearest integer).

[Given K_b for CCl_4 is $5.0 \text{ K kg mol}^{-1}$]

Official Ans. by NTA (250)

Sol. $\Delta T_b = K_b \times \text{molality}$

$$0.60 = 5 \times \left(\frac{3/M}{100/100} \right)$$

$$M = 250$$

10. An LPG cylinder contains gas at a pressure of 300 kPa at 27°C . The cylinder can withstand the pressure of $1.2 \times 10^6 \text{ Pa}$. The room in which the cylinder is kept catches fire. The minimum temperature at which the bursting of cylinder will take place is _____ $^\circ\text{C}$. (Nearest integer)

Official Ans. by NTA (927)

$$\text{Sol. } \frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow \frac{300 \times 10^3}{300} = \frac{1.2 \times 10^6}{T_2}$$

$$\Rightarrow T_2 = 1200 \text{ K}$$

$$T_2 = 927^\circ\text{C}$$