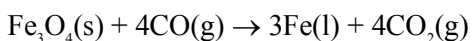


**FINAL JEE-MAIN EXAMINATION – JUNE, 2022**
**(Held On Wednesday 29<sup>th</sup> June, 2022)**
**TIME : 9 : 00 AM to 12 : 00 PM**
**CHEMISTRY**
**TEST PAPER WITH SOLUTION**
**SECTION-A**

1. Production of iron in blast furnace follows the following equation



when 4.640 kg of  $\text{Fe}_3\text{O}_4$  and 2.520 kg of CO are allowed to react then the amount of iron (in g) produced is :

[Given : Molar Atomic mass ( $\text{g mol}^{-1}$ ): Fe = 56

Molar Atomic mass ( $\text{g mol}^{-1}$ ): O = 16

Molar Atomic mass ( $\text{g mol}^{-1}$ ): C = 12

(A) 1400 (B) 2200

(C) 3360 (D) 4200

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

**Allen Ans. (C)**

**Sol.** Moles of  $\text{Fe}_3\text{O}_4 = \frac{4.640 \times 10^3}{232} = 20$

Moles of CO =  $\frac{2.52 \times 10^3}{28} = 90$

So limiting Reagent =  $\text{Fe}_3\text{O}_4$

So moles of Fe formed = 60

Weight of Fe =  $60 \times 56 = 3360$  gms

2. Which of the following statements are **correct** ?

(A) The electronic configuration of Cr is  $[\text{Ar}] 3d^5 4s^1$ .

(B) The magnetic quantum number may have a negative value.

(C) In the ground state of an atom, the orbitals are filled in order of their increasing energies.

(D) The total number of nodes are given by  $n - 2$ .

Choose the **most appropriate** answer from the options given below :

(A) (A), (C) and (D) only

(B) (A) and (B) only

(C) (A) and (C) only

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

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

**Allen Ans. (D)**

**Sol.** (A)  $\text{Cr} = [\text{Ar}]3d^5 4s^1$

(B)  $m = -\ell$  to  $+\ell$

(C) According to Aufbau principle, orbitals are filled in order of their increasing energies.

(D) Total nodes =  $n - 1$

3. Arrange the following in the decreasing order of their covalent character :

(A) LiCl

(B) NaCl

(C) KCl

(D) CsCl

Question: Choose the **most appropriate** answer from the options given below :

(A) (A) > (C) > (B) > (D)

(B) (B) > (A) > (C) > (D)

(C) (A) > (B) > (C) > (D)

(D) (A) > (B) > (D) > (C)

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

**Allen Ans. (C)**

**Sol.**  $\text{LiCl} > \text{NaCl} > \text{KCl} > \text{CsCl}$  (Covalent character)

4. The solubility of AgCl will be maximum in which of the following ?

(A) 0.01 M KCl

(B) 0.01 M HCl

(C) 0.01 M  $\text{AgNO}_3$

(D) Deionised water

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

**Allen Ans. (D)**

**Sol.** In deionized water no common ion effect will take place so maximum solubility

5. Which of the following is a **correct** statement ?
- (A) Brownian motion destabilises sols.  
 (B) Any amount of dispersed phase can be added to emulsion without destabilising it.  
 (C) Mixing two oppositely charged sols in equal amount neutralises charges and stabilises colloids.  
 (D) Presence of equal and similar charges on colloidal particles provides stability to the colloidal solution.

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

**Allen Ans. (D)**

- Sol.** As equal & similar charge particle will repel each other, hence will never precipitate.

6. The electronic configuration of Pt (atomic number 78) is:

- (A)  $[\text{Xe}] 4f^{14} 5d^9 6s^1$   
 (B)  $[\text{Kr}] 4f^{14} 5d^{10}$   
 (C)  $[\text{Xe}] 4f^{14} 5d^{10}$   
 (D)  $[\text{Xe}] 4f^{14} 5d^8 6s^2$

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

**Allen Ans. (A)**

- Sol.**  ${}_{78}\text{Pt} = [\text{Xe}] 4f^{14} 5d^9 6s^1$  (Exceptional electronic configuration)

7. In isolation of which one of the following metals from their ores, the use of cyanide salt is not commonly involved ?

- (A) Zinc  
 (B) Gold  
 (C) Silver  
 (D) Copper

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

**Allen Ans. (D)**

- Sol.** For ZnS, KCN is used as depressant.

For Gold and silver  $\Rightarrow$  leaching [Cyanide process]

8. Which one of the following reactions indicates the reducing ability of hydrogen peroxide in basic medium ?

- (A)  $\text{HOCl} + \text{H}_2\text{O}_2 \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^- + \text{O}_2$   
 (B)  $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$   
 (C)  $2\text{MnO}_4^- + 3\text{H}_2\text{O}_2 \rightarrow 2\text{MnO}_2 + 3\text{O}_2 + 2\text{H}_2\text{O} + 2\text{OH}^-$   
 (D)  $\text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{Mn}^{4+} + 2\text{OH}^-$

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

**Allen Ans. (C)**

- Sol.** In option (A) and (C) reducing action of hydrogen peroxide is shown.

In option (A) it is in acidic medium, in option (B) it is in basic medium.

**or**

For reducing ability  $\text{H}_2\text{O}_2$  changes to  $\text{O}_2$ , i.e. oxidize, so in option 'A' & 'C'  $\text{O}_2$  is formed but 'A' is in acidic medium so option - C correct.

9. Match the **List-I** with **List- II**.

<b>List-I (Metal)</b>	<b>List-II (Emitted light wavelength (nm))</b>
(A) Li	(I) 670.8
(B) Na	(II) 589.2
(C) Rb	(III) 780.0
(D) Cs	(IV) 455.5

Choose the **most appropriate** answer from the options given below:

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

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

**Allen Ans. (A)**

- Sol.** NCERT Table 10.1.5

<b>Metal</b>	<b>Li</b>	<b>Na</b>	<b>K</b>	<b>Rb</b>	<b>Cs</b>
Colour	Crimson red	Yellow	Violet	Red Violet	Blue
$\lambda/\text{nm}$	670.8	589.2	766.5	780.0	455.5

10. Match the List-I with List- II.

List-I (Metal)	List-II Application
(A) Cs	(I) High temperature thermometer
(B) Ga	(II) Water repellent sprays
(C) B	(III) Photoelectric cells
(D) Si	(IV) Bullet proof vest

Choose the most appropriate answer from the option given below:

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

**Official Ans. by NTA (A)****Allen Ans. (A)****Sol.** Caesium is used in devising photoelectric cells.

Boron fibres are used in making bullet-proof vest.

Silicones being surrounded by non-polar alkyl groups are water repelling in nature.

Gallium is less toxic and has a very high boiling point, so it is used in high temperature thermometers.

11. The oxoacid of phosphorus that is easily obtained from a reaction of alkali and white phosphorus and has two P-H bonds, is :

- (A) Phosphonic acid  
 (B) Phosphinic acid  
 (C) Pyrophosphorus acid  
 (D) Hypophosphoric acid

**Official Ans. by NTA (B)****Allen Ans. (B)****Sol.**  $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$ 

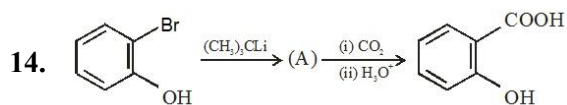
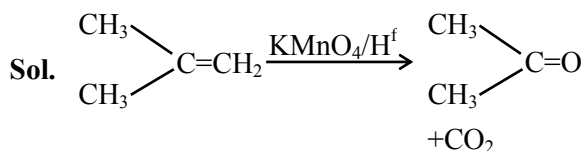
oxoacid =  $H_3PO_2$  (hypo phosphorus acid) or  
 (phosphinic acid)

12. The acid that is believed to be mainly responsible for the damage of Taj Mahal is

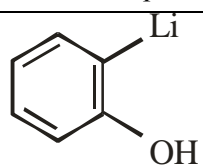
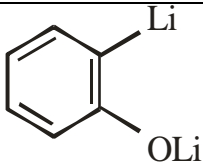
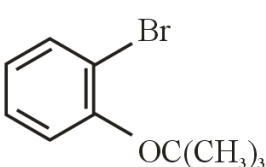
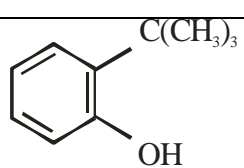
- (A) Sulfuric acid (B) Hydrofluoric acid  
 (C) Phosphoric acid (D) Hydrochloric acid

**Official Ans. by NTA (A)****Allen Ans. (A)****Sol.**  $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$ 13. Two isomers 'A' and 'B' with molecular formula  $C_4H_8$  give different products on oxidation with  $KMnO_4$  in acidic medium. Isomer 'A' on reaction with  $KMnO_4/H^+$  results in effervescence of a gas and gives ketone. The compound 'A' is

- (A) But-1-ene (B) cis-But-2-ene  
 (C) trans-But-2ene (D) 2-methyl propene

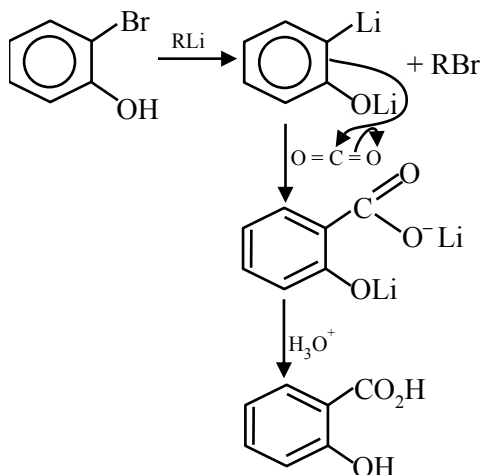
**Official Ans. by NTA (D)****Allen Ans. (D)**

In the given conversion the compound A is:

(A)	
(B)	
(C)	
(D)	

**Official Ans. by NTA (B)****Allen Ans. (B)**

Sol.



15. Given below are two statements :

**Statement I :** The esterification of carboxylic acid with an alcohol is a nucleophilic acyl substitution.

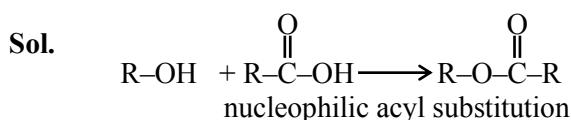
**Statement II :** Electron withdrawing groups in the carboxylic acid will increase the rate of esterification reaction.

Choose the **most appropriate** option :

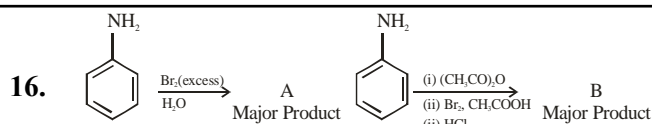
- (A) Both **Statement I** and **Statement II** are correct.  
 (B) Both **Statement I** and **Statement II** are incorrect.  
 (C) **Statement I** is correct but **Statement II** is incorrect.  
 (D) **Statement I** is incorrect but **Statement II** is correct.

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

**Allen Ans. (A)**



electron with drawing group on carboxylic acid will increase the rate of esterification

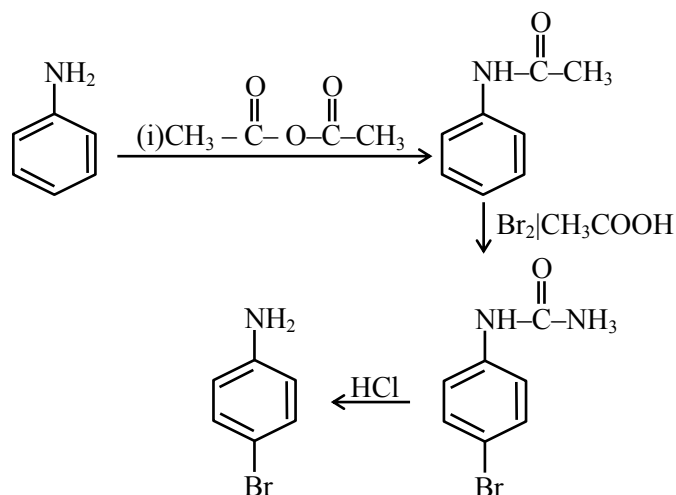
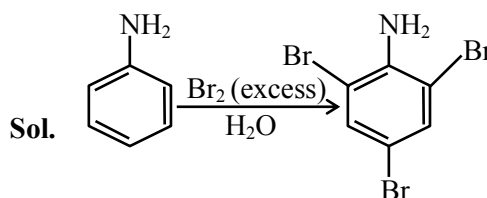


Consider the above reaction, the product A and product B respectively are

(A)	
(B)	
(C)	
(D)	

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

**Allen Ans. (C)**



17. The polymer, which can be stretched and retains its original status on releasing the force is

- (A) Bakelite (B) Nylon 6,6  
 (C) Buna-N (D) Terylene

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

**Allen Ans. (C)**

Buna – N is synthetic rubber which can be stretched and retains its original status on releasing the force.

18. Sugar moiety in DNA and RNA molecules respectively are

- (A)  $\beta$ -D-2-deoxyribose,  $\beta$ -D-deoxyribose  
 (B)  $\beta$ -D-2-deoxyribose,  $\beta$ -D-ribose  
 (C)  $\beta$ -D-ribose,  $\beta$ -D-2-deoxyribose  
 (D)  $\beta$ -D-deoxyribose,  $\beta$ -D-2-deoxyribose

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

**Allen Ans. (B)**

**Sol.** DNA contains  $\Rightarrow \beta$ -D-2-deoxyribose

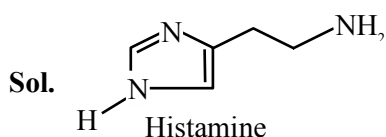
RNA contains  $\Rightarrow \beta$ -D-ribose

19. Which of the following compound **does not** contain sulphur atom ?

- (A) Cimetidine (B) Ranitidine  
 (C) Histamine (D) Saccharin

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

**Allen Ans. (C)**



Histamine is nitrogenous compound it does not contain sulphur.

20. Given below are two statements.

**Statement I :** Phenols are weakly acidic.

**Statement II :** Therefore they are freely soluble in NaOH solution and are weaker acids than alcohols and water.

Choose the **most appropriate** option:

- (A) Both **Statement I** and **Statement II** are correct.  
 (B) Both **Statement I** and **Statement II** are incorrect.  
 (C) **Statement I** is correct but **Statement II** is incorrect.  
 (D) **Statement I** is incorrect but **Statement II** is correct.

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

**Allen Ans. (C)**

**Sol.** Phenol are weakly acidic. Phenol is more acidic than alcohol &  $H_2O$  statement (I) is correct. (II) is incorrect.

### SECTION-B

1. Geraniol, a volatile organic compound, is a component of rose oil. The density of the vapour is  $0.46 \text{ gL}^{-1}$  at  $257^\circ\text{C}$  and 100 mm Hg. The molar mass of geraniol is \_\_\_\_\_ (Nearest Integer)  
 [Given  $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$ ]

**Official Ans. by NTA (152)**

**Allen Ans. (152)**

**Sol.** Assuming ideal behaviour  $P = \frac{dRT}{M}$

$$P = \frac{100}{760} \text{ atm}, T = 257 + 273 = 530 \text{ K}$$

$$d = 0.46 \text{ gm/L}$$

$$\text{So } M = \frac{0.46 \times 0.082 \times 530}{100} \times 760$$

$$= 151.93 \approx 152$$

2. 17.0 g of  $\text{NH}_3$  completely vapourises at  $-33.42^\circ\text{C}$  and 1 bar pressure and the enthalpy change in the process is  $23.4 \text{ kJ mol}^{-1}$ . The enthalpy change for the vapourisation of 85 g of  $\text{NH}_3$  under the same conditions is \_\_\_\_\_ kJ.

**Official Ans. by NTA (117)**

**Allen Ans. (117)**

- Sol.** Given data is for 1 moles and asked for 5 moles so value is  $23.4 \times 5 = 117 \text{ kJ}$

3. 1.2 mL of acetic acid is dissolved in water to make 2.0 L of solution. The depression in freezing point observed for this strength of acid is  $0.0198^\circ\text{C}$ . The percentage of dissociation of the acid is \_\_\_\_\_. (Nearest integer)

[Given : Density of acetic acid is  $1.02 \text{ g mL}^{-1}$

Molar mass of acetic acid is  $60 \text{ g mol}^{-1}$

$K_f(\text{H}_2\text{O}) = 1.85 \text{ K kg mol}^{-1}$ ]

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

**Allen Ans. (5)**

- Sol.**  $M = d \times V = 1.02 \times 1.2 = 1.224 \text{ gm}$

Moles of acetic acid = 0.0204 moles in 2L

So molality = 0.0102 mol/kg

Now  $\Delta T_f = i \times K_f \times M$

$i = 1 + \alpha$  for acetic acid

$0.0198 = (1 + \alpha) \times 1.85 \times 0.0102$

$\alpha = 0.04928$

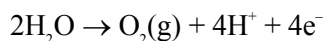
$\cong 5\%$

4. A dilute solution of sulphuric acid is electrolysed using a current of 0.10 A for 2 hours to produce hydrogen and oxygen gas. The total volume of gases produced at STP is \_\_\_\_\_  $\text{cm}^3$ . (Nearest integer) [Given : Faraday constant  $F = 96500 \text{ C mol}^{-1}$  at STP, molar volume of an ideal gas is  $22.7 \text{ L mol}^{-1}$ ]

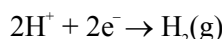
**Official Ans. by NTA (127)**

**Allen Ans. (127)**

- Sol.** At anode



At cathode



Now number of gm eq. =  $\frac{i \times t}{96500}$

$$= \frac{0.1 \times 2 \times 60 \times 60}{96500}$$

$$= 0.00746$$

$$V_{\text{O}_2} = \frac{0.00746}{4} \times 22.7 = 0.0423$$

$$V_{\text{H}_2} = \frac{0.00746}{2} \times 22.7 = 0.0846$$

$$V_{\text{Total}} \approx 127 \text{ ml or cc}$$

5. The activation energy of one of the reactions in a biochemical process is  $532611 \text{ J mol}^{-1}$ . When the temperature falls from 310 K to 300 K, the change in rate constant observed is  $k_{300} = x \times 10^{-3} k_{310}$ . The value of x is \_\_\_\_\_.

[Given:  $\ln 10 = 2.3$

$R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

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

**Allen Ans. (1)**

**Sol.**  $\ln\left(\frac{K_2}{K_1}\right) = \frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

$$\ln\left(\frac{K_2}{K_1}\right) = \frac{532611}{8.3} \times \left(\frac{1}{310} - \frac{1}{300}\right)$$

where  $K_2$  is at 310 K &  $K_1$  is at 300 K

$$\ln\left(\frac{K_2}{K_1}\right) = 6.9$$

$$= 3 \times \ln 10$$

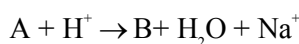
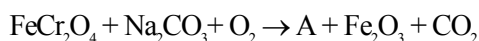
$$\ln \frac{K_2}{K_1} = \ln 10^3$$

$$K_2 = K_1 \times 10^3$$

$$K_1 = K_2 \times 10^3$$

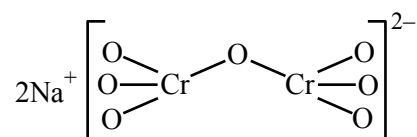
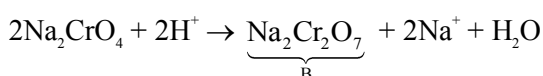
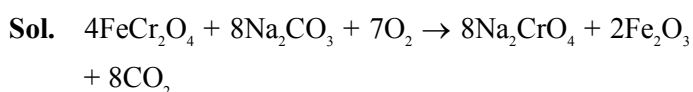
So  $K = 1$

6. The number of terminal oxygen atoms present in the product B obtained from the following reaction is \_\_\_\_\_.



**Official Ans. by NTA (6)**

**Allen Ans. (6)**

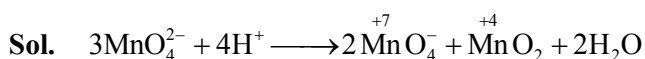


7. An acidified manganate solution undergoes disproportionation reaction. The spin-only magnetic moment value of the product having manganese in higher oxidation state is \_\_\_\_\_

B.M. (Nearest integer)

**Official Ans. by NTA (0)**

**Allen Ans. (0)**



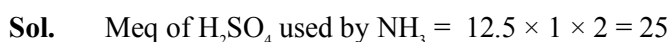
$\overset{+7}{\text{Mn}}$  = no. of unpaired electrons is '0'

$\mu = 0$  B.M.

8. Kjeldahl's method was used for the estimation of nitrogen in an organic compound. The ammonia evolved from 0.55 g of the compound neutralised 12.5 mL of 1 M  $\text{H}_2\text{SO}_4$  solution. The percentage of nitrogen in the compound is \_\_\_\_\_. (Nearest integer)

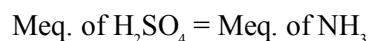
**Official Ans. by NTA (64)**

**Allen Ans. (64)**



$$\% \text{ of N in the compound} = \frac{25 \times 10^{-3} \times 14 \times 100}{0.55} = 63.6$$

or



$$12.5 \times 1 \times 2 = 25 \text{ meq. of } \text{NH}_3$$

$$= 25 \text{ millimoles of } \text{NH}_3$$

$$\text{So Millimoles of 'N' = 25}$$

$$\text{Moles of 'N' = } 25 \times 10^{-3}$$

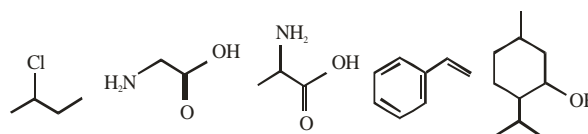
$$\text{wt. of N = } 14 \times 25 \times 10^{-3}$$

$$\% \text{ N} = \frac{14 \times 25 \times 10^{-3}}{0.55} \times 100$$

$$= 63.66$$

$$\approx 64\%$$

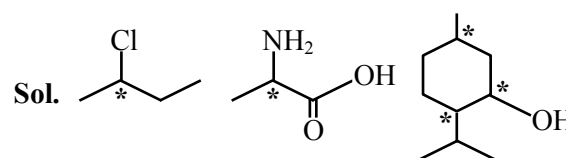
9. Observe structures of the following compounds



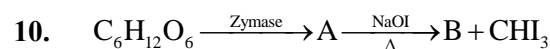
The total number of structures/compounds which possess asymmetric carbon atoms is \_\_\_\_\_.

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

**Allen Ans. (3)**



Number of compounds containing asymmetric carbons are three.

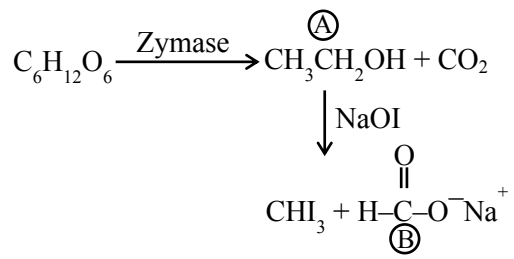


The number of carbon atoms present in the product B is \_\_\_\_\_.

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

**Allen Ans. (1)**

**Sol.**



no. of carbon atoms present in B is 1