JEE Main 30 January 2024 Shift 1 Answer Key

Chemistry

Q.1: What is the sum of the coefficients of all the species involved in the balanced equation: $2MnO4 + I^- \rightarrow$ (in presence of alkaline medium) $\rightarrow$ Product
A.1: 9

Q.2: What are the maximum number of hybrid orbitals formed when 2s and 2p orbitals are mixed?
A.2: 4

Q.3: Find out the work done in Joules for the cyclic process ABCA such that $P_A = 30$ kPa, $V_A = 10\ dm^3$, $P_B = 10$ kPa, $V_B = 30\ dm^3$, $P_C = 10$ kPa, $V_C = 10\ dm^3$ (as per the given graph).
A.3: 200 J

Q.4: Find the final product when C6H6–Br reacts with
i. Mg, Dry Ether
ii. CO2, H+
iii. NH3, heat
iv. Br2, KOH
A.4: C6H6–NH2

Q.5: Identify the following reaction.
C_6H_6–C=O–Cl $\rightarrow$ (in the presence of H_2, $Pd/BaSO_4$) $\rightarrow$ Product
i. Etard Reaction
ii. Stephen's Reaction
iii. Wolff Kishner Reduction
iv. Rosenmund Reaction

A.5: Rosenmund Reaction

Q.6: Among the given compounds, which will not give the Fehling test?
i. Lactose
ii. Maltose
iii. Sucrose
iv. Glucose

A.6: Sucrose

Q.7: Which of the following sets comprises both diamagnetic ions?
i. Ni^{2+}, Cu^{2+}
ii. Eu^{3+}, Gd^{3+}
iii. Cu^{+}, Zn^{2+}
iv. Ce^{4+}, Pm^{3+}

A.7: Cu^{+}, Zn^{2+}

Q.8: Statement I: For hydrogen atoms, 3p and 3d are degenerate.
Statement II: Degenerate orbitals have the same energy.
i. Both statements I and II are correct.
ii. Both statements I and II are incorrect.
iii. Statement I is correct and statement II is incorrect.
iv. Statement I is incorrect and statement Il is correct.

A.8: Both statements I and II are correct.

Q.9: What is the geometry of Aluminium chloride in an aqueous solution?
i. Square planar
ii. Octahedral
iii. Tetrahedral
iv. Square pyramidal

A.9: Octahedral

Q.10: The number of atoms in a silver plate having an area of 0.05 cm^2 and a thickness of 0.05 cm is $m \times 10^{19}$. If the density of silver is 7.9 g/cm^3, what is the value of m?

A.10: 11

Q.11: What is the group number of unununnium?

A.11: 11

Q.12: Match the following:
Column I: i. BrF5, ii. H2O, iii. ClF3, iv. SF4
Column II: a. Sea-Saw, b. T-Shape, c. Bent, d. Square Pyramidal

A.12: (A) –iv; (B) – iii; (C) – ii; (D) - i

Q.13: If a 250 mL solution of CH_3COONa of molarity 0.35 M is to be prepared, what is the mass of CH_3COONa required in grams? Find the nearest integer.

A.13: 7

Q.14: The K_{sp} of $Mg(OH)_2$ is 1×10^{-12}. Find the limiting pH at 25 °C at which 0.01 M Mg^{2+} ions will precipitate.

A.14: 9

Q.15: Assertion (A): From N to P covalent radius increases significantly, but from As to Bi, only a small increase is observed.
Reason (R): For a particular oxidation state, covalent radii and ionic radii increase down the group.
i. Both (A) and (R) are correct and (R) is the correct explanation of (A).
ii. Both (A) and (R) are correct but (R) is not the correct explanation of (A).
iii. (A) is correct but (R) is incorrect.
iv. (A) is incorrect but (R) is correct.

A.15: Both (A) and (R) are correct but (R) is not the correct explanation of (A).

Q.16: Find A and B if:
$CH_3 – C \equiv CH \rightarrow$ (reacts with Na) $\rightarrow$ Product A $\rightarrow$ (reacts with B) $\rightarrow CH_3 – C \equiv C – CH_2 – CH_2 – CH_3$

A.16: $CH_3 - C \equiv CNa, CH_3 - CH_2 - CH_2 - CI$

Q.17: Find A and B if:
$C_6H_6–NH_2$ → (reacts with A) → $C_6H_6–N_2^+$ → (reacts with B) → Orange-Red Precipitate

A.17: $NaNO_2/HCI$, Phenol

Q.18: Match the following:
Column I: i. Mn^{2+}, ii. V^+, iii. Cr^+, iv. Fe^{2+}
Column II: a. $3d^34s^1$, b. $3d^54s^0$, c. $3d^64s^0$, d. $3d^4s^1$

A.18: a – ii, b – i, c-ii, d-iii

Q.19: What happens to the freezing point of benzene, when a small amount of naphthalene is added to benzene?

A.19: Decreases

Q.20: A mixture is heated with dilute H_2SO_4 and the lead acetate paper turns black by the evolved gas. The mixture contains:
i. Sulphite
ii. Sulphide
iii. Sulphate
iv. Thiosulphate

A.20: Sulphide

Q.21: A → P
In a first-order reaction, the concentration of reactant A is 0.04 M at 10 mins and 0.03 M at 20 mins. Calculate the half-life of the first-order reaction in mins. [log2 = 0.3, log3 = 0.48]

A.21: 25