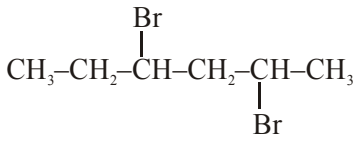
# FINAL JEE–MAIN EXAMINATION – FEBRUARY, 2021

**(Held On Wednesday 24th February, 2021) TIME : 9 : 00 AM to 12 : 00 NOON**

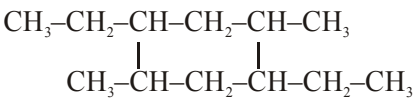
## CHEMISTRY — TEST PAPER WITH ANSWER

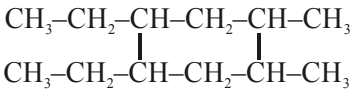
### SECTION-A

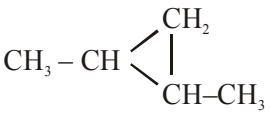
**1.** The product formed in the first step of the reaction of

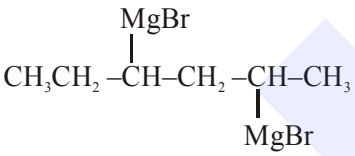


with excess $Mg/Et_2O(Et = C_2H_5)$ is :

(1) 

(2) 

(3) 

(4) 

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

**2.** Consider the elements Mg. Al, S, P and Si, the correct increasing order of their first ionization enthalpy is :

(1) Mg < Al < Si < S < P

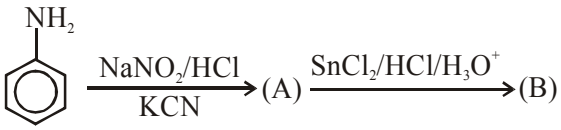
(2) Al < Mg < Si < S < P

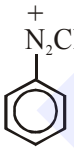
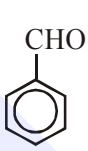
(3) Mg < Al < Si < P < S

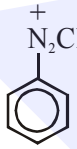
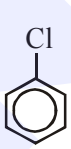
(4) Al < Mg < S < Si < P

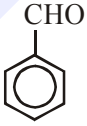
**Official Ans. by NTA (2)**

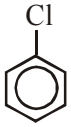
**3.** 'A' and 'B' in the following reactions are :



(1) (A) :  (B) : 

(2) (A) :  (B) : 

(3) (A) :  (B) : 

(4) (A) :  (B) : 

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

**4.** Which of the following ore is concentrated using group 1 cyanide salt ?

(1) Sphalerite (2) Calamine

(3) Siderite (4) Malachite

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

**5.** $Al_2O_3$ was leached with alkali to get X. The solution of X on passing of gas Y, forms Z. X, Y and Z respectively are :

(1) X = $Na[Al(OH)_4]$, Y = $SO_2$, Z = $Al_2O_3$

(2) X = $Na[Al(OH)_4]$, Y = $CO_2$, Z = $Al_2O_3.xH_2O$

(3) X = $Al(OH)_3$, Y = $CO_2$, Z = $Al_2O_3$

(4) X = $Al(OH)_3$, Y = $SO_2$, Z = $Al_2O_3.xH_2O$

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

**6.** Which of the following are isostructural pairs ?

A. $SO_4^{2-}$ and $CrO_4^{2-}$

B. $SiCl_4$ and $TiCl_4$

C. $NH_3$ and $NO_3^-$

D. $BCl_3$ and $BrCl_3$

$BCl_3$ and $BrCl_3$

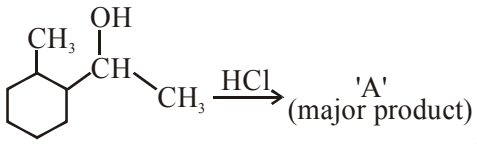
(1) C and D only

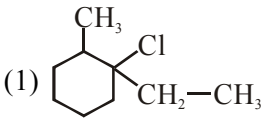
(2) A and B only

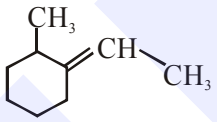
(3) A and C only (4) B and C only

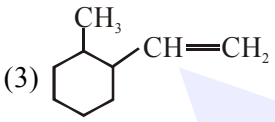
**Official Ans. by NTA (2)**

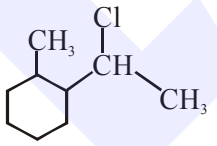
**7.** What is the final product (major) 'A' in the given reaction ?




(1) 

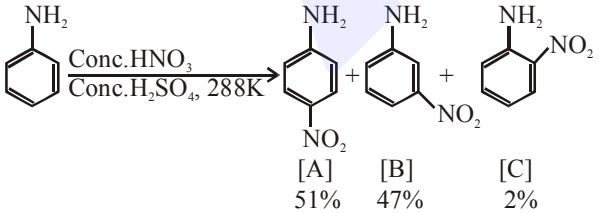

(2) 


(3) 


(4) 


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

**8.** In the following reaction the reason why meta-nitro product also formed is :




(1) low temperature

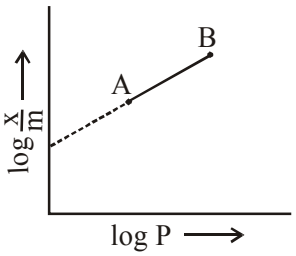
(2) $-NH_2$ group is highly meta-directive

(3) Formation of anilinium ion

(4) $-NO_2$ substitution always takes place at meta-position

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

**9.** In Freundlich adsorption isotherm, slope of AB line is :




(1) log n with (n > 1)

(2) n with (n, 0.1 to 0.5)

(3) $\log\frac{1}{n}$ with $(n<1)$

(4) $\frac{1}{n}$ with $\left(\frac{1}{n}=0 \text{ to } 1\right)$

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

**10.** (A) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$

(B) $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$

Choose the correct option.

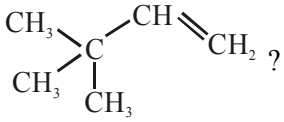
(1) $H_2O_2$ acts as reducing and oxidising agent respectively in equation (A) and (B)

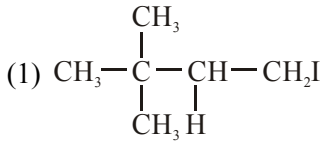
(2) $H_2O_2$ acts as oxidising agent in equation (A) and (B)

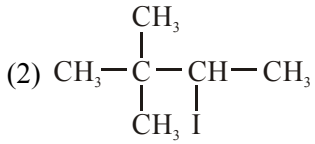
(3) $H_2O_2$ acts as reducing agent in equation (A) and (B)

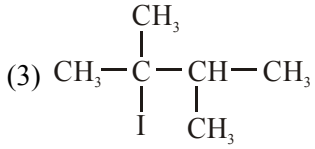
(4) $H_2O_2$ act as oxidizing and reducing agent respectively in equation (A) and (B)

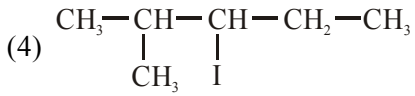
**Official Ans. by NTA (3)**

**11.** What is the major product formed by HI on reaction with  ?

(1) 

(2) 

(3) 

(4) 

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

**12.** Which of the following reagent is used for the following reaction ?

$$CH_3CH_2CH_3 \xrightarrow{?} CH_3CH_2CHO$$

(1) Manganese acetate
(2) Copper at high temperature and pressure
(3) Molybdenum oxide
(4) Potassium permanganate

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

**13.** Given below are two statements :

Statement I : Colourless cupric metaborate is reduced to cuprous metaborate in a luminous flame.

Statement II : Cuprous metaborate is obtained by heating boric anhydride and copper sulphate in a non-luminous flame.

In the light of the above statements, choose the most appropriate 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

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

**14.** Out of the following, which type of interaction is responsible for the stabilisation of α-helix structure of proteins ?

(1) Ionic bonding
(2) Hydrogen bonding
(3) Covalent bonding
(4) vander Waals forces

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

**15.** Match List I with List II.

| **List I (Monomer Unit)** | **List II (Polymer)** |
|---|---|
| (a) Caprolactum | (i) Natural rubber |
| (b) 2-Chloro-1,3-butadiene | (ii) Buna-N |
| (c) Isoperene | (iii) Nylon 6 |
| (d) Acrylonitrile | (iv) Neoprene |

Choose the correct answer from the options given below :

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

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

**16.** The gas released during anaerobic degradation of vegetation may lead to :

(1) Ozone hole
(2) Acid rain
(3) Corrosion of metals
(4) Global warming and cancer

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

**17.** The major components in "Gun Metal" are :

(1) Cu, Zn and Ni (2) Cu, Sn and Zn
(3) Al, Cu, Mg and Mn (4) Cu, Ni and Fe

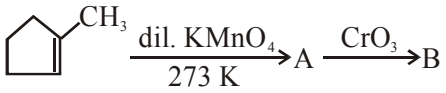
**Official Ans. by NTA (2)**

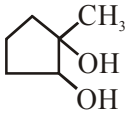
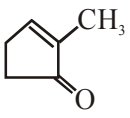
**18.** The electrode potential of $M^{2+}$ / M of 3d-series elements shows positive value of :

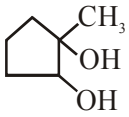
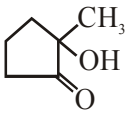
(1) Zn (2) Fe (3) Co (4) Cu

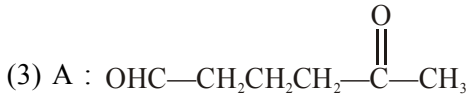
**Official Ans. by NTA (4)**

**19.** Identify products A and B :

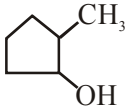
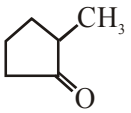



(1) A :  B : 

(2) A :  B : 

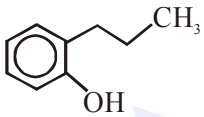
(3) A : 

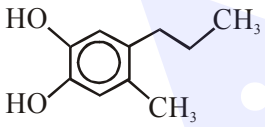
B : 

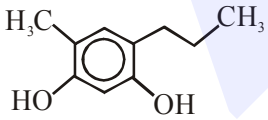
(4) A :  (4) 

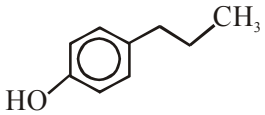
**Official Ans. by NTA (2)**

**20.** Which of the following compound gives pink colour on reaction with phthalic anhydride in conc. $H_2SO_4$ followed by treatment with NaOH ?

(1) 

(2) 

(3) 

(4) 

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

## SECTION-B

**1.** When 9.45 g of $ClCH_2COOH$ is added to 500 mL of water, its freezing point drops by 0.5°C. The dissociation constant of $ClCH_2COOH$ is $x \times 10^{-3}$. The value of x is _____. (Rounded off to the nearest integer)

$\left[K_{f(H_2O)} = 1.86\,K\,kg\,mol^{-1}\right]$

**Official Ans. by NTA (35)**

**Official Ans. by ALLEN (36)**

**2.** 4.5 g of compound A (MW = 90) was used to make 250 mL of its aqueous solution. The molarity of the solution in M is $x \times 10^{-1}$. The value of x is _____. (Rounded off to the nearest integer)

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

**3.** At 1990 K and 1 atm pressure, there are equal number of $Cl_2$ molecules and Cl atoms in the reaction mixture. The value $K_P$ for the reaction $Cl_{2(g)} \rightleftharpoons 2Cl_{(g)}$ under the above conditions is $x \times 10^{-1}$. The value of x is _____. (Rounded of to the nearest integer)

**Official Ans. by NTA (5)**

**4.** Number of amphoteric compound among the following is _____

(A) BeO (B) BaO

(C) $Be(OH)_2$ (D) $Sr(OH)_2$

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

**5.** The reaction of sulphur in alkaline medium is the below:

$$S_{8(s)} + a\ OH^-_{(aq)} \rightarrow b\ S^{2-}_{(aq)} + c\ S_2O_3^{2-}{}_{(aq)} + d\ H_2O_{(\ell)}$$

The values of 'a' is _____. (Integer answer)

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

**6.** For the reaction $A_{(g)} \rightarrow (B)_{(g)}$, the value of the equilibrium constant at 300 K and 1 atm is equal to 100.0. The value of $\Delta_r G$ for the reaction at 300 K and 1 atm in J $mol^{-1}$ is $-xR$, where x is _____ (Rounded of to the nearest integer) (R = 8.31 J $mol^{-1}$ $K^{-1}$ and ln 10 = 2.3)

**Official Ans. by NTA (1380)**

**7.** A proton and a $Li^{3+}$ nucleus are accelerated by the same potential. If $\lambda_{Li}$ and $\lambda_P$ denote the de Broglie wavelengths of $Li^{3+}$ and proton respectively, then the value of $\frac{\lambda_{Li}}{\lambda_P}$ is $x \times 10^{-1}$. The value of x is _____.

(Rounded off to the nearest integer) (Mass of $Li^{3+}$ = 8.3 mass of proton)

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

**8.** The stepwise formation of $[Cu(NH_3)_4]^{2+}$ is given below

$$Cu^{2+} + NH_3 \overset{K_1}{\rightleftharpoons} [Cu(NH_3)]^{2+}$$

$$[Cu(NH_3)]^{2+} + NH_3 \overset{K_2}{\rightleftharpoons} [Cu(NH_3)_2]^{2+}$$

$$[Cu(NH_3)_2]^{2+} + NH_3 \overset{K_3}{\rightleftharpoons} [Cu(NH_3)_3]^{2+}$$

$$[Cu(NH_3)_3]^{2+} + NH_3 \overset{K_4}{\rightleftharpoons} [Cu(NH_3)_4]^{2+}$$

The value of stability constants $K_1$, $K_2$, $K_3$ and $K_4$ are $10^4$, $1.58 \times 10^3$, $5 \times 10^2$ and $10^2$ respectively. The overall equilibrium constants for dissociation of $[Cu(NH_3)_4]^{2+}$ is $x \times 10^{-12}$. The value of x is _____. (Rounded off to the nearest integer)

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

**9.** The coordination number of an atom in a body-centered cubic structure is _____.

[Assume that the lattice is made up of atoms.]

**Official Ans. by NTA (8)**

**10.** Gaseous cyclobutene isomerizes to butadiene in a first order process which has a 'k' value of $3.3 \times 10^{-4} s^{-1}$ at 153°C. The time in minutes it takes for the isomerization to proceed 40 % to completion at this temperature is _____. (Rounded off to the nearest integer)

**Official Ans. by NTA (26)**