JEE Main January 2024

Question Paper With Text Solution

31 January | Shift-1

CHEMISTRY

MATRIX

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

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1. The correct sequence of electron gain enthalpy of the elements listed below is

A. Ar B. Br C. F D. S

Choose the most appropriate from the options given below:

(1) C > B > D > A (2) D > C > B > A (3) A > D > C > B (4) A > D > B > C

Question ID : 4058591170

Ans. Official Answer NTA (4)

2. Given below are two statements:

Statement I: IUPAC name of $HO-CH_2-(CH_2)_3-CH_2-COCH_3$ is 7-hydroxyheptan-2-one.

Statement II: 2-oxoheptan-7-ol is the correct IUPAC name for above compound. 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) Statement I is correct but Statement II is incorrect.

(4) Both Statement I and Statement II are correct.

Question ID : 4058591179

Ans. Official Answer NTA (3)

3. 'Adsorption' principle is used for which of the following purification method?

(1) Extraction (2) Sublimation (3) Chromatography (4) Distillation

Question ID : 4058591175

Ans. Official Answer NTA (3)

4. The compound that is white in color is

(1) ammonium sulphide (2) lead sulphate

(3) ammonium arsinomolybdate (4) lead iodide

Question ID : 4058591184

Ans. Official Answer NTA (2)

5. The metals that are employed in the battery industries are

A. Fe

B. Mn

C. Ni

D. Cr

E. Cd

Choose the correct answer from the options given below:

(1) B, C and E only (2) A, B, C, D and E

(3) B, D and E only (4) A, B, C and D only

Question ID : 4058591173

Ans. Official Answer NTA (1)

6. The correct statements from following are:

A. The strength of anionic ligands can be explained by crystal field theory.

B. Valence bond theory does not give a quantitative interpretation of kinetic stability of coordination compounds.

C. The hybridization involved in formation of $[Ni(CN)_4]^{2-}$ complex is dsp^2.

D. The number of possible isomer(s) of cis-$[PtCl_2(en)_2]^{2+}$ is one

Choose the correct answer from the options given below:

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

Question ID : 4058591174

Ans. Official Answer NTA (1)

7. The product (C) in the below mentioned reaction is :

$$CH_3-CH_2-CH_2-Br \xrightarrow[\Delta]{KOH_{(alc)}} A \xrightarrow{HBr} B \xrightarrow[KOH_{(aq)}]{\Delta} C$$

(1) Propan-2-ol (2) Propene (3) Propyne (4) Propan-1-ol

Question ID : 4058591180

Ans. Official Answer NTA (1)

8. For the given reaction, choose the correct expression of K_C from the following :-

$$Fe^{3+}_{(aq)} + SCN^-_{(aq)} \rightleftharpoons (FeSCN)^{2+}_{(aq)}$$

(1) $K_C = \dfrac{[FeSCN^{2+}]}{[Fe^{3+}]^2[SCN^-]^2}$ (2) $K_C = \dfrac{[FeSCN^{2+}]}{[Fe^{3+}][SCN^-]}$

(3) $K_C = \dfrac{[Fe^{3+}][SCN^-]}{[FeSCN^{2+}]}$ (4) $K_C = \dfrac{[FeSCN^{2+}]^2}{[Fe^{3+}][SCN^-]}$

Question ID : 4058591167

Ans. Official Answer NTA (2)

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

Assertion A: Alcohols react both as nucleophiles and electrophiles.

Reason R: Alcohols react with active metals such as sodium, potassium and aluminum to yield corresponding alkoxides and liberate hydrogen.

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

(1) Both A and R are true but R is NOT the correct explanation of A.

(2) A is false but R is true.

(3) A is true but R is false.

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

Question ID : 4058591182

Ans. Official Answer NTA (1)

10. Identify the mixture that shows positive deviations from Raoult's Law

(1) $(CH_3)_2CO + CS_2$ (2) $CHCl_3 + (CH_3)_2CO$

(3) $(CH_3)_2CO + C_6H_5NH_2$ (4) $CHCl_3 + C_6H_6$

Question ID : 4058591166

Ans. Official Answer NTA (1)

11. Match List I with List II

LIST I	**LIST II**
A. Glucose/$NaHCO_3/\Delta$	I. Gluconic acid
B. Glucose/HNO_3	II. No reaction
C. Glucose/HI/Δ	III. n-hexane
D. Glucose/Bromine water	IV. Saccharic acid

Choose the correct answer from the options given below:

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

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

Question ID : 4058591183

Ans. Official Answer NTA (3)

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

Assertion A: pK_a value of phenol is 10.0 while that of ethanol is 15.9.

Reason R: Ethanol is stronger acid than phenol.

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

(1) A is true but R is false.

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

(3) A is false but R is true.

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

Question ID : 4058591181

Ans. Official Answer NTA (1)

13. Integrated rate law equation for a first order gas phase reaction is given by (where P_i is initial pressure and P_t is total pressure at time t)

(1) $k = \frac{2.303}{t} \times \log \frac{(2P_i - P_t)}{P_i}$

(2) $k = \frac{2.303}{t} \times \frac{P_i}{(2P_i - P_t)}$

(3) $k = \frac{2.303}{t} \times \log \frac{P_i}{(2P_i - P_t)}$

(4) $k = \frac{2.303}{t} \times \log \frac{2P_i}{(2P_i - P_t)}$

Question ID : 4058591169

Ans. Official Answer NTA (3)

14. Identify correct statements from below:

A. The chromate ion is square planar.

B. Dichromates are generally prepared from chromates.

C. The green manganate ion is diamagnetic.

D. Dark green coloured K_2MnO_4 disproportionates in a neutral or acidic medium to give permanganate.

E. With increasing oxidation number of transition metal, ionic character of the oxides decreases.

Choose the correct answer from the options given below:

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

Question ID : 4058591172

Ans. Official Answer NTA (4)

15. A species having carbon with sextet of electrons and can act as electrophile is called

(1) carbocation (2) carbanion (3) pentavalent carbon (4) carbon free radical

Question ID : 4058591178

Ans. Official Answer NTA (1)

16. Match List I with List II

LIST-I (Technique)	LIST-II (Application)
A. Distillation	I. Separation of glycerol from spent-lye
B. Fractional distillation	II. Aniline - Water mixture
C. Steam distillation	III. Separation of crude oil fractions
D. Distillation under reduced pressure	IV. Chloroform - Aniline

Choose the correct answer from the options given below:

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

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

Question ID : 4058591176

Ans. Official Answer NTA (4)

17. Identify the factor from the following that **does not** affect electrolytic conductance of a solution.

(1) Concentration of the electrolyte

(2) The nature of solvent used

(3) The nature of the electrode used

(4) The nature of the electrolyte added

Question ID : 4058591168

Ans. Official Answer NTA (3)

18. The linear combination of atomic orbitals to form molecular orbitals takes place only when the combining atomic orbitals

A. have the same energy

B. have the minimum overlap

C. have same symmetry about the molecular axis

D. have different symmetry about the molecular axis

Choose the most appropriate from the options given below:

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

Question ID : 4058591165

Ans. Official Answer NTA (2)

19. Give below are two statements:

Statement - I: Noble gases have very high boiling points.

Statement - II: Noble gases are monoatomic gases. They are held together by strong dispersion forces.

Because of this they are liquefied at very low temperature. Hence, they have very high boiling points.

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 false but Statement II is true

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

(4) Both Statement I and Statement II are true

Question ID : 4058591177

Ans. Official Answer NTA (1)

20. Consider the oxides of group 14 elements

$SiO_2, GeO_2, SnO_2, PbO_2, CO$ and GeO. The amphoteric oxides are

(1) SiO_2, GeO_2 (2) SnO_2, CO (3) GeO, GeO_2 (4) SnO_2, PbO_2

Question ID : 4058591171

Ans. Official Answer NTA (4)

21. Consider the following reaction at 298K. $\frac{3}{2}O_{2(g)} \rightleftharpoons O_{3(g)} \cdot K_P = 2.47 \times 10^{-29}$.

$\Delta_r G^{\ominus}$ for the reaction is kJ. (Given $R = 8.314\ JK^{-1}\ mol^{-1}$)

Question ID : 4058591188

Ans. Official Answer NTA (163)

22. One Faraday of electricity liberates $x \times 10^{-1}$ gram atom of copper from copper sulphate. x is _____ .

Question ID : 4058591189

Ans. Official Answer NTA (5)

23. $CH_3CH_2Br + NaOH$ → (C_2H_5OH → Product A; H_2O → Product B)

The total number of hydrogen atoms in product A and product B is

Question ID : 4058591192

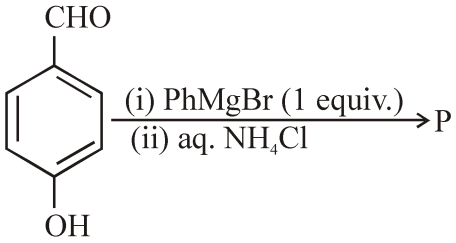
Ans. Official Answer NTA (10)

24. Number of alkanes obtained on electrolysis of a mixture of CH_3COONa and C_2H_5COONa is

Question ID : 4058591191

Ans. Official Answer NTA (3)

25. The product of the following reaction is P.



The number of hydroxyl groups present in the product P is

Question ID : 4058591193

Ans. Official Answer NTA (0)

26. The number of species from the following in which the central atom uses sp^3 hybrid orbitals in its bonding is _____.

NH_3, SO_2, SiO_2, $BeCl_2$, CO_2, H_2O, CH_4, BF_3

Question ID : 4058591187

Ans. Official Answer NTA (4)

27. The 'Spin only' Magnetic moment for $[Ni(NH_3)_6]^{2+}$ is _____ $\times 10^{-1}$ BM. (given = Atomic number of N: 28)

Question ID : 4058591190

Ans. Official Answer NTA (28)

28. The ionization energy of sodium in kJ mol^{-1}, if electromagnetic radiation of wavelength 242 nm is just sufficient to ionize sodium atom is

Question ID : 4058591186

Ans. Official Answer NTA (494)

29. Molar mass of the salt from NaBr, $NaNO_3$, KI and CaF_2 which does not evolve coloured vapours on heating with concentrated H_2SO_4 is

(Molar mass in g mol^{-1}: Na : 23, N : 14, K : 39, O : 16, Br : 80, I : 127, F : 19, Ca : 40)

Question ID : 4058591194

Ans. Official Answer NTA (78)

30. Number of moles of methane required to produce 22g $CO_{2(g)}$ after combustion is $x \times 10^{-2}$ moles. The value of x is

Question ID : 4058591185

Ans. Official Answer NTA (50)