

**FINAL JEE–MAIN EXAMINATION – JULY, 2021**  
**Held On Sunday 25th July, 2021**  
**TIME: 3:00 PM to 06:00 PM**

**SECTION-A**

1. In the following the correct bond order sequence is:  
 (1)  $O_2^- > O_2^+ > O_2^- > O_2$  (2)  $O_2^+ > O_2^- > O_2^- > O_2$   
 (3)  $O_2^+ > O_2 > O_2^- > O_2^-$  (4)  $O_2 > O_2^- > O_2^- > O_2^+$

**Official Ans. by NTA (3)**

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)**

3. Match List I with List II :

	List-I Elements		List-II Properties
(a)	Li	(i)	Poor water solubility of $\Gamma$ 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)**

4. Which one of the following metal complexes is most stable?  
 (1)  $[Co(en)(NH_3)_4]Cl_2$   
 (2)  $[Co(en)_3]Cl_2$   
 (3)  $[Co(en)_2(NH_3)_2]Cl_2$   
 (4)  $[Co(NH_3)_6]Cl_2$

**Official Ans. by NTA (2)**

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)**

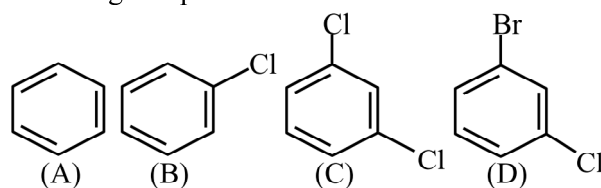
6. The ionic radii of  $F^-$  and  $O^{2-}$  respectively are 1.33 Å and 1.4 Å, while the covalent radius of N is 0.74 Å.

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

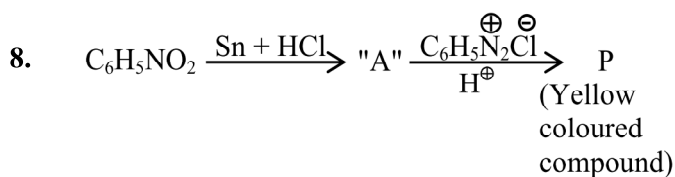
**Official Ans. by NTA (2)**

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

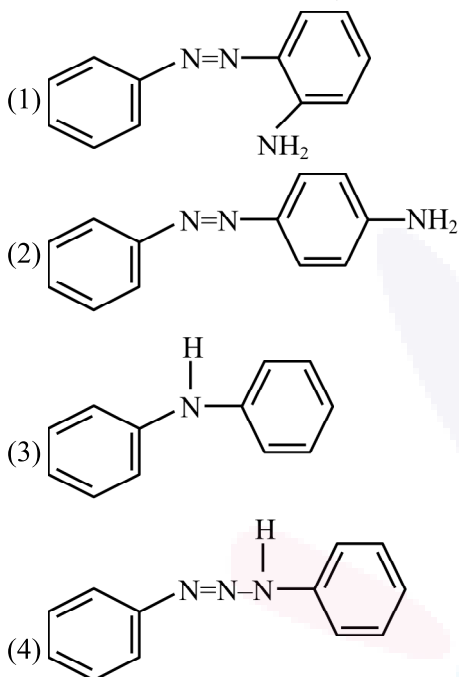


- (1) (D) > (C) > (B) > (A)  
 (2) (C) > (D) > (A) > (B)  
 (3) (C) > (B) > (A) > (D)  
 (4) (A) > (B) > (C) > (D)

**Official Ans. by NTA (1)**



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



**Official Ans. by NTA (2)**

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

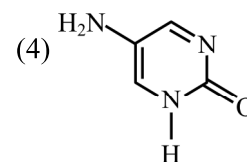
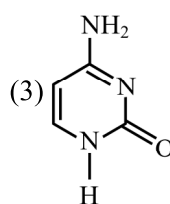
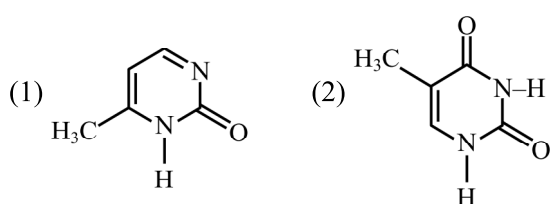
**Official Ans. by NTA (1)**

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)**

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



**Official Ans. by NTA (3)**

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

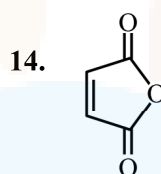
- (1)  $SO_3$       (2)  $O_2$       (3)  $SO_2$       (4)  $CO_3^{2-}$

**Official Ans. by NTA (4)**

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

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

**Official Ans. by NTA (1)**



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)**

15. Given below are two statements :

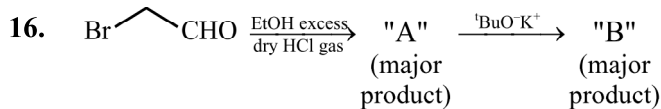
**Statement I** : Chlorofluoro carbons breakdown by radiation in the visible energy region and release chlorine gas in the atmosphere which then reacts with stratospheric ozone.

**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 :

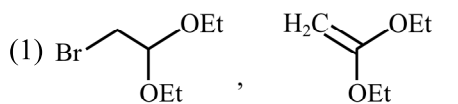
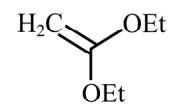
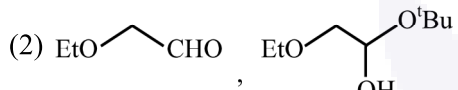
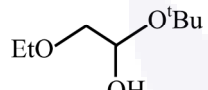
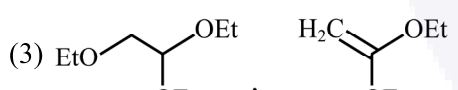
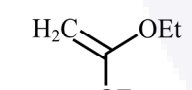
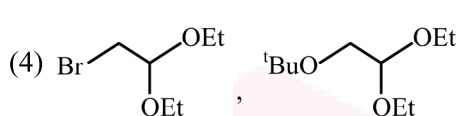
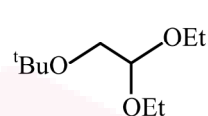
- (1) **Statement I** is incorrect but **statement II** is true  
(2) Both **statement I** and **II** are false  
(3) **Statement I** is correct but **statement II** is false  
(4) Both **statement I** and **II** are correct

**Official Ans. by NTA (2)**



[where Et  $\Rightarrow$   $-\text{C}_2\text{H}_5$   $^t\text{Bu} \Rightarrow (\text{CH}_3)_3\text{C}-$ ]

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

- (1)  , 
- (2)  , 
- (3)  , 
- (4)  , 

Official Ans. by NTA (1)

17. Match List I with List II :

List-I

List-II

Example of colloids

Classification

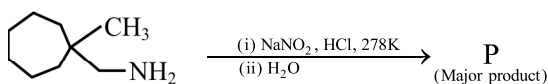
- (a) Cheese (i) dispersion of liquid in liquid  
 (b) Pumice stone (ii) dispersion of liquid in gas  
 (c) Hair cream (iii) dispersion of gas in solid  
 (d) Cloud (iv) dispersion of liquid in solid

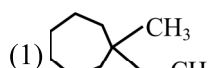
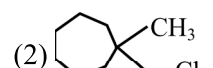
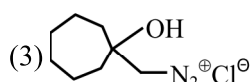
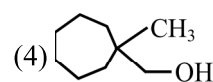
Choose the most appropriate answer from the options given below

- (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)

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



- (1)  (2)   
 (3)  (4) 

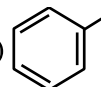


Official Ans. by NTA (4)

19. Identify the process in which change in the oxidation state is five :

- (1)  $\text{Cr}_2\text{O}_7^{2-} \rightarrow 2\text{Cr}^{3+}$  (2)  $\text{MnO}_4^- \rightarrow \text{Mn}^{2+}$   
 (3)  $\text{CrO}_4^{2-} \rightarrow \text{Cr}^{3+}$  (4)  $\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{CO}_2$

Official Ans. by NTA (2)

20. Which among the following is the strongest acid ?

- (1)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$  (2)   
 (3)  (4) 

Official Ans. by NTA (4)

### SECTION-B

1. A system does 200 J of work and at the same time absorbs 150 J of heat. The magnitude of the change in internal energy is \_\_\_\_\_ J. (Nearest integer)

Official Ans. by NTA (50)

2. An accelerated electron has a speed of  $5 \times 10^6 \text{ ms}^{-1}$  with an uncertainty of 0.02%. The uncertainty in finding its location while in motion is  $x \times 10^{-9} \text{ m}$ . The value of x is \_\_\_\_\_. (Nearest integer)

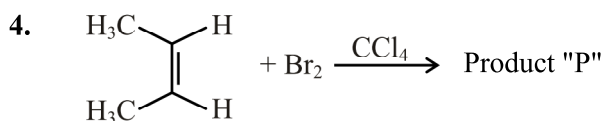
[Use mass of electron =  $9.1 \times 10^{-31} \text{ kg}$ ,

$h = 6.63 \times 10^{-34} \text{ Js}$ ,  $\pi = 3.14$ ]

Official Ans. by NTA (58)

3. Number of electrons present in 4f orbital of  $\text{Ho}^{3+}$  ion is \_\_\_\_\_. (Given Atomic No. of Ho = 67)

Official Ans. by NTA (10)



Consider the above chemical reaction. The total number of stereoisomers possible for Product 'P' is \_\_\_\_\_.

Official Ans. by NTA (2)

5. For a chemical reaction  $\text{A} \rightarrow \text{B}$ , it was found that concentration of B is increased by  $0.2 \text{ mol L}^{-1}$  in 30 min. The average rate of the reaction is \_\_\_\_\_  $\times 10^{-1} \text{ mol L}^{-1} \text{ h}^{-1}$ . (in nearest integer)

Official Ans. by NTA (4)



6. The number of significant figures in 0.00340 is \_\_\_\_\_.

**Official Ans. by NTA (3)**

7. Assuming that  $\text{Ba}(\text{OH})_2$  is completely ionised in aqueous solution under the given conditions the concentration of  $\text{H}_3\text{O}^+$  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)**

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  $\text{H}_2\text{SO}_4$  would have been neutralized by the ammonia evolved during the analysis.

**Official Ans. by NTA (12)**

9. When 3.00 g of a substance 'X' is dissolved in 100 g of  $\text{CCl}_4$ , it raises the boiling point by 0.60 K. The molar mass of the substance 'X' is \_\_\_\_\_  $\text{g mol}^{-1}$ . (Nearest integer).

[Given  $K_b$  for  $\text{CCl}_4$  is  $5.0 \text{ K kg mol}^{-1}$ ]

**Official Ans. by NTA (250)**

10. An LPG cylinder contains gas at a pressure of 300 kPa at  $27^\circ\text{C}$ . 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)**