FINAL JEE–MAIN EXAMINATION – JULY, 2021

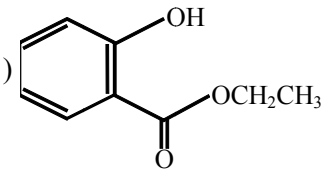
(Held On Tuesday 27th July, 2021) **TIME : 9 : 00 AM to 12 : 00 NOON**

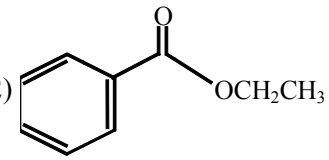
CHEMISTRY

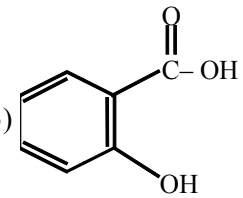
TEST PAPER WITH ANSWER

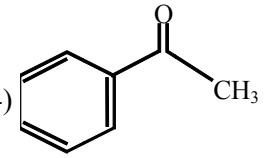
SECTION-A

1. Which one of the following compounds will give orange precipitate when treated with 2,4-dinitrophenyl hydrazine ?

(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (4)

2. The product obtained from the electrolytic oxidation of acidified sulphate solutions, is :

(1) HSO_4^-

(2) HO_3SOOSO_3H

(3) HO_2SOSO_2H

(4) HO_3SOSO_3H

Official Ans. by NTA (2)

3. The parameters of the unit cell of a substance are a = 2.5, b = 3.0, c = 4.0, $\alpha = 90°$, $\beta = 120°$ $\gamma = 90°$. The crystal system of the substance is :

(1) Hexagonal (2) Orthorhombic

(3) Monoclinic (4) Triclinic

Official Ans. by NTA (3)

4. The oxidation states of 'P' in $H_4P_2O_7$, $H_4P_2O_5$ and $H_4P_2O_6$, respectively, are :

(1) 7, 5 and 6 (2) 5, 4 and 3

(3) 5, 3 and 4 (4) 6, 4 and 5

Official Ans. by NTA (3)

5. For a reaction of order n, the unit of the rate constant is :

(1) $mol^{1-n} L^{1-n} s$ (2) $mol^{1-n} L^{2n} s^{-1}$

(3) $mol^{1-n} L^{n-1} s^{-1}$ (4) $mol^{1-n} L^{1-n} s^{-1}$

Official Ans. by NTA (3)

6. Given below are two statements :

Statement I : Aniline is less basic than acetamide.

Statement II : In aniline, the lone pair of electrons on nitrogen atom is delocalised over benzene ring due to resonance and hence less available to a proton.

Choose the **most appropriate** option ;

(1) Statement I is true but statement II is false.

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

(3) Both statement I and statement II are true.

(4) Both statement I and statement II are false.

Official Ans. by NTA (2)

7. The type of hybridisation and magnetic property of the complex $[MnCl_6]^{3-}$, respectively, are :

(1) sp^3d^2 and diamagnetic

(2) d^2sp^3 and diamagnetic

(3) d^2sp^3 and paramagnetic

(4) sp^3d^2 and paramagnetic

Official Ans. by NTA (4)

8. The number of geometrical isomers found in the metal complexes $[PtCl_2(NH_3)_2]$, $[Ni(CO)_4]$, $[Ru(H_2O)_3Cl_3]$ and $[CoCl_2(NH_3)_4]^+$ respectively, are :

(1) 1, 1, 1, 1 (2) 2, 1, 2, 2

(3) 2, 0, 2, 2 (4) 2, 1, 2, 1

Official Ans. by NTA (2)

ALLEN Ans. (3)

9. Which one of the following statements is **NOT** correct ?

(1) Eutrophication indicates that water body is polluted ?

(2) The dissolved oxygen concentration below 6 ppm inhibits fish growth

(3) Eutrophication leads to increase in the oxygen level in water

(4) Eutrophication leads to anaerobic conditions

Official Ans. by NTA (3)

10. Given below are two statements :

Statement I : Rutherford's gold foil experiment cannot explain the line spectrum of hydrogen atom.

Statement II : Bohr's model of hydrogen atom contradicts Heisenberg's uncertainty principle.

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

(1) **Statement I** is false but **statement II** is true.

(2) **Statement I** is true but **statement II** is false.

(3) Both **statement I** and **statement II** are false.

(4) Both **statement I** and **statement II** are true.

Official Ans. by NTA (4)

11. Presence of which reagent will affect the reversibility of the following reaction, and change it to a irreversible reaction :

$$CH_4 + I_2 \underset{\text{Reversible}}{\overset{h\nu}{\rightleftharpoons}} CH_3 - I + HI$$

(1) HOCl

(2) dilute HNO_2

(3) Liquid NH_3

(4) Concentrated HIO_3

Official Ans. by NTA (4)

12. Which one among the following chemical tests is used to distinguish monosaccharide from disaccharide ?

(1) Seliwanoff's test

(2) Iodine test

(3) Barfoed test

(4) Tollen's test

Official Ans. by NTA (3)

13. Match **List-I** with **List-II** :

List-I (Drug)	**List-II (Class of Drug)**
(a) Furacin	(i) Antibiotic
(b) Arsphenamine	(ii) Tranquilizers
(c) Dimetone	(iii) Antiseptic
(d) Valium	(iv) Synthetic antihistamines

Choose the **most appropriate** match :

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

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

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

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

Official Ans. by NTA (4)

14. The statement that is INCORRECT about Ellingham diagram is

(1) provides idea about the reaction rate.

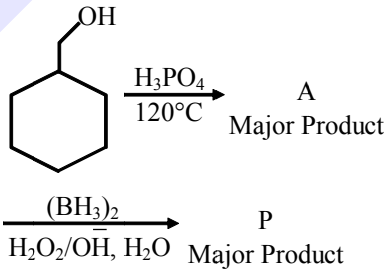
(2) provides idea about free energy change.

(3) provides idea about changes in the phases during the reaction.

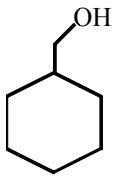
(4) provides idea about reduction of metal oxide.

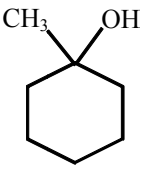
Official Ans. by NTA (1)

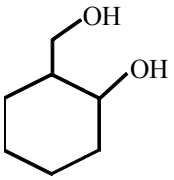
15.

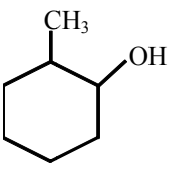


Consider the above reaction and identify the Product P :

(1)


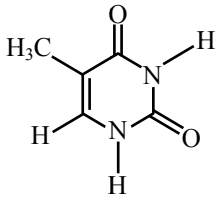
(2)


(3)


(4)


Official Ans. by NTA (4)

16.



(A)

The compound 'A' is a complementary base of _____ in DNA stands.

(1) Uracil (2) Guanine

(3) Adenine (4) Cytosine

Official Ans. by NTA (3)

17. Staggered and eclipsed conformers of ethane are :

(1) Polymers (2) Rotamers

(3) Enantiomers (4) Mirror images

Official Ans. by NTA (2)

18. Match **List - I** with **List - II** :

List - I	**List - II**
(a) NaOH	(i) Acidic
(b) $Be(OH)_2$	(ii) Basic
(c) $Ca(OH)_2$	(iii) Amphoteric
(d) $B(OH)_3$	
(e) $Al(OH)_3$	

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

(1) (a)-(ii), (b)-(ii), (c)-(iii), (d)-(ii), (e)-(iii)

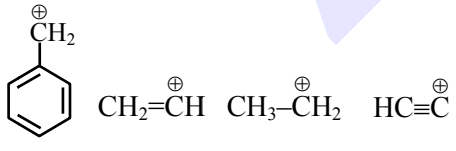
(2) (a)-(ii), (b)-(iii), (c)-(ii), (d)-(i), (e)-(iii)

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

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

Official Ans. by NTA (2)

19.



A B C D

The correct order of stability of given carbocation is :

(1) A > C > B > D (2) D >B > C > A

(3) D > B > A > C (4) C > A > D > B

Official Ans. by NTA (1)

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

Assertion A : Lithium halides are some what covalent in nature.

Reason R : Lithium possess high polarisation capability.

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

(1) **A** is true but **R** is false

(2) **A** is false but **R** is true

(3) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

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

Official Ans. by NTA (4)

SECTION-B

1. The density of NaOH solution is 1.2 g cm^{-3}. The molality of this solution is _____ m.

(Round off to the Nearest Integer)

[Use : Atomic masses : Na : 23.0 u O : 16.0 u H : 1.0 u

Density of H_2O : 1.0 g cm^{-3}]

Official Ans. by NTA (5)

2. CO_2 gas adsorbs on charcoal following Freundlich adsorption isotherm. For a given amount of charcoal, the mass of CO_2 adsorbed becomes 64 times when the pressure of CO_2 is doubled.

The value of n in the Freundlich isotherm equation is _____ $\times 10^{-2}$. (Round off to the Nearest Integer)

Official Ans. by NTA (17)

3. The conductivity of a weak acid HA of concentration 0.001 mol L^{-1} is 2.0×10^{-5} S cm^{-1}. If $\Lambda_m^o(HA) = 190$ S cm^2 mol^{-1}, the ionization constant (K_a) of HA is equal to _____ $\times 10^{-6}$.

(Round off to the Nearest Integer)

Official Ans. by NTA (12)

4. 1.46 g of a biopolymer dissolved in a 100 mL water at 300 K exerted an osmotic pressure of 2.42×10^{-3} bar.

The molar mass of the biopolymer is _____ $\times 10^4$ g mol^{-1}. (Round off to the Nearest Integer)

[Use : R = 0.083 L bar mol^{-1} K^{-1}]

Official Ans. by NTA (15)

5. An organic compound is subjected to chlorination to get compound A using 5.0 g of chlorine. When 0.5 g of compound A is reacted with $AgNO_3$ [Carius Method], the percentage of chlorine in compound A is _____ when it forms 0.3849 g of AgCl. (Round off to the Nearest Integer)

(Atomic masses of Ag and Cl are 107.87 and 35.5 respectively)

Official Ans. by NTA (19)

6. The number of geometrical isomers possible in triamminetrinitrocobalt (III) is X and in trioxalatochromate (III) is Y. Then the value of X + Y is _____.

Official Ans. by NTA (2)

7. In gaseous triethyl amine the "–C–N–C–" bond angle is _____ degree.

Official Ans. by NTA (108)

8. For water at 100°C and 1 bar,

$\Delta_{vap} H - \Delta_{vap} U =$ _____ $\times 10^2$ J mol^{-1}.

(Round off to the Nearest Integer)

[Use : R=8.31 J mol^{-1} K^{-1}]

[Assume volume of $H_2O(l)$ is much smaller than volume of $H_2O(g)$. Assume $H_2O(g)$ treated as an ideal gas]

Official Ans. by NTA (31)

9. $PC1_5 \rightleftharpoons PCl_3 + Cl_3$ $\quad K_c = 1.844$

3.0 moles of PCl_5 is introduced in a 1 L closed reaction vessel at 380 K. The number of moles of PCl_5 at equilibrium is _____ $\times 10^{-3}$.

(Round off to the Nearest Integer)

Official Ans. by NTA (1400)

ALLEN Ans. (1396)

10. The difference between bond orders of CO and $NO^{\oplus}$ is $\frac{x}{2}$ where x = _____.

(Round off to the Nearest Integer)

Official Ans. by NTA (0)