IIT-JEE-2007

PAPER-II

CHEMISTRY

[Time allowed: 3 hours] [Maximum Marks: 243]

GENERAL INSTRUCTIONS

1. **Section I** contains 9 multiple choice questions which have only one correct answer. Each question carries +3 marks each for correct answer and **-1 mark** for each wrong answer.

2. **Section II** contains 4 questions. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason).

   Bubble (A) if both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

   Bubble (B) if both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

   Bubble (C) if STATEMENT-1 is TRUE and STATEMENT-2 is FALSE.

   Bubble (D) if STATEMENT-1 is FALSE and STATEMENT-2 is TRUE.

   Carries +3 marks each for correct answer and -1 mark for each wrong answer.

3. **Section III** contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has only one correct answer and carries +4 marks for correct answer and **-1 mark** for wrong answer**.**

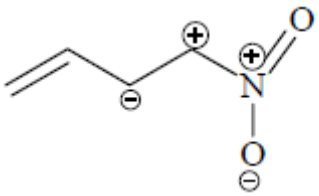
4. **Section IV** contains 3 questions. Each question contains statements given in 2 columns. Statements in the first column have to be matched with statements in the second column and each question carries +6 marks and marks will be awarded if all the four parts are correctly matched. No marks will be given for any wrong match in any question. There is **no negative marking.**

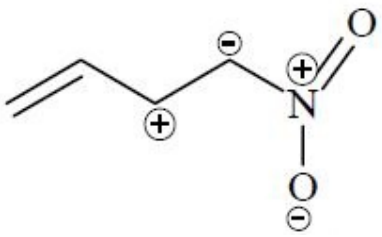
SECTION – I

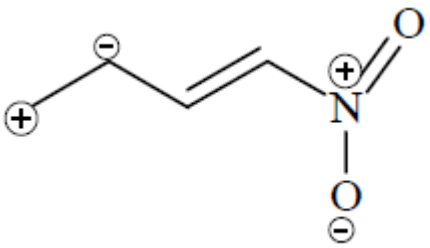
Straight Objective Type

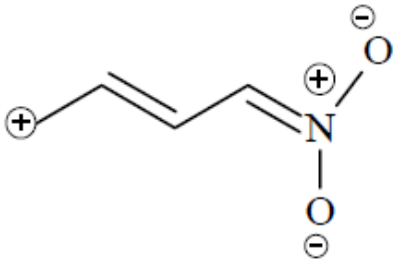
This section contains 9 multiple choice questions numbered 23 to 31. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

23. Among the following, the least stable resonance structure is

(A) 

(B) 

(C) 

(D) 

24. For the process $H_2O(l)(1bar, 373K) \rightarrow H_2O(g)(1bar, 373K)$, the correct set of thermodynamic parameters is

(A) $\Delta G = 0,\ \Delta S = +ve$

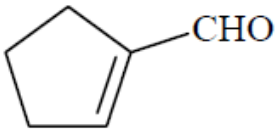
(B) $\Delta G = 0,\ \Delta S = -ve$

(C) $\Delta G = +ve,\ \Delta S = 0$

(D) $\Delta G = -ve,\ \Delta S = +ve$

25. Cyclohexene on ozonolysis followed by reaction with zinc dust and water gives compound E. Compound E on further treatment with aqueous KOH yields compound F. Compound F is

(A)



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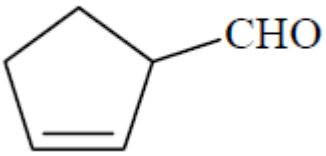

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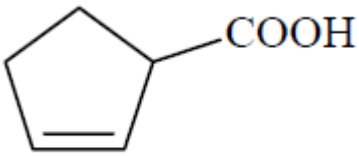

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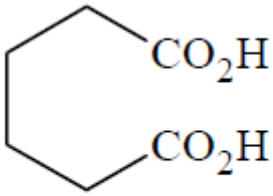


26. Consider a reaction $aG + bH \rightarrow Products$. When concentration of both the reactants G and H is doubled, the rate increases by eight times. However, when concentration of G is doubled keeping the concentration of H fixed, the rate is doubled. The overall order of the reaction is

(A) 0

(B) 1

(C) 2

(D) 3

27. Among the following metal carbonyls, the $C-O$ bond order is lowest in

(A) $\left[Mn(CO)_6\right]^+$

(B) $\left[Fe(CO)_5\right]$

(C) $\left[Cr(CO)_6\right]$

(D) $\left[V(CO)_6\right]$

28. A positron is emitted from $23\,^{23}Na_{11}$. The ratio of the atomic mass and atomic number of the resulting nuclide is

(A) 22/10

(B) 22/11

(C) 23/10

(D) 23/12

29. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is

(A) 3

(B) 4

(C) 5

(D) 6

30. The number of stereoisomers obtained by bromination of trans-2-butene is

(A) 1

(B) 2

(C) 3

(D) 4

31. A solution of metal ion when treated with KI gives a red precipitate which dissolves in excess KI to give a colourless solution. Moreover, the solution of metal ion on treatment with a solution of cobalt (II) thiocyanate gives rise to a deep blue crystalline precipitate. The metal ion is

(A) Pb^{2+}

(B) Hg^{2+}

(C) Cu^{2+}

(D) Co^{2}

SECTION – II

Assertion – Reason Type

This section 4 questions numbered 32 to 35. Each question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason).
Each question has 4 choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

32. STATEMENT-1: Molecules that are not superimposable on their mirror images are chiral
because
STATEMENT-2: All chiral molecules have chiral centres.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

33. STATEMENT-1: Alkali metals dissolves in liquid ammonia to give blue solution
because
STATEMENT-2: Alkali metals in liquid ammonia give solvated species of the type $\left[M\left(NH_3\right)_n\right]^+$ $\left(M=\text{alkali metals}\right)$.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

34. STATEMENT-1: Band gap in germanium is small.

because

STATEMENT-2: The energy spread of each germanium atomic energy level is infinitesimally small.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

35. STATEMENT-1: Glucose gives a reddish-brown precipitate with Fehling's solution.

because

STATEMENT-2: Reaction of glucose with Fehling's solution gives CuO and gluconic acid.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

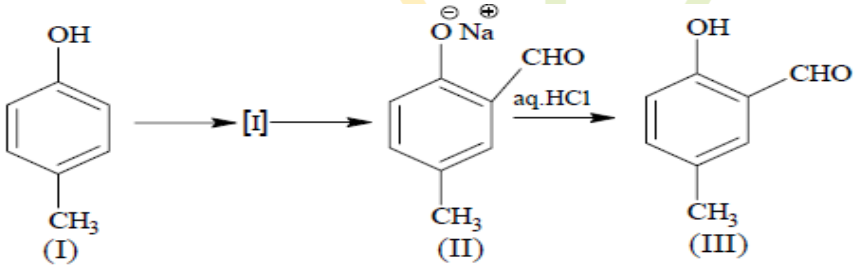
(C) Statement-1 is True, Statement-2 is False

SECTION – III

Linked Comprehension Type

C36-38 : Paragraph for question Nos 36 to 38

Reimer-Tiemann reaction introduces an aldehyde group, on to the aromatic ring of phenol, *ortho* to the hydroxyl group. This
reaction involves electrophilic aromatic substitution. This is a general method for the synthesis of substituted salicyladehydes as
depicted below.



36. Which one of the following reagents is used in the above reaction?

(A) $aq.NaOH + CH_3CI$

(B) $aq.NaOH + CH_2CI_2$

(C) $aq.NaOH + CHCI_3$

(D) $aq.NaOH + CCI_4$

37. The electrophile in this reaction is

(A) $:CHCl$

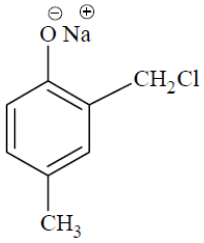
(B) $^{+}CHCl_2$

(C) $:CHCl_2$

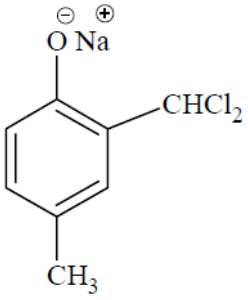
(D) $.CHCl_3$

38. The structure of the intermediate I is

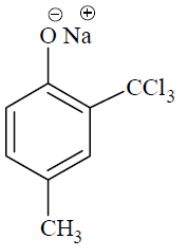
(A)



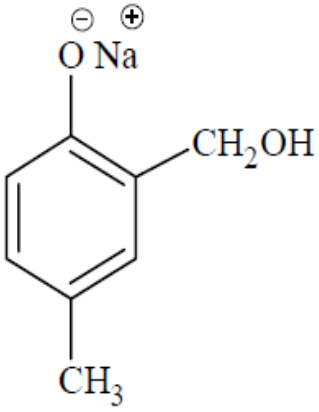
(B)



(C)



(D)



C39-41 : Paragraph for question Nos 39 to 41

Redox reactions play a pivotal role in chemistry and biology. The values of standard redox potential $(E°)$ of two half-cell reactions decide which way the reaction is expected to proceed. A simple example is a Daniel cell in which zinc goes into solution and copper gets deposited. Given below are a set of half-cell reactions (acidic medium) along with their $E°$ (V with respect to normal hydrogen electrode) values. Using this data obtain the correct explanations to Questions 39-41.

$I_2 + 2e^- \rightarrow 2I^-$	$E° = 0.54$
$Cl_2 + 2e^- \rightarrow 2Cl^-$	$E° = 1.36$
$Mn^{3+} + e^- \rightarrow Mn^{2+}$	$E° = 1.50$
$Fe^{3+} + e^- \rightarrow Fe^{2+}$	$E° = 0.77$
$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$	$E° = 1.23$

39. Among the following, identify the correct statement.

(A) Chloride ion is oxidized by O_2

(B) Fe^{2+} is oxidized by iodine

(C) Iodide ion is oxidized by chlorine

(D) Mn^{2+} is oxidized by chlorine

40. While Fe^{3+} is stable, Mn^{3+} is not stable in acid solution because

(A) O_2 oxidises Mn^{2+} to Mn^{3+}

(B) O_2 oxidises both Mn^{2+} and Fe^{2+} to Fe^{3+}

(C) Fe^{3+} oxidizes H_2O to O_2

(D) Mn^{3+} oxidises H_2O to O_2

41. Sodium fusion extract, obtained from aniline, on treatment with iron (II) sulphate and H_2SO_4 in presence of air gives a Prussian blue precipitate. The blue colour is due to the formation of

(A) $Fe_4\left[Fe(CN)_6\right]_3$

(B) $Fe_3\left[Fe(CN)_6\right]_2$

(C) $Fe_4\left[Fe(CN)_6\right]_2$

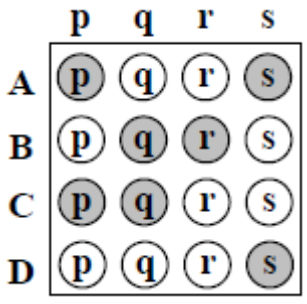
(D) $Fe_3\left[Fe(CN)_6\right]_3$

SECTION – IV

Matrix-Match Type

This section contains 3 questions. Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column-I have to be matched with statements (p, q, r, s) in Column-II. The answer to these questions have to be appropriately bubbled as illustrated in the following example.

If the correct matches are A-p, A-s, B-q, B-r, C-p, C-q and D-s, then the correctly bubbled 4 × 4 matrix should be as follows:



42. Match the reactions in Column I with nature of the reactions/type of the products in Column II. Indicate your answer by darkening the appropriate bubbles of the 4 × 4 matrix given in the ORS.

Column I	Column II
(A) $O_2^- \rightarrow O_2 + O_2^{2-}$	(p) redox reaction
(B) $CrO_4^{2-} + H^+ \rightarrow$	(q) one of the products has trigonal planar structure
(C) $MnO_4^- + NO_2^- + H^+ \rightarrow$	(r) dimeric bridged tetrahedral metal ion
(D) $NO_3^- + H_2SO_4 + Fe^{2+} \rightarrow$	(s) disproportionation

43. Match the compounds/ions in column I with their properties/reactions in column II. Indicate your answer by darkening the appropriate bubbles of the 4 × 4 matrix given in the ORS.

	Column I	Column II
(A)	C_6H_5CHO	(p) gives precipitate with 2, 4-dinitrophenylhydrazine
(B)	$CH_3C = CH$	(q) gives precipitate with $AgNO_3$
(C)	CH^-	(r) is a nucleophile
(D)	I^-	(s) is involved in cyanohydrin formation

44. Match the crystal system/unit cells mentioned in Column I with their characteristics features mentioned in column II. Indicate your answer by darkening the appropriate bubbles of the 4 × 4 matrix given in the ORS.

Column I	Column II
(A) Simple cubic and face-centred cubic	(p) have these cell parameters $a = b = c$ and $\alpha = \beta = \gamma$
(B) cubic and rhombohedral	(q) are two crystal systems
(C) cubic and tetragonal	(r) have only two crystallography angles of 90°
(D) hexagonal and monoclinic	(s) belong to same crystal system