JEE MAIN-2007

CHEMISTRY

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

A. General Instructions :

Note: (i) The question paper consists of 3 parts (Physics, Chemistry and Mathematics). Each part has 4 sections.

(ii) 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.

(iii) 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.

(iv) 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.

(v) 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

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. The number of structural isomers for C_6H_{14} is

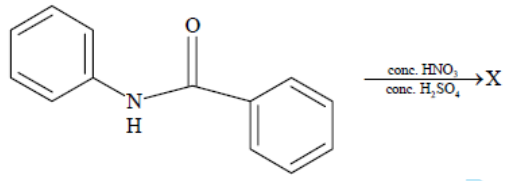
(A) 3

(B) 4

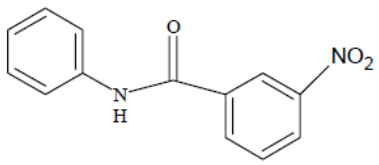
(C) 5

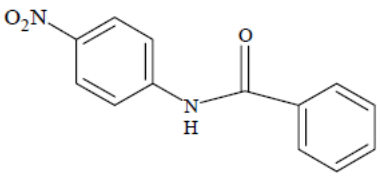
(D) 6

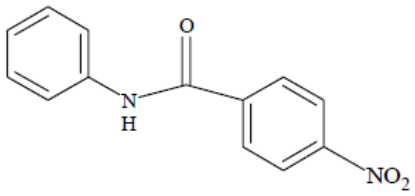
24. In the following reaction,

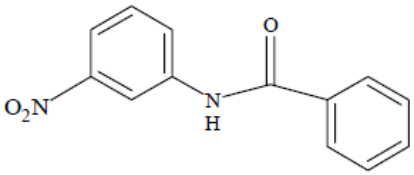


the structure of the major product 'X' is

(A) 

(B) 

(C) 

(D) 

25. When $20\,g$ of naphthoic acid $\left(C_{11}H_8O_2\right)$ is dissolved in $20\,g$ of benzene $\left(K_f = 1.72\,K\,kg\,mol^{-1}\right)$, a freezing depression of $2\,K$ is observed. The van't Hoff factor (i) is

(A) 0.5

(B) 1

(C) 2

(D) 3

26. Among the following, the paramagnetic compound is

(A) Na_2O_2

(B) O_3

(C) N_2O

(D) KO_2

27. The value of log10K for a reaction $A \rightleftharpoons B$ is

$$\begin{pmatrix} \text{Given}: \Delta_r H^{\circ}_{298K} = -54.07 kJ\ mol^{-1}, \Delta_r S^{\circ}_{298K} = 10 KJ^{-1}\ mol^{-1} \\ \text{and } R = 8.31410 KJ^{-1}\ mol^{-1};\ 2.303 \times 8.314 \times 298 = 5705 \end{pmatrix}$$

(A) 5

(B) 10

(C) 95

(D) 100

28. The species having bond order different from that in CO is

(A) NO^-

(B) NO^+

(C) CN^-

(D) N_2

29. The percentage of p-character in the orbitals forming $P-P$ bonds in P_4 is

(A) 25

(B) 33

(C) 50

(D) 75

30. Extraction of zinc from zinc blende is achieved by

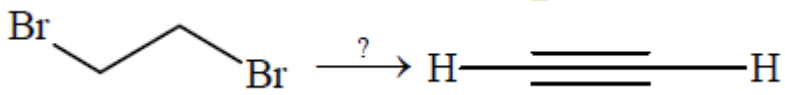
(A) electrolytic reduction

(B) roasting followed by reduction with carbon

(C) roasting followed by reduction with another metal

(D) roasting followed by self-reduction

31. The reagent (s) for the following conversion,



is/are

(A) alcoholic KOH

(B) alcoholic KOH followed by $NaNH_2$

(C) aqueous KOH followed by $NaNH_2$

(D) Z_n/CH_3OH

SECTION – II

This section contains 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**: p-Hydroxybenzoic acid has a lower boiling point than o-Hydroxybenzoic acid.

because

STATEMENT-2: o-Hydroxybenzoic acid has intramolecular hydrogen bonding.

(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: Micelles are formed by surfactant molecules above the critical micellar concentration (CMC).

because

STATEMENT-2: The conductivity of a solution having surfactant molecules decreases sharply at the CMC.

(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**: Boron always forms covalent bond.

because

STATEMENT-2: The small size of B^{3+} favours formation of covalent bond.

(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 True.

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

35. **STATEMENT-1**: In water, orthoboric acid behaves as a weak monobasic acid.

because

STATEMENT-2: In water, orthoboric acid acts as a proton donor.

(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-1is True, Statement-2 is False.

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

SECTION – III

This section contains 2 paragraphs C36-38 and C39-41. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

C36-38 : Paragraph for question Nos 36 to 38

Chemical reactions involve interaction of atoms and molecules. A large number of atoms/molecules (approximately 6.023×10^{23}) are present in a few grams of any chemical compound varying with their atomic/molecular masses. To handle such large numbers conveniently, the mole concept was introduced. This concept has implications in diverse areas such as analytical chemistry, biochemistry, electrochemistry and radiochemistry. The following example illustrates a typical case, involving chemical/electrochemical reaction, which requires a clear understanding of the mole concept.

A 4.0 molar aqueous solution of $NaCl$ is prepared and 500 mL of this solution is electrolysed. This leads to the evolution of chlorine gas at one of the electrodes (atomic mass: $Na = 23, Hg = 200; 1 Faraday = 96500$ coulombs)

36. The total number of moles of chlorine gas evolved is

(A) 0.5

(B) 1.0

(C) 2.0

(D) 3.0

37. If the cathode is a Hg electrode, the maximum weight (g) of amalgam formed from this solution is

(A) 200

(B) 225

(C) 400

(D) 446

38. The total charge (coulombs) required for complete electrolysis is

(A) 24125

(B) 48250

(C) 96500

(D) 193000

C39-41: Paragraph for Question Nos. 39 to 41

The noble gases have closed-shell electronic configuration and are monoatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of other interatomic interactions.

The direct reaction of xenon with fluorine leads to a series of compounds with oxidation numbers $+2, +4$ and $+6$. XeF_4 reacts violently with water to give XeO_3. The compounds of xenon exhibit rich stereochemistry and their geometries can be deduced considering the total number of electron pairs in the valence shell.

39. Argon is used in arc welding because of its

(A) low reactivity with metal

(B) ability to lower the melting point of metal

(C) flammability

(D) high calorific value

40. The structure of XeO_3 is

(A) linear

(B) planar

(C) pyramidal

(D) T-shaped

41. XeF_4 and XeF_6 are expected to be

(A) oxidizing

(B) reducing

(C) unreactive

(D) strongly basic