JEE Main January 2024

Question Paper With Text Solution

01 February | Shift-1

CHEMISTRY

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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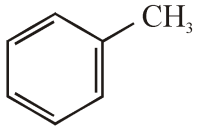
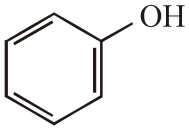
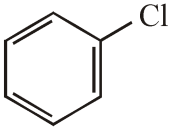
1. Which of the following compound will most easily be attacked by an electrophile ?

(1) 

(2) 

(3) 

(4) 

Question ID: 9561771113

Ans. Official Answer NTA (2)

Sol.

2. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following :

(1) $q = 0, \Delta T < 0, w \neq 0$

(2) $q \neq 0, \Delta T = 0, w = 0$

(3) $q = 0, \Delta T = 0, w = 0$

(4) $q = 0, \Delta T \neq 0, w = 0$

Question ID: 9561771098

Ans. Official Answer NTA (3)

Sol.

3. If one strand of a DNA has the sequence ATGCTTCA, sequence of the bases in complementary strand is:

(1) CATTAGCT

(2) ATGCGACT

(3) TACGAAGT

(4) GTACTTAC

Question ID: 9561771114

Ans. Official Answer NTA (3)

Sol.

4. Arrange the bonds in order of increasing ionic character in the molecules. $LiF, K_2O, N_2, SO_2 \text{ and } ClF_3$:

(1) $N_2 < ClF_3 < SO_2 < K_2O < LiF$

(2) $LiF < K_2O < ClF_3 < SO_2 < N_2$

(3) $ClF_3 < N_2 < SO_2 < K_2O < LiF$

(4) $N_2 < SO_2 < ClF_3 < K_2O < LiF$

Question ID: 9561771097

Ans. Official Answer NTA (4)

Sol.

5. Given below are two statements :

Statement (I) : The NH_2 group in Aniline is ortho and para directing and a powerful activating group.

Statement (II) : Aniline does not undergo Friedel-Craft's reaction (alkylation and acylation). In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are incorrect

(3) Both Statement I and Statement II are correct

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

Question ID: 9561771112

Ans. Official Answer NTA (3)

Sol.

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

Assertion (A): PH_3 has lower boiling point than NH_3.

Reason (R) : In liquid state NH_3 molecules are associated through vander Waal's forces, but PH_3 molecules are associated through hydrogen bonding.

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

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

(2) (A) is correct but (R) is not correct

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

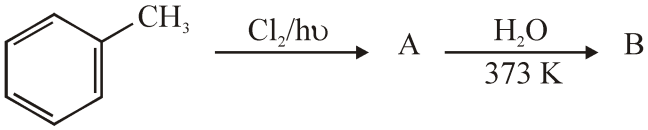
(4) (A) is not correct but (R) is correct

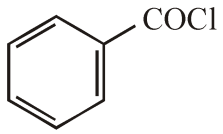
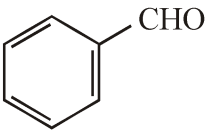
Question ID: 9561771101

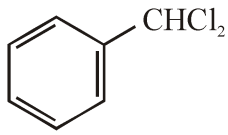
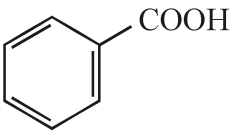
Ans. Official Answer NTA (2)

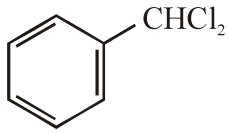
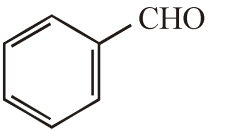
Sol.

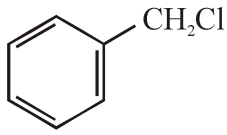
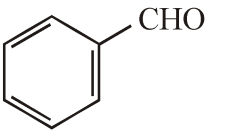
7. Identify A and B in the following sequence of reaction



(1) A =  B = 

(2) A =  B = 

(3) A =  B = 

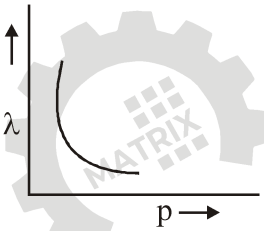
(4) A =  B = 

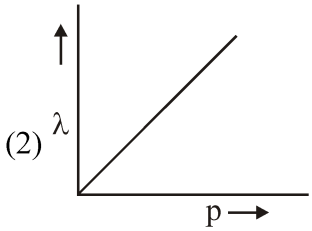
Question ID: 9561771110

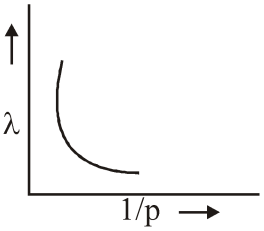
Ans. Official Answer NTA (3)

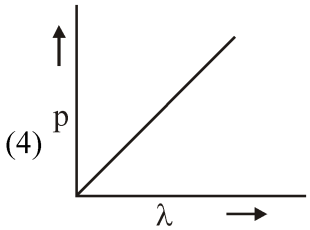
Sol.

8. According to the wave-particle duality of matter by de-Broglie, which of the following graph plot presents most appropriate relationship between wavelength of electron (λ) and momentum of electron (p) ?

(1) 

(2) 

(3) 

(4) 

Question ID: 9561771096

Ans. Official Answer NTA (1)

Sol.

9. In case of isoelectronic species the size of F^-, Ne and Na^+ is affected by :

(1) Electron-electron interaction in the outer orbitals

(2) None of the factors because their size is the same

(3) Nuclear charge (z)

(4) Principal quantum number (n)

Question ID: 9561771100

Ans. Official Answer NTA (3)

Sol.

10. Which of the following reactions are disproportionation reactions ?

(A) $Cu^{+} \rightarrow Cu^{2+} + Cu$

(B) $3MnO_4^{2-} + 4H^{+} \rightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

(C) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

(D) $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{+}$

Choose the correct answer from the options given below :

(1) (B), (C), (D)

(2) (A), (B)

(3) (A), (D)

(4) (A), (B), (C)

Question ID: 9561771103

Ans. Official Answer NTA (2)

Sol.

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

Assertion (A) : Haloalkanes react with KCN to form alkyl cyanides as a main product while with AgCN form isocyanide as the main product.

Reason (R): KCN and AgCN both are highly ionic compounds.

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

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

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

(3) (A) is not correct but (R) is correct

(4) (A) is correct but (R) is not correct

Question ID: 9561771109

Ans. Official Answer NTA (4)

Sol.

12. We have three aqueous solutions of $NaCl$ labelled as 'A', 'B' and 'C' with concentration $0.1M$, $0.01M$ and $0.001M$, respectively. The value of van't Hoff factor(i) for these solutions will be in the order:

(1) $i_A = i_B = i_C$

(2) $i_A < i_C < i_B$

(3) $i_A < i_B < i_C$

(4) $i_A > i_B > i_C$

Question ID: 9561771099

Ans. Official Answer NTA (3)

Sol.

13. Match List - I with List - II.

List - I (Reactions)	**List - II (Reagents)**
(A) $CH_3(CH_2)_5-\underset{\underset{O}{\|}}{C}-OC_2H_5 \rightarrow CH_3(CH_2)_5CHO$	(I) CH_3MgBr, H_2O
(B) $C_6H_5COC_6H_5 \rightarrow C_6H_5CH_2C_6H_5$	(II) $Zn(Hg)$ *and conc.* HCl
(C) $C_6H_5CHO \rightarrow C_6H_5CH(OH)CH_3$	(III) $NaBH_4, H^+$
(D) $CH_3COCH_2COOC_2H_5 \rightarrow CH_3\underset{\underset{H}{\|}}{C}(OH)CH_2COOC_2H_5$	(IV) $DIBAL-H, H_2O$

Choose the correct answer from the options given below :

(1) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

(2) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

(3) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Question ID: 9561771111

Ans. Official Answer NTA (2)

Sol.

14. Which of the following complex is homoleptic?

(1) $\left[Ni\left(NH_3\right)_2 Cl_2\right]$

(2) $\left[Co\left(NH_3\right)_4 Cl_2\right]^+$

(3) $\left[Ni(CN)_4\right]^{2-}$

(4) $\left[Fe\left(NH_3\right)_4 Cl_2\right]^+$

Question ID: 9561771105

Ans. Official Answer NTA (3)

Sol.

15. Given below are two statements :

Statement (I) : Aminobenzene and aniline are same organic compounds.

Statement (II) : Aminobenzene and aniline are different organic compounds.

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 incorrect

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

(3) Both Statement I and Statement II are correct

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

Question ID: 9561771107

Ans. Official Answer NTA (2)

Sol.

16. Ionic reactions with organic compounds proceed through :

(A) homolytic bond cleavage

(B) heterolytic bond cleavage

(C) free radical formation

(D) primary free radical

(E) secondary free radical

Choose the correct answer from the options given below :

(1) (A) only

(2) (D) and (E) only

(3) (B) only

(4) (C) only

Question ID: 9561771108

Ans. Official Answer NTA (3)

Sol.

17. In Kjeldahl's method for estimation of nitrogen, $CuSO_4$ acts as :

(1) hydrolysis agent

(2) catalytic agent

(3) oxidising agent

(4) reducing agent

Question ID:

Ans. Official Answer NTA (2)

Sol.

18. Given below are two statements :

Statement (I) : Potassium hydrogen phthalate is a primary standard for standardisation of sodium. hydroxide solution.

Statement (II) : In this titration phenolphthalein can be used as indicator.

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) Both Statement I and Statement II are incorrect

(3) Statement I is incorrect but Statement II is correct

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

Question ID: 9561771115

Ans. Official Answer NTA (1)

Sol.

19. In acidic medium, $K_2Cr_2O_7$ shows oxidising action as represented in the half reaction :

$$Cr_2O_7^{2-} + XH^+ + Ye^{\ominus} \rightarrow 2A + ZH_2O$$

X, Y, Z and Aare respectively are :

(1) $14, 7, 6 and Cr^{3+}$

(2) $8, 6, 4 and Cr_2O_3$

(3) $14, 6, 7 and Cr^{3+}$

(4) $8, 4, 6 and Cr_2O_3$

Question ID: 9561771102

Ans. Official Answer NTA (3)

Sol.

20. Given below are two statements :

Statement (I) : A solution of $\left[Ni\left(H_2O\right)_6\right]^{2+}$ is green in colour.

Statement (II) : A solution of $\left[Ni(CN)_4\right]^{2-}$ is colourless.

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) Statement I is correct but Statement II is incorrect

(4) Both Statement I and Statement II are incorrect

Question ID: 9561771104

Ans. Official Answer NTA (1)

Sol.

21. The ratio of $\frac{^{14}C}{^{12}C}$ in a piece of wood is $\frac{1}{8}$ part that of atmosphere. If half life of $\frac{1}{8}^{14}C$ is 5730 years, the age of wood sample is years.

Question ID: 9561771121

Ans. Official Answer NTA (17328)

Answer by Matrix is (17190)

Sol.

22. Number of optical isomers possible for 2-chlorobutane

Question ID: 9561771124

Ans. Official Answer NTA (2)

Sol.

23. K_a for CH_3COOH is 1.8×10^{-5} and K_b for NH_4OH is 1.8×10^{-5}. The pH of ammonium acetate solution will be

Question Type : SA

Question ID : 9561771118

Ans. Official Answer NTA (7)

Sol.

24. The potential for the given half cell at 298 K is (-) _____ $\times 10^{-2}$ V.

$2H^+_{(aq)} + 2e^- \rightarrow H_2(g)$

$\left[H^+\right] = 1M, P_{H_2} = 2\,atm$

(Given : $2.303RT/F = 0.06\,V, \log 2 = 0.3$)

Question ID: 9561771120

Ans. Official Answer NTA (1)

Sol.

25. The lowest oxidation number of an atom in a compound A_2B is –2 . The number of electrons in its valence shell is

Question ID: 9561771119

Ans. Official Answer NTA (6)

Sol.

26. Consider the following reaction :

$3PbCl_2 + 2(NH_4)_3PO_4 \rightarrow Pb_3(PO_4)_2 + 6NH_4Cl$

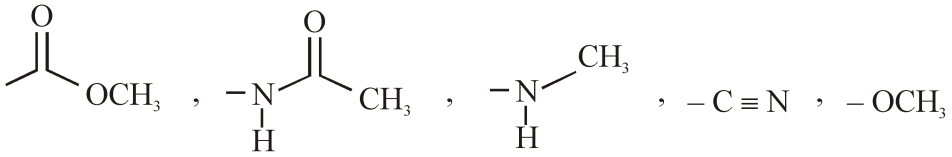
If 72 mmol of $PbCl_2$ is mixed with 50 mmol of $(NH_4)_3PO_4$, then the amount of $Pb_3(PO_4)_2$ formed is mmol (nearest integer).

Question ID: 9561771116

Ans. Official Answer NTA (24)

Sol.

27. Total number of deactivating groups in aromatic electrophilic substitution reaction among the following is



Question ID: 9561771123

Ans. Official Answer NTA (2)

Sol.

28. Among the following oxides of p-block elements, number of oxides having amphoteric nature is

$Cl_2O_7, CO, PbO_2, N_2O, NO, Al_2O_3, SiO_2, N_2O_5, SnO_2$

Question ID: 9561771122

Ans. Official Answer NTA (3)

Sol.

29. The number of molecules/ion/s having trigonal bipyramidal shape is $PF_5, BrF_5, PCl_5, [PtCl_4]^{2-}, BF_3, Fe(CO)_5$

Question ID: 9561771117

Ans. Official Answer NTA (3)

Sol.

30. The number of white coloured salts, among the following is

(a) $SrSO_4$

(b) $Mg(NH_4)PO_4$

(c) $BaCrO_4$

(d) $Mn(OH)_2$

(e) $PbSO_4$

(f) $PbCrO_4$

(g) AgBr

(h) PbI_2

(i) CaC_2O_4

(j) $[Fe(OH)_2(CH_3COO)]$

Question ID: 9561771125

Ans. Official Answer NTA (5)

Sol.