

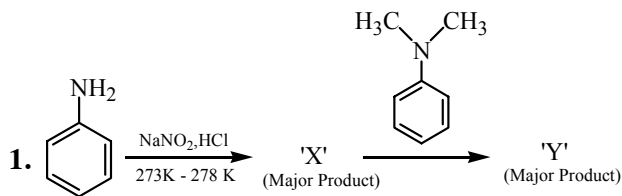
**FINAL JEE-MAIN EXAMINATION – MARCH, 2021**

(Held On Thursday 18<sup>th</sup> March, 2021) TIME : 9 : 00 AM to 12 : 00 NOON

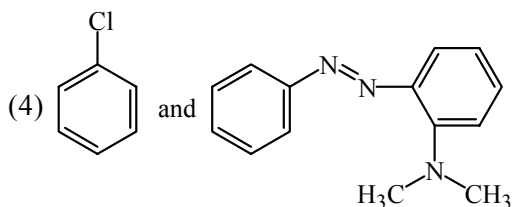
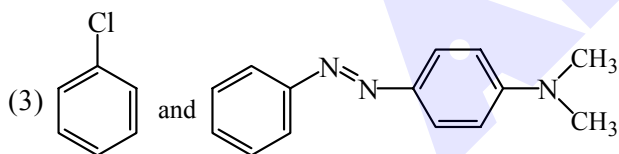
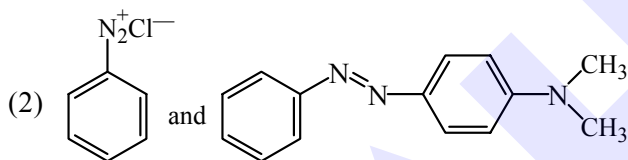
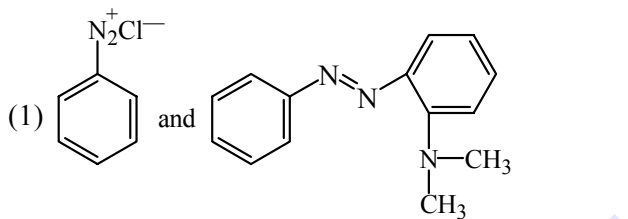
**CHEMISTRY**

**TEST PAPER WITH ANSWER**

**SECTION-A**



Considering the above reaction, X and Y respectively are :

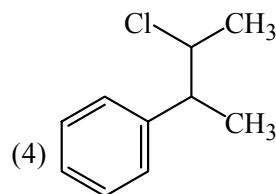
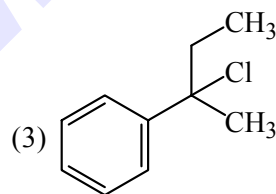
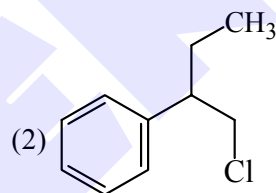
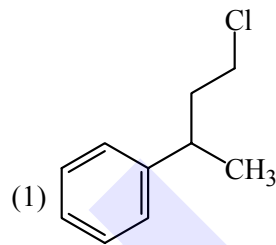


**Official Ans. by NTA (2)**

2. The ionic radius of  $\text{Na}^+$  ions is  $1.02 \text{ \AA}$ . The ionic radii (in  $\text{\AA}$ ) of  $\text{Mg}^{2+}$  and  $\text{Al}^{3+}$ , respectively, are
- (1) 1.05 and 0.99
  - (2) 0.72 and 0.54
  - (3) 0.85 and 0.99
  - (4) 0.68 and 0.72

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

3. Reaction of Grignard reagent,  $\text{C}_2\text{H}_5\text{MgBr}$  with  $\text{C}_8\text{H}_8\text{O}$  followed by hydrolysis gives compound "A" which reacts instantly with Lucas reagent to give compound B,  $\text{C}_{10}\text{H}_{13}\text{Cl}$ . The Compound B is :



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

4. Reagent, 1-naphthylamine and sulphanilic acid in acetic acid is used for the detection of
- (1)  $\text{N}_2\text{O}$
  - (2)  $\text{NO}_3^-$
  - (3)  $\text{NO}$
  - (4)  $\text{NO}_2^-$

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

5. A non-reducing sugar "A" hydrolyses to give two reducing mono saccharides. Sugar A is
- (1) Fructose
  - (2) Galactose
  - (3) Glucose
  - (4) Sucrose

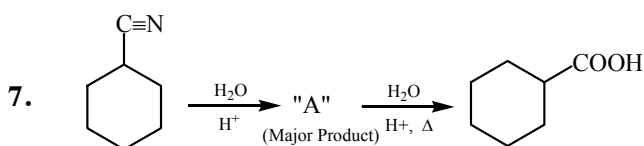
**Official Ans. by NTA (4)**

6. Match the list -I with list - II

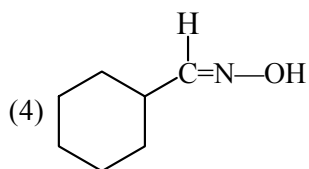
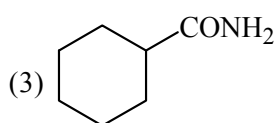
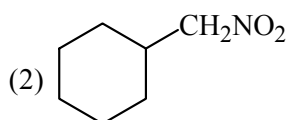
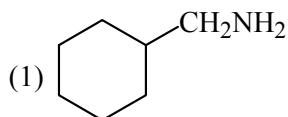
List-I (Class of Drug)	List-II (Example)
(a) Antacid	(i) Novestrol
(b) Artificial sweetener	(ii) Cimetidine
(c) Antifertility	(iii) Valium
(d) Tranquilizers	(iv) Alitame

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

Official Ans. by NTA (1)



Consider the above chemical reaction and identify product "A"



Official Ans. by NTA (3)

8. Match List-I with List-II

List-I	List-II
(a) Chlorophyll	(i) Ruthenium
(b) Vitamin-B <sub>12</sub>	(ii) Platinum
(c) Anticancer drug	(iii) Cobalt
(d) Grubbs catalyst	(iv) Magnesium

Choose the most appropriate answer from the options given below :

- (a) a-iii, b-ii, c-iv, d-i  
 (b) a-iv, b-iii, c-ii, d-i  
 (c) a-iv, b-iii, c-i, d-ii  
 (d) a-iv, b-ii, c-iii, d-i

Official Ans. by NTA (2)

9. Match List-I with List-II :

List-I (Chemicals)	List-II (Use / Preparation / Constituent)
(a) Alcoholic potassium hydroxide	(i) Electrodes in batteries
(b) Pd/ BaSO <sub>4</sub>	(ii) Obtained by addition reaction
(c) BHC (Benzene hexachloride)	(iii) Used for β - elimination reaction
(d) Polyacetylene	(iv) Lindlar's catalyst

Choose the most appropriate match :

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

Official Ans. by NTA (2)

10. The statements that are TRUE :

- (A) Methane leads to both global warming and photochemical smog  
 (B) Methane is generated from paddy fields  
 (C) Methane is a stronger global warming gas than CO<sub>2</sub>  
 (D) Methane is a part of reducing smog

Choose the most appropriate answer from the options given below :

- (1) (A), (B), (C) only  
 (2) (A) and (B) only  
 (3) (B), (C), (D) only  
 (4) (A), (B), (D) only

Official Ans. by NTA (1)

11. Match List-I with List-II

**List-I**

(a)  $\text{Ca}(\text{OCl})_2$

(b)  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

(c)  $\text{CaO}$

(d)  $\text{CaCO}_3$

**List-II**

(i) Antacid

(ii) Cement

(iii) Bleach

(iv) Plaster of paris

Choose the most appropriate answer from the options given below :

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

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

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

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

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

12. Compound with molecular formula  $\text{C}_3\text{H}_6\text{O}$  can show :

(1) Positional isomerism

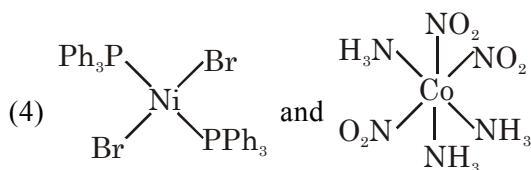
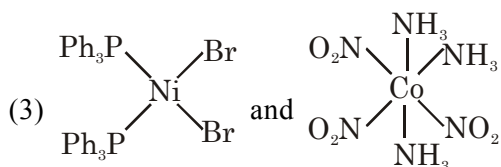
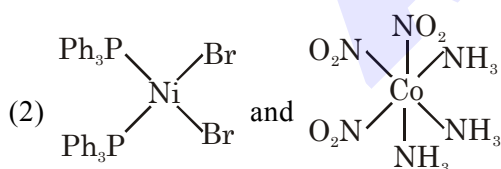
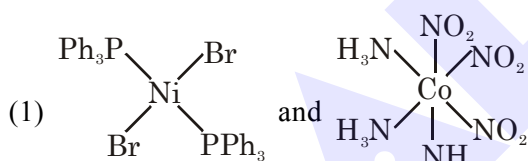
(2) Both positional isomerism and metamerism

(3) Metamerism

(4) Functional group isomerism

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

13. The correct structures of  $\text{trans}[\text{NiBr}_2(\text{PPh}_3)_2]$  and meridional- $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$ , respectively, are

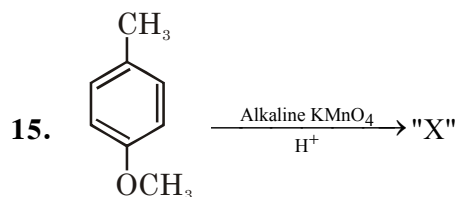


**Official Ans. by NTA (4)**

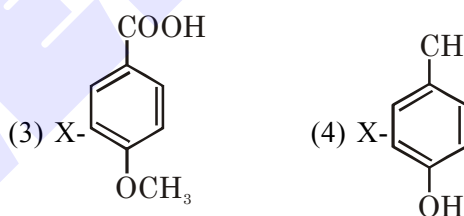
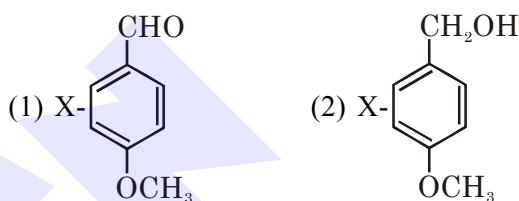
14. A certain orbital has no angular nodes and two radial nodes. The orbital is :

(1) 2s (2) 3s (3) 3p (4) 2p

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



Considering the above chemical reaction, identify the product "X" :



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

16. Match List-I with List-II

**List-I (process)**

(a) Deacon's process

(b) Contact process

(c) Cracking of hydrocarbons

(d) Hydrogenation of vegetable oils

**List-II (catalyst)**

(i) ZSM-5

(ii)  $\text{CuCl}_2$

(iii) Particles 'Ni'

(iv)  $\text{V}_2\text{O}_5$

oils

Choose the most appropriate answer from the options given below -

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

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

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

17. Given below are two statements : One is labelled as Assertion A and the other labelled as reason R

**Assertion A :** During the boiling of water having temporary hardness,  $\text{Mg}(\text{HCO}_3)_2$  is converted to  $\text{MgCO}_3$ .

**Reason R :** The solubility product of  $\text{Mg}(\text{OH})_2$  is greater than that of  $\text{MgCO}_3$ .

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

- (1) Both A and R are true but R is not the correct explanation of A  
 (2) A is true but R is false  
 (3) Both A and R are true and R is the correct explanation of A  
 (4) A is false but R is true

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

18. The number of ionisable hydrogens present in the product obtained from a reaction of phosphorus trichloride and phosphonic acid is:  
 (1) 3 (2) 0 (3) 2 (4) 1

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

19. In a binary compound, atoms of element A form a hcp structure and those of element M occupy  $2/3$  of the tetrahedral voids of the hcp structure. The formula of the binary compound is :

- (1)  $\text{M}_2\text{A}_3$  (2)  $\text{M}_4\text{A}_3$  (3)  $\text{M}_4\text{A}$  (4)  $\text{MA}_3$

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

20. The chemical that is added to reduce the melting point of the reaction mixture during the extraction of aluminium is :

- (1) Cryolite (2) Bauxite  
 (3) Calamine (4) Kaolite

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

#### SECTION-B

1. AX is a covalent diatomic molecule where A and X are second row elements of periodic table. Based on Molecular orbital theory, the bond order of AX is 2.5. The total number of electrons in AX is \_\_\_\_\_. (Round off to the Nearest Integer).

**Official Ans. by NTA (15)**

2. In order to prepare a buffer solution of pH 5.74, sodium acetate is added to acetic acid. If the concentration of acetic acid in the buffer is 1.0 M, the concentration of sodium acetate in the buffer is \_\_\_\_\_ M. (Round off to the Nearest Integer).

[Given :  $\text{pK}_a$  (acetic acid) = 4.74]

**Official Ans. by NTA (10)**

3.  $2 \text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2 \text{NOCl}(\text{s})$

This reaction was studied at  $-10^\circ\text{C}$  and the following data was obtained

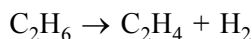
run	$[\text{NO}]_0$	$[\text{Cl}_2]_0$	$r_0$
1	0.10	0.10	0.18
2	0.10	0.20	0.35
3	0.20	0.20	1.40

$[\text{NO}]_0$  and  $[\text{Cl}_2]_0$  are the initial concentrations and  $r_0$  is the initial reaction rate.

The overall order of the reaction is \_\_\_\_\_. (Round off to the Nearest Integer).

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

4. For the reaction



the reaction enthalpy  $\Delta_r H =$  \_\_\_\_\_  $\text{kJ mol}^{-1}$ .

(Round off to the Nearest Integer).

[Given : Bond enthalpies in  $\text{kJ mol}^{-1}$  : C–C : 347, C=C : 611; C–H : 414, H–H : 436]

**Official Ans. by NTA (128)**

5. \_\_\_\_\_ grams of 3-Hydroxy propanal (MW=74) must be dehydrated to produce 7.8 g of acrolein (MW = 56) ( $\text{C}_3\text{H}_4\text{O}$ ) if the percentage yield is 64. (Round off to the Nearest Integer).

[Given : Atomic masses : C : 12.0 u, H : 1.0 u, O : 16.0 u]

**Official Ans. by NTA (16)**

6. A reaction of 0.1 mole of Benzylamine with bromomethane gave 23 g of Benzyl trimethyl ammonium bromide. The number of moles of bromomethane consumed in this reaction are  $n \times 10^{-1}$ , when  $n = \underline{\hspace{2cm}}$ . (Round off to the Nearest Integer).

(Given : Atomic masses : C : 12.0 u, H : 1.0 u, N : 14.0 u, Br : 80.0 u]

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

7. The total number of unpaired electrons present in the complex  $K_3[Cr(\text{oxalate})_3]$  is  $\underline{\hspace{2cm}}$ .

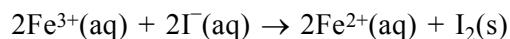
**Official Ans. by NTA (3)**

8. 2 molal solution of a weak acid HA has a freezing point of  $3.885^\circ\text{C}$ . The degree of dissociation of this acid is  $\underline{\hspace{2cm}} \times 10^{-3}$ . (Round off to the Nearest Integer).

[Given : Molal depression constant of water =  $1.85 \text{ K kg mol}^{-1}$  Freezing point of pure water =  $0^\circ\text{C}$ ]

**Official Ans. by NTA (50)**

9. For the reaction



the magnitude of the standard molar free energy change,  $\Delta_r G_m^\circ = - \underline{\hspace{2cm}}$  kJ (Round off to the Nearest Integer).

$$\left[ \begin{array}{l} E_{\text{Fe}^{2+}/\text{Fe}(\text{s})}^\circ = -0.440 \text{ V}; E_{\text{Fe}^{3+}/\text{Fe}(\text{s})}^\circ = -0.036 \text{ V} \\ E_{\text{I}_2/2\text{I}^{-}}^\circ = 0.539 \text{ V}; \quad F = 96500 \text{ C} \end{array} \right]$$

**Official Ans. by NTA (46)**

**Official Ans. by ALLEN (45)**

10. Complete combustion of 3 g of ethane gives  $x \times 10^{22}$  molecules of water. The value of  $x$  is  $\underline{\hspace{2cm}}$ . (Round off to the Nearest Integer).

[Use :  $N_A = 6.023 \times 10^{23}$ ; Atomic masses in u : C : 12.0 ; O : 16.0 ; H : 1.0]

**Official Ans. by NTA (18)**