

FINAL JEE-MAIN EXAMINATION – FEBRUARY, 2021

(Held On Thursday 25th February, 2021) TIME : 3 : 00 PM to 6 : 00 PM

CHEMISTRY

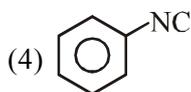
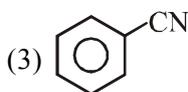
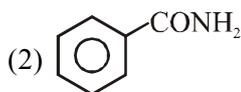
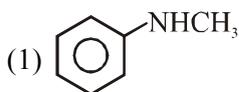
SECTION-A

1. Which among the following species has unequal bond lengths ?

(1) BF_4^- (2) XeF_4 (3) SF_4 (4) SiF_4

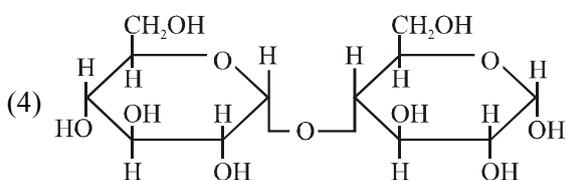
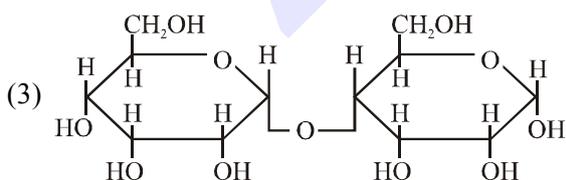
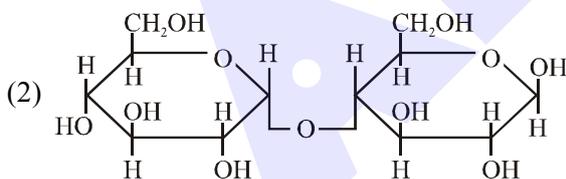
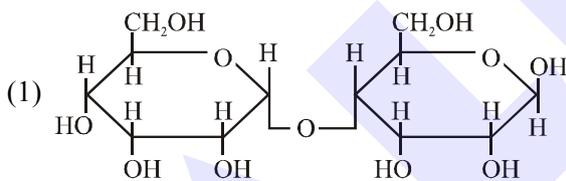
Official Ans. by NTA (3)

2. Carbylamine test is used to detect the presence of primary amino group in an organic compound. Which of the following compound is formed when this test is performed with aniline?



Official Ans. by NTA (4)

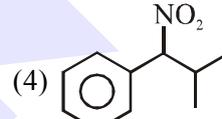
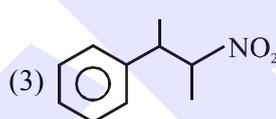
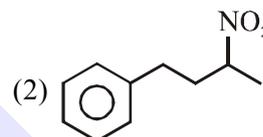
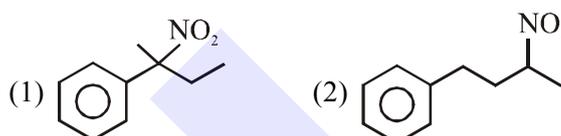
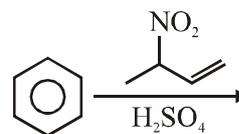
3. Which of the following is correct structure of α -anomer of maltose ?



Official Ans. by NTA (4)

TEST PAPER WITH ANSWER

4. The major product of the following reaction is:



Official Ans. by NTA (3)

5. The correct sequence of reagents used in the preparation of 4-bromo-2-nitroethyl benzene from benzene is :

(1) $\text{HNO}_3/\text{H}_2\text{SO}_4$, $\text{Br}_2/\text{AlCl}_3$, $\text{CH}_3\text{COCl}/\text{AlCl}_3$, $\text{Zn-Hg}/\text{HCl}$

(2) $\text{Br}_2/\text{AlBr}_3$, $\text{CH}_3\text{COCl}/\text{AlCl}_3$, $\text{HNO}_3/\text{H}_2\text{SO}_4$, Zn/HCl

(3) $\text{CH}_3\text{COCl}/\text{AlCl}_3$, $\text{Br}_2/\text{AlBr}_3$, $\text{HNO}_3/\text{H}_2\text{SO}_4$, Zn/HCl

(4) $\text{CH}_3\text{COCl}/\text{AlCl}_3$, $\text{Zn-Hg}/\text{HCl}$, $\text{Br}_2/\text{AlBr}_3$, $\text{HNO}_3/\text{H}_2\text{SO}_4$

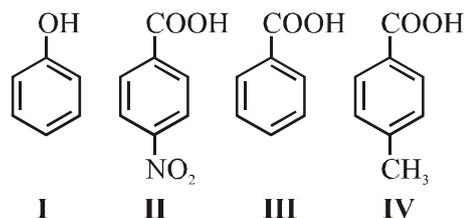
Official Ans. by NTA (4)

6. Water does not produce CO on reacting with:

(1) CO_2 (2) C (3) CH_4 (4) C_3H_8

Official Ans. by NTA (1)

7. The correct order of acid character of the following compounds is :

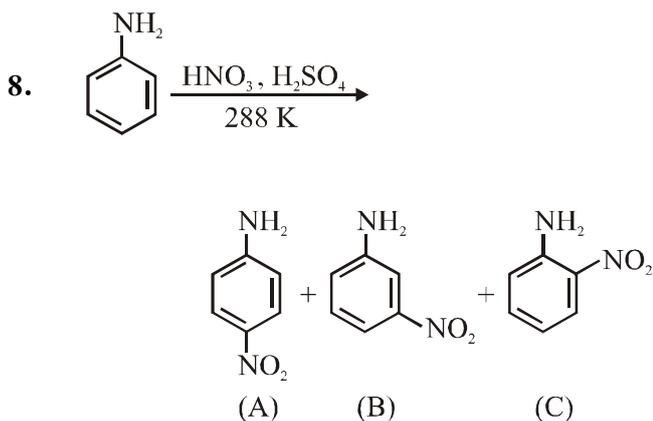


Options:

(1) III > II > I > IV (2) IV > III > II > I

(3) I > II > III > IV (4) II > III > IV > I

Official Ans. by NTA (4)



Correct statement about the given chemical reaction is :

- (1) $-\ddot{N}H_2$ group is *ortho* and *para* directive, so product (B) is not possible.
- (2) Reaction is possible and compound (B) will be the major product.
- (3) The reaction will form sulphonated product instead of nitration.
- (4) Reaction is possible and compound (A) will be major product.

Official Ans. by NTA (4)

9. The correct order of bond dissociation enthalpy of halogens is :

- (1) $Cl_2 > F_2 > Br_2 > I_2$
- (2) $I_2 > Br_2 > Cl_2 > F_2$
- (3) $Cl_2 > Br_2 > F_2 > I_2$
- (4) $F_2 > Cl_2 > Br_2 > I_2$

Official Ans. by NTA (3)

10. Given below are two statements :

Statement I :

The pH of rain water is normally ~ 5.6 .

Statement II :

If the pH of rain water drops below 5.6, it is called acid rain.

In the light of the above statements, choose the correct 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 (4)

11. The major components of German Silver are :

- (1) Ge, Cu and Ag
- (2) Zn, Ni and Ag
- (3) Cu, Zn and Ni
- (4) Cu, Zn and Ag

Official Ans. by NTA (3)

12. In which of the following order the given complex ions are arranged correctly with respect to their decreasing spin only magnetic moment ?

- (i) $[FeF_6]^{3-}$
 - (ii) $[Co(NH_3)_6]^{3+}$
 - (iii) $[NiCl_4]^{2-}$
 - (iv) $[Cu(NH_3)_4]^{2+}$
- (1) (i) > (iii) > (iv) > (ii)
 - (2) (ii) > (iii) > (i) > (iv)
 - (3) (iii) > (iv) > (ii) > (i)
 - (4) (ii) > (i) > (iii) > (iv)

Official Ans. by NTA (1)

13. Which of the following compound is added to the sodium extract before addition of silver nitrate for testing of halogens?

- (1) Nitric acid
- (2) Ammonia
- (3) Hydrochloric acid
- (4) Sodium hydroxide

Official Ans. by NTA (1)

14. Which one of the following statements is FALSE for hydrophilic sols ?

- (1) Their viscosity is of the order of that of H_2O .
- (2) The sols cannot be easily coagulated.
- (3) They do not require electrolytes for stability.
- (4) These sols are reversible in nature.

Official Ans. by NTA (1)

15. The solubility of $Ca(OH)_2$ in water is :

[Given : The solubility product of $Ca(OH)_2$ in water = 5.5×10^{-6}]

- (1) 1.77×10^{-6}
- (2) 1.11×10^{-6}
- (3) 1.11×10^{-2}
- (4) 1.77×10^{-2}

Official Ans. by NTA (3)

16. Given below are two statements :

Statement I :

The identification of Ni^{2+} is carried out by dimethyl glyoxime in the presence of NH_4OH .

Statement II :

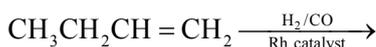
The dimethyl glyoxime is a bidentate neutral ligand.

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

- (1) Statement I is false but Statement II is true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is true but Statement II is false.
- (4) Both Statement I and Statement II are true.

Official Ans. by NTA (3)

17. The major product of the following reaction is:



- (1) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}-\text{CHO}$
- (2) $\text{CH}_3\text{CH}_2\overset{\text{CHO}}{\underset{|}{\text{C}}}\text{=CH}_2$
- (3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
- (4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$

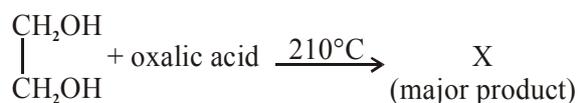
Official Ans. by NTA (3)

18. The method used for the purification of Indium is :

- (1) van Arkel method
- (2) liquation
- (3) zone refining
- (4) vapour phase refining

Official Ans. by NTA (3)

19. What is 'X' in the given reaction?



- (1) $\begin{array}{c} \text{CH}_2 \\ || \\ \text{CH}_2 \end{array}$
- (2) $\begin{array}{c} \text{CH}-\text{OH} \\ || \\ \text{CH}_2 \end{array}$
- (3) $\begin{array}{c} \text{CHO} \\ | \\ \text{CHO} \end{array}$
- (4) $\begin{array}{c} \text{CH}_2\text{OH} \\ | \\ \text{CHO} \end{array}$

Official Ans. by NTA (1)

20. Given below are two statements :

Statement-I : α and β forms of sulphur can change reversibly between themselves with slow heating or slow cooling.

Statement-II : At room temperature the stable crystalline form of sulphur is monoclinic sulphur.

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

- (1) Statement I is false but Statement II is true.
- (2) Both Statement I and Statement II are true.
- (3) Both Statement I is true but Statement II is false.
- (4) Both Statement I and Statement II are false.

Official Ans. by NTA (3)

SECTION-B

1. If a compound AB dissociates to the extent of 75%

in an aqueous solution, the molality of the solution which shows a 2.5 K rise in the boiling point of the solution is _____ molal. (Rounded-off to the nearest integer)

$$[K_b = 0.52\text{K kg mol}^{-1}]$$

Official Ans. by NTA (3)

2. The number of compound/s given below which contain/s $-\text{COOH}$ group is _____.

- (A) Sulphanilic acid (B) Picric acid
(C) Aspirin (D) Ascorbic acid

Official Ans. by NTA (1)

3. The rate constant of a reaction increases by five times on increase in temperature from 27°C to 52°C . The value of activation energy in kJ mol^{-1} is _____ (Rounded-off to the nearest integer)

$$[R = 8.314\text{ J K}^{-1}\text{ mol}^{-1}]$$

Official Ans. by NTA (52)

4. Among the following, number of metal/s which can be used as electrodes in the photoelectric cell is _____ (Integer answer)

- (A) Li (B) Na
(C) Rb (D) Cs

Official Ans. by NTA (1)

5. The spin only magnetic moment of a divalent ion in aqueous solution (atomic number 29) is _____ BM.

Official Ans. by NTA (2)

6. Electromagnetic radiation of wavelength 663 nm is just sufficient to ionise the atom of metal A. The ionization energy of metal A in kJ mol^{-1} is _____ (Rounded-off to the nearest integer)

$$[h = 6.63 \times 10^{-34}\text{ Js}, c = 3.00 \times 10^8\text{ ms}^{-1}, N_A = 6.02 \times 10^{23}\text{ mol}^{-1}]$$

Official Ans. by NTA (180)

7. Consider titration of NaOH solution versus 1.25M oxalic acid solution. At the end point

following burette readings were obtained.

- (i) 4.5 mL (ii) 4.5 mL
 (iii) 4.4 mL (iv) 4.4 mL
 (v) 4.4 mL

If the volume of oxalic acid taken was 10.0 mL then the molarity of the NaOH solution is _____ M. (Rounded-off to the nearest integer)

Official Ans. by NTA (6)

8. Five moles of an ideal gas at 293 K is expanded isothermally from an initial pressure of 2.1 MPa to 1.3 MPa against at constant external pressure 4.3 MPa. The heat transferred in this process is _____ kJ mol⁻¹. (Rounded-off to the nearest integer) [Use R = 8.314 J mol⁻¹K⁻¹]

Official Ans. by NTA (15)

9. Copper reduces NO₃⁻ into NO and NO₂ depending upon the concentration of HNO₃ in solution. (Assuming fixed [Cu²⁺] and P_{NO} = P_{NO₂}), the HNO₃ concentration at which the thermodynamic tendency for reduction of NO₃⁻ into NO and NO₂ by copper is same is 10^x M. The value of 2x is _____. (Rounded-off to the nearest integer)

[Given, E^o_{Cu²⁺/Cu = 0.34 V, E^o_{NO₃⁻/NO = 0.96 V,}}

E^o_{NO₃⁻/NO₂ = 0.79 V and at 298 K,}

$$\frac{RT}{F} (2.303) = 0.059]$$

Official Ans. by NTA (1)

10. The unit cell of copper corresponds to a face centered cube of edge length 3.596 Å with one copper atom at each lattice point. The calculated density of copper in kg/m³ is _____. [Molar mass of Cu : 63.54 g ; Avogadro Number = 6.022 × 10²³]

Official Ans. by NTA (9077)