FINAL JEE–MAIN EXAMINATION – FEBRUARY, 2021

(Held On Thursday 25th February, 2021) TIME : 9 : 00 AM to 12 : 00 NOON

CHEMISTRY

TEST PAPER WITH ANSWER

SECTION-A

1. Given below are two statements:

Statement I : CeO_2 can be used for oxidation of aldehydes and ketones.

Statement II : Aqueous solution of $EuSO_4$ is a strong reducing agent.

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) Statment I is true but statement II is false

(3) Both statement I and statement II are true

(4) Both statement I and statement II are false

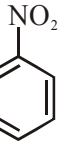
Official Ans. by NTA (3)

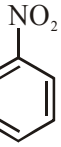
2. According to molecular theory, the species among the following that does not exist is:

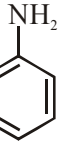
(1) He_2^+ (2) He_2^- (3) Be_2 (4) O_2^{2-}

Official Ans. by NTA (3)

3. Which of the following reaction/s will not give p-aminoazobenzene?

(A)  $\xrightarrow[\text{(ii) } HNO_2]{\text{(i) Sn/HCl}}$ (iii) Aniline

(B)  $\xrightarrow[\text{(ii) NaOH}]{\text{(i) } NaBH_4}$ (iii) Aniline

(C)  $\xrightarrow[\text{(ii) Aniline, HCl}]{\text{(i) } HNO_2}$

(1) A only (2) B only
(3) C only (4) A and B

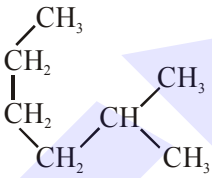
Official Ans. by NTA (2)

4. Which of the following equation depicts the oxidizing nature of H_2O_2?

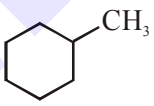
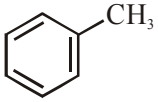
(1) $KIO_4 + H_2O_2 \rightarrow KIO_3 + H_2O + O_2$
(2) $2I^- + H_2O_2 + 2H^+ \rightarrow I_2 + 2H_2O$
(3) $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$
(4) $Cl_2 + H_2O_2 \rightarrow 2HCl + O_2$

Official Ans. by NTA (2)

5. Identify A in the given chemical reaction.

 $\xrightarrow[773\text{ K, }10\text{-}20\text{ atm}]{Mo_2O_3}$ 'A' major product

(1)  (2) 

(3)  (4) 

Official Ans. by NTA (4)

6. Complete combustion of 1.80 g of an oxygen containing compound ($C_xH_yO_z$) gave 2.64 g of CO_2 and 1.08 g of H_2O. The percentage of oxygen in the organic compound is:

(1) 51.63 (2) 63.53 (3) 53.33 (4) 50.33

Official Ans. by NTA (3)

7. Which one of the following reactions will not form acetaldehyde?

(1) $CH_3CH_2OH \xrightarrow[573K]{Cu}$

(2) $CH_3CN \xrightarrow[(ii)H_2O]{(i)DIBAL-H}$

(3) $CH_2{=}CH_2 + O_2 \xrightarrow[H_2O]{Pd(II)/Cu(II)}$

(4) $CH_3CH_2OH \xrightarrow{CrO_3-H_2SO_4}$

Official Ans. by NTA (4)

8. The correct statement about B_2H_6 is:

(1) Terminal B–H bonds have less p-character when compared to bridging bonds.

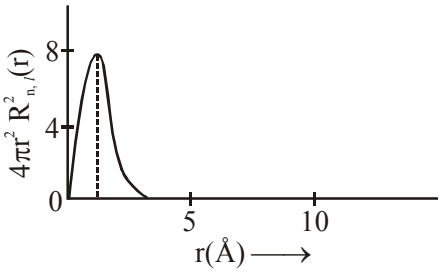
(2) The two B–H–B bonds are not of same length

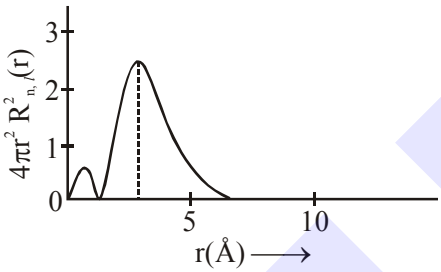
(3) All B–H–B angles are of 120°

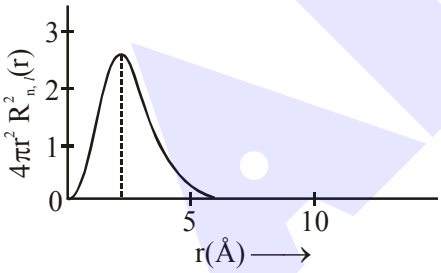
(4) Its fragment, BH_3, behaves as a Lewis base

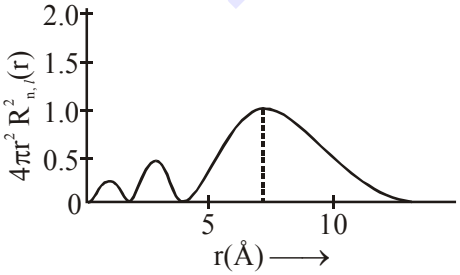
Official Ans. by NTA (1)

9. The plots of radial distribution functions for various orbitals of hydrogen atom against 'r' are given below:

(A) 

(B) 

(C) 

(D) 

The correct plot for 3s orbital is:

(1) (B) (2) (A)

(3) (D) (4) (C)

Official Ans. by NTA (3)

10. Given below are two statements:

Statement I : An allotrope of oxygen is an important intermediate in the formation of reducing smog.

Statement II : Gases such as oxides of nitrogen and sulphur present in troposphere contribute to the formation of photochemical smog.

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

(1) Both statement I and Statement II are false

(2) Statement I is true but Statement II is false

(3) Both Statement I and Statement II are true

(4) Statement I is false but Statement II is true

Official Ans. by NTA (1)

11. In which of the following pairs, the outer most electronic configuration will be the same?

(1) Cr^+ and Mn^{2+} (2) Ni^{2+} and Cu^+

(3) Fe^{2+} and Co^+ (4) V^{2+} and Cr^+

Official Ans. by NTA (1)

12. Which of the glycosidic linkage between galactose and glucose is present in lactose?

(1) C-1 of galactose and C-4 of glucose

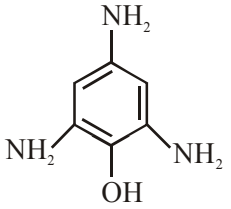
(2) C-1 of glucose and C-6 of galactose

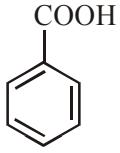
(3) C-1 of glucose and C-4 of galactose

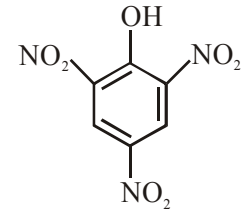
(4) C-1 of galactose and C-6 of glucose

Official Ans. by NTA (1)

13. Compound(s) which will liberate carbon dioxide with sodium bicarbonate solution is/are:

A = 

B = 

C = 

(1) B only (2) C only

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

Official Ans. by NTA (3)

14. The hybridization and magnetic nature of $[Mn(CN)_6]^{4-}$ and $[Fe(CN)_6]^{3-}$, respectively are:

(1) d^2sp^3 and diamagnetic

(2) sp^3d^2 and diamagnetic

(3) d^2sp^3 and paramagnetic

(4) sp^3d^2 and paramagnetic

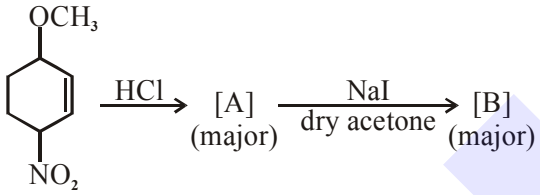
Official Ans. by NTA (3)

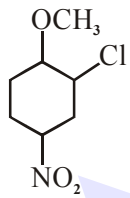
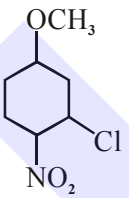
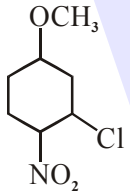
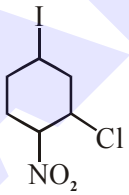
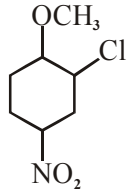
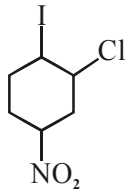
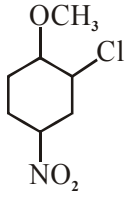
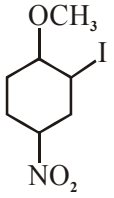
15. Ellingham diagram is a graphical representation of:
(1) ΔH vs T (2) ΔG vs T
(3) ΔG vs P (4) $(\Delta G - T\Delta S)$ vs T
Official Ans. by NTA (2)

16. The solubility of AgCN in a buffer solution of pH = 3 is x. The value of x is:
[Assume : No cyano complex is formed; $K_{sp}(AgCN) = 2.2 \times 10^{-16}$ and $K_a(HCN) = 6.2 \times 10^{-10}$]
(1) 0.625×10^{-6} (2) 1.9×10^{-5}
(3) 2.2×10^{-16} (4) 1.6×10^{-6}
Official Ans. by NTA (2)

17. In Freundlich adsorption isotherm at moderate pressure, the extent of adsorption $\left(\frac{x}{m}\right)$ is directly proportional to P^x. The value of x is
(1) zero (2) $\frac{1}{n}$
(3) 1 (4) ∞
Official Ans. by NTA (2)

18. Identify A and B in the chemical reaction.



(1) A =  B = 
(2) A =  B = 
(3) A =  B = 
(4) A =  B = 

Official Ans. by NTA (4)

19. Which statement is correct ?
(1) Synthesis of Buna-S needs nascent oxygen.
(2) Neoprene is an addition copolymer used in plastic bucket manufacturing.
(3) Buna-S is a synthetic and linear thermosetting polymer.
(4) Buna-N is a natural polymer.
Official Ans. by NTA (1)

20. The major product of the following chemical reaction is :

$$CH_3CH_2CN \xrightarrow[(3)\ Pd/BaSO_4,H_2]{(1)\ H_3O^+,\ \Delta \\ (2)\ SOCl_2} ?$$

(1) $CH_3CH_2CH_3$ (2) $CH_3CH_2CH_2OH$
(3) $(CH_3CH_2CO)_2O$ (4) CH_3CH_2CHO
Official Ans. by NTA (4)

SECTION-B

1. Among the following, the number of halide(s) which is/are inert to hydrolysis is _____.
(A) BF_3 (B) $SiCl_4$
(C) PCl_5 (D) SF_6
Official Ans. by NTA (1)

2. 1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionised. The boiling point of the solution at 1 atm is _____ K. (Rounded-off to the nearest integer)
[Given K_b for $(H_2O) = 0.52$ K kg mol^{-1}]
Official Ans. by NTA (375)

3. In basic medium CrO_4^{2-} oxidises $S_2O_3^{2-}$ to form SO_4^{2-} and itself changes into $Cr(OH)_4^-$. The volume of 0.154 M CrO_4^{2-} required to react with 40 mL of 0.25 M $S_2O_3^{2-}$ is _____ mL. (Rounded-off to the nearest integer)
Official Ans. by NTA (173)

4. A car tyre is filled with nitrogen gas at 35 psi at 27°C. It will burst if pressure exceeds 40 psi. The temperature in °C at which the car tyre will burst is _____. (Rounded-off to the nearest integer)
Official Ans. by NTA (70)

5. The reaction of cyanamide, $NH_2CN_{(s)}$ with oxygen was run in a bomb calorimeter and ΔU was found to be –742.24 kJ mol^{-1}. The magnitude of ΔH_{298} for the reaction

$$NH_2CN_{(s)} + \frac{3}{2}O_2(g) \rightarrow N_{2(g)} + O_2(g) + H_2O_{(l)}$$

is _____ kJ. (Rounded off to the nearest integer)
[Assume ideal gases and R = 8.314 J mol^{-1} K^{-1}]

Official Ans. by NTA (741)

6. Using the provided information in the following paper chromatogram :

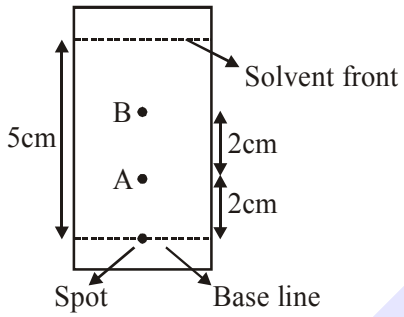
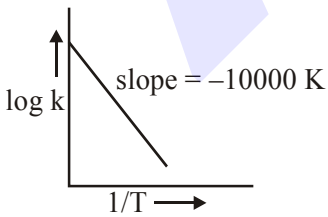


Figure : Paper chromatography for compounds A and B.

the calculate R_f value of A _____ × 10^{-1}.

Official Ans. by NTA (4)

7. For the reaction, aA + bB → cC + dD, the plot of log k vs $\frac{1}{T}$ is given below :



The temperature at which the rate constant of the reaction is 10^{-4} s^{-1} is _____ K.
(Rounded-off to the nearest integer)
[Given : The rate constant of the reaction is 10^{-5} s^{-1} at 500 K.]

Official Ans. by NTA (526)

8. 0.4 g mixture of NaOH, Na_2CO_3 and some inert impurities was first titrated with $\frac{N}{10}$ HCl using phenolphthalein as an indicator, 17.5 mL of HCl was required at the end point. After this methyl orange was added and titrated. 1.5 mL of same HCl was required for the next end point. The weight percentage of Na_2CO_3 in the mixture is _____. (Rounded-off to the nearest integer)

Official Ans. by NTA (4)

9. Consider the following chemical reaction.

$$CH \equiv CH \xrightarrow[(2)\ CO,\ HCl,\ AlCl_3]{(1)\ \text{Red hot Fe tube, 873 K}} \text{Product}$$

The number of sp^2 hybridized carbon atom(s) present in the product is _____.

Official Ans. by NTA (7)

10. The ionization enthalpy of Na^+ formation from $Na_{(g)}$ is 495.8 kJ mol^{-1}, while the electron gain enthalpy of Br is –325.0 kJ mol^{-1}. Given the lattice enthalpy of NaBr is –728.4 kJ mol^{-1}. The energy for the formation of NaBr ionic solid is (–) _____ × 10^{-1} kJ mol^{-1}.

Official Ans. by NTA (5576)