# JEE-MAIN EXAM JANUARY, 2024

**Date: - 31-01-2024 (SHIFT-1)**

## CHEMISTRY

### SECTION-A

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

(2) Both Statement I and Statement II are true.

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

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

**2.** For the given reaction, choose the correct expression of $K_C$ from the following :-

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

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

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

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

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

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

(1) $(CH_3)_2CO + C_6H_5NH_2$

(2) $CHCl_3 + C_6H_6$

(3) $CHCl_3 + (CH_3)_2CO$

(4) $(CH_3)_2CO + CS_2$

**4.** The compound that is white in color is

(1) ammonium sulphide

(2) lead sulphate

(3) lead iodide

(4) ammonium arsinomolybdate

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

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

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

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

(1) The nature of the electrolyte added.

(2) The nature of the electrode used.

(3) Concentration of the electrolyte.

(4) The nature of solvent used.

**8.** 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-1-ol (2) Propene (3) Propyne (4) Propan-2-ol

**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) A is false but $R$ is true.

(2) A is true but R is false.

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

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

**10.** 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) A > D > B > C (3) A > D > C > B (4) D > C > B > A

**11.** 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) B, C, D only (2) A, D, E only (3) A, B, C only (4) B, D, E only

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

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

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

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

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

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

**Assertion A:** $\mathrm{pK_a}$ 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) $A$ is false but $R$ is true.

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

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

**15.** Given below are two statements:

**Statement I:** IUPAC name of $\mathrm{HO - CH_2 - (CH_2)_3 - CH_2 - COCH_3}$ 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 correct but Statement II is incorrect.

(2) Both Statement I and Statement II are incorrect.

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

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

**16.** 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 $[\mathrm{Ni(CN)_4}]^{2-}$ complex is dsp $^2$.

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

Choose the correct answer from the options given below:

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

**17.** 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) A, B, C only (2) A and C only (3) B, C, D only (4) B and D only

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

| LIST-I | | LIST-II | |
|---|---|---|---|
| A. | Glucose/NaHCO $/HCO_3/\Delta$ | I. | Gluconic acid |
| B. | Glucose $/HNO_3$ | II. | No reaction |
| C. | Glucose/HI/ $\Delta$ | III. | n-hexane |
| D. | Glucose/Bromine water | IV. | Saccharic acid |

Choose the correct answer from the options given below:

(1) A-IV, B-I, C-III, D-II (2) A-II, B-IV, C-III, D-I (3) A-III, B-II, C-I, D-IV (4) A-I, B-IV, C-III, D-II

**19.** Consider the oxides of group 14 elements

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

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

**20.** 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-IV, B-I, C-II, D-III (2) A-IV, B-III, C-II. D-I (3) A-I. B-II, C-IV, D-III (4) A-II, B-III. C-I, D-IV

## SECTION-B

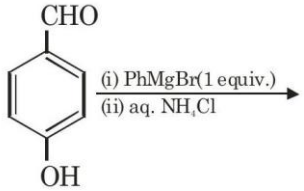
**21.** Molar mass of the salt from $NaBr, NaNO_3, KI$ and $CaF_2$ which does not evolve coloured vapours on heating with concentrated $H_2SO_4$ is _____ $gmol^{-1}$, (Molar mass in $gmol^{-1}$: Na: 23, N: 14, K: 39, O: 16, Br: 80, I: 127, F: 19, Ca: 40

**22.** The 'Spin only' Magnetic moment for $[Ni(NH_3)_6]^{2+}$ is _____ $\times 10^{-1}$BM.

( given = Atomic number of Ni: 28)

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

**24.** The product of the following reaction is P.




The number of hydroxyl groups present in the product $P$ is _____.

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

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

**26.** $CH_3CH_2Br + NaOH \xrightarrow[H_2O]{C_2H_5OH} \begin{matrix}\text{Product A}\\ \text{Product B}\end{matrix}$

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

**27.** Number of alkanes obtained on electrolysis of a mixture of $CH_3COONa$ and $C_2H_5COONa$ is _____.

**28.** Consider the following reaction at 298 K.

$\frac{3}{2}O_{2(g)} \rightleftharpoons O_{3(g)} \cdot K_p = 2.47 \times 10^{-29}$.

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

**29.** The ionization energy of sodium in $kJmol^{-1}$. If electromagnetic radiation of wavelength 242 nm is just sufficient to ionize sodium atom is _____ .

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

## NTA ANSWERS

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | **(4)** | **2.** | **(1)** | **3.** | **(4)** | **4.** | **(2)** | **5.** | **(1)** | **6.** | **(3)** | **7.** | **(2)** |
| **8.** | **(4)** | **9.** | **(4)** | **10.** | **(2)** | **11.** | **(4)** | **12.** | **(2)** | **13.** | **(1)** | **14.** | **(1)** |
| **15.** | **(1)** | **16.** | **(4)** | **17.** | **(2)** | **18.** | **(2)** | **19.** | **(3)** | **20.** | **(2)** | **21.** | **(78)** |
| **22.** | **(28)** | **23.** | **(50)** | **24.** | **(0)** | **25.** | **(4)** | **26.** | **(10)** | **27.** | **(3)** | **28.** | **(163)** |
| **29.** | **(494)** | **30.** | **(5)** | | | | | | | | | | |