FINAL JEE–MAIN EXAMINATION – MARCH, 2021

(Held On Tuesday 16th March, 2021) TIME : 9 : 00 AM to 12 : 00 NOON

CHEMISTRY

TEST PAPER WITH ANSWER

SECTION-A

1. Given below are two statement : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : Size of Bk^{3+} ion is less than Np^{3+} ion.

Reason R : The above is a consequence of the lanthanoid contraction.

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

(1) A is false but R is true

(2) Both A and R are true but R is not the correct explanation of A

(3) Both A and R are true and R is the correct explanation of A

(4) A is true but R is false

Official Ans. by NTA (3)

Official Ans. by ALLEN (4)

2. Which among the following pairs of Vitamins is stored in our body relatively for longer duration ?

(1) Thiamine and Vitamin A

(2) Vitamin A and Vitamin D

(3) Thiamine and Ascorbic acid

(4) Ascorbic acid and Vitamin D

Official Ans. by NTA (2)

3. Given below are two statements :

Statement I : Both $CaCl_2.6H_2O$ and $MgCl_2.8H_2O$ undergo dehydration on heating.

Statement II : BeO is amphoteric whereas the oxides of other elements in the same group are acidic.

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

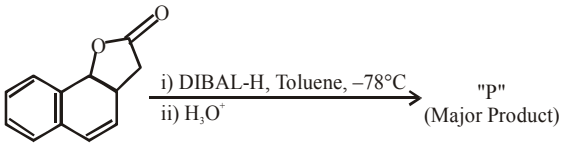
(2) Both statement I and statement II are false

(3) Both statement I and statement II are true

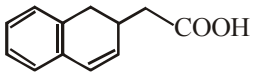
(4) Statement I is true but statement II is false

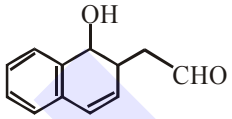
Official Ans. by NTA (2)

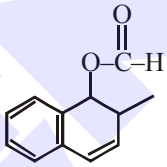
4.

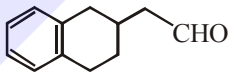


The product "P" in the above reaction is :

(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (2)

5. Match List-I with List-II :

List-I Industrial process	List-II Application
(a) Haber's process	(i) HNO_3 synthesis
(b) Ostwald's process	(ii) Aluminium extraction
(c) Contact process	(iii) NH_3 synthesis
(d) Hall-Heroult process	(iv) H_2SO_4 synthesis

Choose the correct answer from the options given below :

(1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

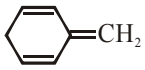
(2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

(4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

Official Ans. by NTA (3)

6. Among the following, the aromatic compounds are :

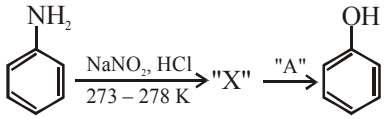
(A)  (B) 

(C)  (D) 

Choose the correct answer from the following options :

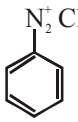
(1) (A) and (B) only
(2) (B) and (C) only
(3) (B), (C) and (D) only
(4) (A), (B) and (C) only

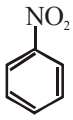
Official Ans. by NTA (2)

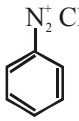
7. 

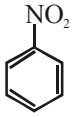
Major Product

In the above chemical reaction, intermediate "X" and reagent/condition "A" are :

(1)  ; A- H_2O/NaOH

(2)  ; A- H_2O/Δ

(3)  ; A- H_2O/Δ

(4)  ; A- H_2O/NaOH

Official Ans. by NTA (3)

8. Given below are two statements :

Statement I : The E° value of Ce^{4+} / Ce^{3+} is + 1.74 V.

Statement II : Ce is more stable in Ce^{4+} state than Ce^{3+} state.

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

(1) Both statement I and statement II are correct

(2) Statement I is incorrect but statement II is correct

(3) Both statement I and statement II are incorrect

(4) Statement I is correct but statement II is incorrect

Official Ans. by NTA (4)

9. The functions of antihistamine are :

(1) Antiallergic and Analgesic

(2) Antacid and antiallergic

(3) Analgesic and antacid

(4) Antiallergic and antidepressant

Official Ans. by NTA (2)

10. Which of the following is Lindlar catalyst ?

(1) Zinc chloride and HCl

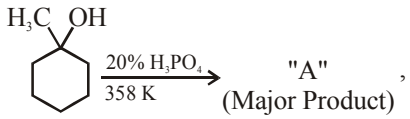
(2) Cold dilute solution of $KMnO_4$

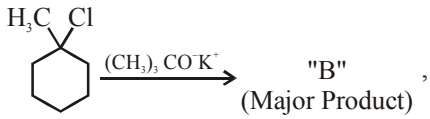
(3) Sodium and Liquid NH_3

(4) Partially deactivated palladised charcoal

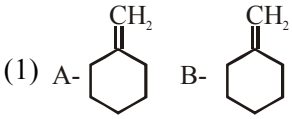
Official Ans. by NTA (4)

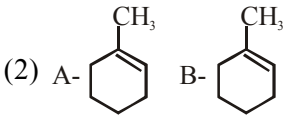
11.

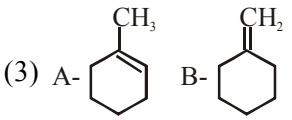


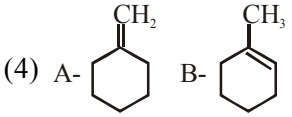


The product "A" and "B" formed in above reactions are :

(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (3)

12. Given below are two statements :

Statement I : H_2O_2 can act as both oxidising and reducing agent in basic medium.

Statement II : In the hydrogen economy, the energy is transmitted in the form of dihydrogen.

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) Both statement I and statement II are true
(3) Statement I is true but statement II is false
(4) Statement I is false but statement II is true

Official Ans. by NTA (2)

13. The type of pollution that gets increased during the day time and in the presence of O_3 is :

(1) Reducing smog (2) Oxidising smog
(3) Global warming (4) Acid rain

Official Ans. by NTA (2)

14. Assertion A : Enol form of acetone $[CH_3COCH_3]$ exists in < 0.1% quantity. However, the enol form of acetyl acetone $[CH_3COCH_2OCCH_3]$ exists in approximately 15% quantity.

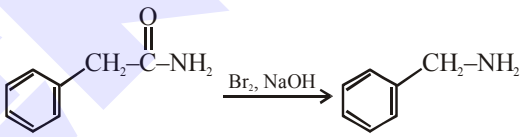
Reason R : enol form of acetyl acetone is stabilized by intramolecular hydrogen bonding, which is not possible in enol form of acetone.

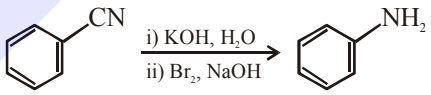
Choose the correct statement :

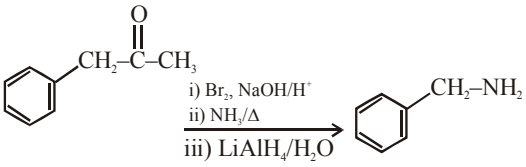
(1) A is false but R is true
(2) Both A and R are true and R is the correct explanation of A
(3) Both A and R are true but R is not the correct explanation of A
(4) A is true but R is false

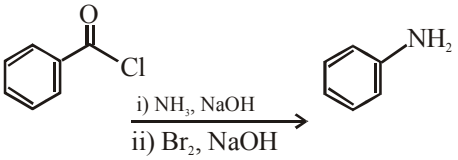
Official Ans. by NTA (2)

15. Which of the following reaction DOES NOT involve Hoffmann Bromamide degradation ?

(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (3)

16. The process that involves the removal of sulphur from the ores is :

(1) Smelting
(2) Roasting
(3) Leaching
(4) Refining

Official Ans. by NTA (2)

17. Match List-I with List-II :

List-I	**List-II**
Name of oxo acid	Oxidation state of 'P'
(a) Hypophosphorous acid	(i) +5
(b) Orthophosphoric acid	(ii) +4
(c) Hypophosphoric acid	(iii) +3
(d) Orthophosphorous acid	(iv) +2
	(v) +1

Choose the correct answer from the options given below :

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

Official Ans. by NTA (1)

18. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : The H–O–H bond angle in water molecule is 104.5°.

Reason R : The lone pair – lone pair repulsion of electrons is higher than the bond pair - bond pair repulsion.

(1) A is false but R is true
(2) Both A and R are true, but R is not the correct correct explanation of A
(3) A is true but R is false
(4) Both A and R are true, and R is the correct explanation of A

Official Ans. by NTA (4)

19. In chromotography technique, the purification of compound is independent of :

(1) Mobility or flow of solvent system
(2) Solubility of the compound
(3) Length of the column or TLC Plate
(4) Physical state of the pure compound

Official Ans. by NTA (4)

20. A group 15 element, which is a metal and forms a hydride with strongest reducing power among group 15 hydrides. The element is :

(1) Sb (2) P (3) As (4) Bi

Official Ans. by NTA (4)

SECTION-B

1. For the reaction $A(g) \rightleftharpoons B(g)$ at 495 K, $\Delta_r G^o = -9.478$ kJ mol^{-1}.

If we start the reaction in a closed container at 495 K with 22 millimoles of A, the amount of B is the equilibrium mixture is _____ millimoles. (Round off to the Nearest Integer).

[R = 8.314 J mol^{-1} K^{-1}; $\ell n\ 10 = 2.303$]

Official Ans. by NTA (20)

2. Complete combustion of 750 g of an organic compound provides 420 g of CO_2 and 210 g of H_2O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and _____ respectively. (Round off to the Nearest Integer)

Official Ans. by NTA (3)

3. $2\ MnO_4^- + b\ C_2O_4^{2-} + c\ H^+ \rightarrow x\ Mn^{2+} + y\ CO_2 + z\ H_2O$

If the above equation is balanced with integer coefficients, the value of c is _____.

(Round off to the Nearest Integer).

Official Ans. by NTA (16)

4. AB_2 is 10% dissociated in water to A^{2+} and B^-. The boiling point of a 10.0 molal aqueous solution of AB_2 is _____°C. (Round off to the Nearest Integer).

[Given : Molal elevation constant of water $K_b = 0.5$ K kg mol^{-1} boiling point of pure water = 100°C]

Official Ans. by NTA (106)

5. The equivalents of ethylene diamine required to replace the neutral ligands from the coordination sphere of the trans-complex of $CoCl_3.4NH_3$ is _____. (Round off to the Nearest Integer).

Official Ans. by NTA (2)

6. A 6.50 molal solution of KOH (aq.) has a density of 1.89 g cm^{-3}. The molarity of the solution is _____ mol dm^{-3}. (Round off to the Nearest Integer).

[Atomic masses: K :39.0 u; O :16.0 u; H :1.0 u]

Official Ans. by NTA (9)

7. When light of wavelength 248 nm falls on a metal of threshold energy 3.0 eV, the de-Broglie wavelength of emitted electrons is _____ Å. (Round off to the Nearest Integer).

[Use : $\sqrt{3}$ = 1.73, h = 6.63 × 10^{-34} Js

m_e = 9.1 × 10^{-31} kg ; c = 3.0 × 10^{8} ms^{-1} ; 1eV = 1.6 × 10^{-19}J]

Official Ans. by NTA (9)

8. Two salts A_2X and MX have the same value of solubility product of 4.0 × 10^{-12}. The ratio of their molar solubilities i.e. $\frac{S(A_2X)}{S(MX)}$ = _____.

(Round off to the Nearest Integer).

Official Ans. by NTA (50)

9. A certain element crystallises in a bcc lattice of unit cell edge length 27 Å. If the same element under the same conditions crystallises in the fcc lattice, the edge length of the unit cell in Å will be _____. (Round off to the Nearest Integer).

[Assume each lattice point has a single atom]

[Assume $\sqrt{3}$ = 1.73, $\sqrt{2}$ = 1.41]

Official Ans. by NTA (33)

10. The decomposition of formic acid on gold surface follows first order kinetics. If the rate constant at 300 K is 1.0 × 10^{-3} s^{-1} and the activation energy E_a = 11.488 kJ mol^{-1}, the rate constant at 200 K is _____ × 10^{-5} s^{-1}. (Round of to the Nearest Integer).

(Given : R = 8.314 J mol^{-1} K^{-1})

Official Ans. by NTA (10)