

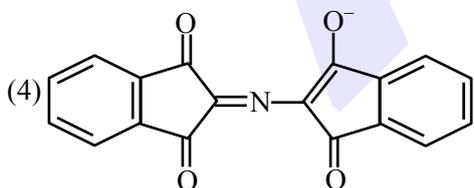
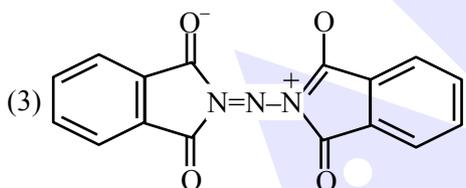
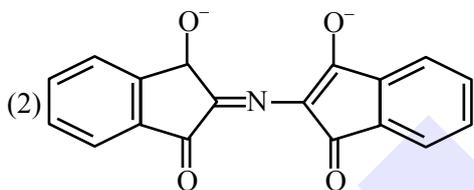
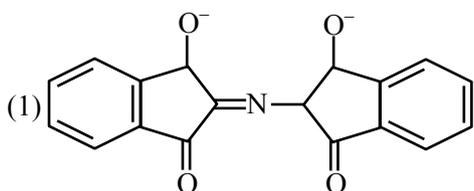
**FINAL JEE-MAIN EXAMINATION – JULY, 2021**
**(Held On Tuesday 20<sup>th</sup> July, 2021)**
**TIME : 9 : 00 AM to 12 : 00 NOON**
**CHEMISTRY**
**TEST PAPER WITH ANSWER**
**SECTION-A**

1. According to the valence bond theory the hybridization of central metal atom is  $dsp^2$  for which one of the following compounds?

- (1)  $NiCl_2 \cdot 6H_2O$                       (2)  $K_2[Ni(CN)_4]$   
 (3)  $[Ni(CO)_4]$                         (4)  $Na_2[NiCl_4]$

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

2. The correct structure of Rhumann's Purple, the compound formed in the reaction of ninhydrin with proteins is :


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

3. Green chemistry in day-to-day life is in the use of:

- (1) Chlorine for bleaching of paper  
 (2) Large amount of water alone for washing clothes  
 (3) Tetrachloroethene for laundry  
 (4) Liquefied  $CO_2$  for dry cleaning of clothes

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

4. The correct order of intensity of colors of the compounds is :

- (1)  $[Ni(CN)_4]^{2-} > [NiCl_4]^{2-} > [Ni(H_2O)_6]^{2+}$   
 (2)  $[Ni(H_2O)_6]^{2+} > [NiCl_4]^{2-} > [Ni(CN)_4]^{2-}$   
 (3)  $[NiCl_4]^{2-} > [Ni(H_2O)_6]^{2+} > [Ni(CN)_4]^{2-}$   
 (4)  $[NiCl_4]^{2-} > [Ni(CN)_4]^{2-} > [Ni(H_2O)_6]^{2+}$

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

5. The set in which compounds have different nature is :

- (1)  $B(OH)_3$  and  $H_3PO_3$   
 (2)  $B(OH)_3$  and  $Al(OH)_3$   
 (3)  $NaOH$  and  $Ca(OH)_2$   
 (4)  $Be(OH)_2$  and  $Al(OH)_3$

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

6. The species given below that does NOT show disproportionation reaction is :

- (1)  $BrO_4^-$                                       (2)  $BrO^-$   
 (3)  $BrO_2^-$                                     (4)  $BrO_3^-$

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

7. Given below are two statements. One is labelled as **Assertion A** and the other is labelled as **Reason R**.  
**Assertion A** : Sharp glass edge becomes smooth on heating it upto its melting point.

**Reason R** : The viscosity of glass decreases on melting.

Choose the most appropriate answer from the options given below.

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

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

8. Orlon fibres are made up of :

- (1) Polyacrylonitrile                      (2) Polyesters  
 (3) Polyamide                              (4) Cellulose

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

9. Given below are two statements : One is labelled as **Assertion A** and other is labelled as **Reason R**.

**Assertion A** : The dihedral angles in  $\text{H}_2\text{O}_2$  in gaseous phase is  $90.2^\circ$  and in solid phase is  $111.5^\circ$ .

**Reason R** : The change in dihedral angle in solid and gaseous phase is due to the difference in the intermolecular forces.

Choose the most appropriate answer from the options given below for **A** and **R**.

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

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

10. Chemical nature of the nitrogen oxide compound obtained from a reaction of concentrated nitric acid and  $\text{P}_4\text{O}_{10}$  (in 4 : 1 ratio) is :

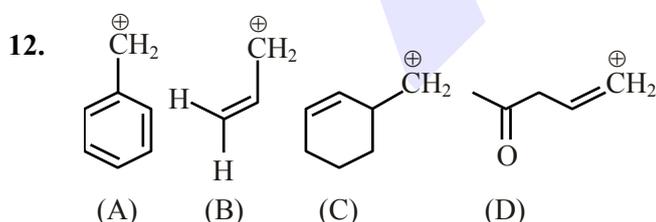
- (1) acidic
- (2) basic
- (3) amphoteric
- (4) neutral

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

11. An inorganic Compound 'X' on treatment with concentrated  $\text{H}_2\text{SO}_4$  produces brown fumes and gives dark brown ring with  $\text{FeSO}_4$  in presence of concentrated  $\text{H}_2\text{SO}_4$ . Also Compound 'X' gives precipitate 'Y', when its solution in dilute  $\text{HCl}$  is treated with  $\text{H}_2\text{S}$  gas. The precipitate 'Y' on treatment with concentrated  $\text{HNO}_3$  followed by excess of  $\text{NH}_4\text{OH}$  further gives deep blue coloured solution, Compound 'X' is:

- (1)  $\text{Co}(\text{NO}_3)_2$
- (2)  $\text{Pb}(\text{NO}_2)_2$
- (3)  $\text{Cu}(\text{NO}_3)_2$
- (4)  $\text{Pb}(\text{NO}_3)_2$

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



Among the given species the Resonance stabilised carbocations are:

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

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

13. A s-block element (M) reacts with oxygen to form an oxide of the formula  $\text{MO}_2$ . The oxide is pale yellow in colour and paramagnetic. The element (M) is:

- (1) Mg
- (2) Na
- (3) Ca
- (4) K

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

14. In the given reaction 3-Bromo-2, 2-dimethyl butane  $\xrightarrow{\text{C}_2\text{H}_5\text{OH}}$  'A' (Major Product) Product A is:

- (1) 2-Ethoxy-3, 3-dimethyl butane
- (2) 1-Ethoxy-3, 3-dimethyl butane
- (3) 2-Ethoxy-2, 3-dimethyl butane
- (4) 2-Hydroxy-3, 3-dimethyl butane

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

15. The metal that can be purified economically by fractional distillation method is:

- (1) Fe
- (2) Zn
- (3) Cu
- (4) Ni

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

16. Compound A is converted to B on reaction with  $\text{CHCl}_3$  and  $\text{KOH}$ . The compound B is toxic and can be decomposed by C. A, B and C respectively are :

- (1) primary amine, nitrile compound, conc.  $\text{HCl}$
- (2) secondary amine, isonitrile compound, conc.  $\text{NaOH}$
- (3) primary amine, isonitrile compound, conc.  $\text{HCl}$
- (4) secondary amine, nitrile compound, conc.  $\text{NaOH}$

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

17. The conditions given below are in the context of observing Tyndall effect in colloidal solutions:

- (A) The diameter of the colloidal particles is comparable to the wavelength of light used.
- (B) The diameter of the colloidal particles is much smaller than the wavelength of light used.
- (C) The diameter of the colloidal particles is much larger than the wavelength of light used.
- (D) The refractive indices of the dispersed phase and the dispersion medium are comparable.
- (E) The dispersed phase has a very different refractive index from the dispersion medium.

Choose the most appropriate conditions from the options given below:

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

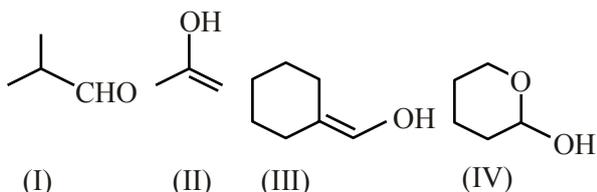
**Official Ans. by NTA (1)**

18. Identify the incorrect statement from the following

- (1) Amylose is a branched chain polymer of glucose
- (2) Starch is a polymer of  $\alpha$ -D glucose
- (3)  $\beta$ -Glycosidic linkage makes cellulose polymer
- (4) Glycogen is called as animal starch

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

19.

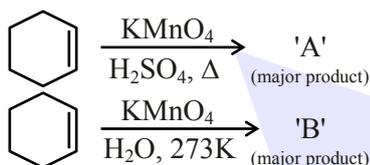


Which among the above compound/s does/do not form Silver mirror when treated with Tollen's reagent?

- (1) (I), (III) and (IV) only
- (2) Only (IV)
- (3) Only (II)
- (4) (III) and (IV) only

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

20.



For above chemical reactions, identify the correct statement from the following:

- (1) Both compound 'A' and compound 'B' are dicarboxylic acids
- (2) Both compound 'A' and compound 'B' are diols
- (3) Compound 'A' is diol and compound 'B' is dicarboxylic acid
- (4) Compound 'A' is dicarboxylic acid and compound 'B' is diol

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

### SECTION-B

1. The number of lone pairs of electrons on the central I atom in  $I_3^-$  is \_\_\_\_\_.

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

2. 250 mL of 0.5 M NaOH was added to 500 mL of 1 M HCl. The number of unreacted HCl molecules in the solution after complete reaction is \_\_\_\_\_  $\times 10^{21}$ . (Nearest integer)

( $N_A = 6.022 \times 10^{23}$ )

**Official Ans. by NTA (226)**

3. The Azimuthal quantum number for the valence electrons of  $Ga^+$  ion is \_\_\_\_\_.

(Atomic number of Ga = 31)

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

4. The spin-only magnetic moment value for the complex  $[Co(CN)_6]^{4-}$  is \_\_\_\_\_ BM.

[At. no. of Co = 27]

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

5.  $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

In an equilibrium mixture, the partial pressures are

$P_{SO_3} = 43$  kPa ;  $P_{O_2} = 530$  Pa and

$P_{SO_2} = 45$  kPa. The equilibrium constant

$K_p = \text{_____} \times 10^{-2}$ . (Nearest integer)

**Official Ans. by NTA (172)**

6. The number of nitrogen atoms in a semicarbazone molecule of acetone is \_\_\_\_\_.

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

7. To synthesise 1.0 mole of 2-methylpropan-2-ol from Ethylethanoate \_\_\_\_\_ equivalents of  $CH_3MgBr$  reagent will be required. (Integer value)

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

8. The inactivation rate of a viral preparation is proportional to the amount of virus. In the first minute after preparation, 10% of the virus is inactivated. The rate constant for viral inactivation is \_\_\_\_\_  $\times 10^{-3} \text{ min}^{-1}$ . (Nearest integer)

[Use :  $\ln 10 = 2.303$  ;  $\log_{10} 3 = 0.477$ ;

property of logarithm :  $\log x^y = y \log x$ ]

**Official Ans. by NTA (106)**

9. An average person needs about 10000 kJ energy per day. The amount of glucose (molar mass =  $180.0 \text{ g mol}^{-1}$ ) needed to meet this energy requirement is \_\_\_\_\_ g.

(Use :  $\Delta_c H(\text{glucose}) = -2700 \text{ kJ mol}^{-1}$ )

**Official Ans. by NTA (667)**

10. At  $20^\circ\text{C}$ , the vapour pressure of benzene is 70 torr and that of methyl benzene is 20 torr. The mole fraction of benzene in the vapour phase at  $20^\circ\text{C}$  above an equimolar mixture of benzene and methyl benzene is \_\_\_\_\_  $\times 10^{-2}$ . (Nearest integer)

**Official Ans. by NTA (78)**