



THE DOON GLOBAL SCHOOL

PRE-BOARD2 (2022-23)

CLASS –XII

SUBJECT-Chemistry

CODE-043

TIME - 3 Hr.

M. M- 70

INSTRUCTION

General Instructions:

1. There are 35 questions in this question paper with internal choice.
2. SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 7 very short answer questions carrying 2 marks each.
4. SECTION C consists of 5 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

(SECTION-A)

Directions (Q. Nos. 1-18) : The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

Q.1 KMnO_4 acts as an oxidising agent in alkaline medium. When alkaline KMnO_4 is treated with KI, iodide ion is oxidised to:

- (a) IO^- (b) I_2 (c) IO_4^- (d) IO_3^-

Q.2 The half-life for a first order reaction is 4 minutes. The time after which 99.9% reaction gets completed is:

- (a) 32 minutes (b) 40 minutes (c) 16 minutes (d) 8 minutes

Q.3 In reaction $\text{A} \rightarrow \text{B}$, the rate of reaction is doubled on increasing the concentration of the reactants four times. The order of the reaction is :

- (a) 1 (b) 2 (c) 4 (d) Zero

Q.4 How much ethyl alcohol must be added to 1L of water so that the solution will freeze at -14°C ? (K_f for water = 1.86°C/mol)

- (a) 10.5 mol (b) 9.5 mol (c) 7.5 mol (d) 8.5 mol

Q.5 The role of a catalyst is to change :

- (a) enthalpy of reaction (b) Gibbs' energy of reaction
(c) equilibrium constant (d) activation energy of reaction

Q.6 The value of K_H for Ar(g) , $\text{CO}_2(\text{g})$, HCHO(g) and $\text{CH}_4(\text{g})$ are 40.39, 1.67, 18.3, 10.5 and 0.413 respectively. Arrange these gases in increasing order of solubility.

- (a) $\text{Ar} < \text{CO}_2 < \text{CH}_4 < \text{HCHO}$ (b) $\text{Ar} < \text{CH}_4 < \text{CO}_2 < \text{HCHO}$
(c) $\text{HCHO} < \text{CH}_4 < \text{CO}_2 < \text{Ar}$ (d) $\text{HCHO} < \text{CO}_2 < \text{CH}_4 < \text{Ar}$

Q.7 Out of the following transition elements, the maximum number of oxidation states are shown by:

- (a) Cr ($Z = 24$) (b) Sc ($Z = 21$) (c) Fe ($Z = 26$) (d) Mn ($Z = 25$)

Q.8 For the reaction $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$, $r = k[\text{H}_2\text{O}_2]$. The reaction is of :

- (a) first order (b) second order (c) third order (d) zero order

Q.9 Using valence bond theory, the complex $[\text{Cr}(\text{NH}_3)_6]^{3+}$ can be described as :

- (a) d^2sp^3 , inner orbital complex, paramagnetic
- (b) d^2sp^3 , outer orbital complex, diamagnetic
- (c) sp^3d^2 , outer orbital complex, paramagnetic
- (d) dsp^2 , inner orbital complex, diamagnetic

Q.10 Major product obtained on reaction of 3-phenyl propene with HBr in presence of organic peroxide is:

- (a) 3-phenyl-2-bromopropane (b) 3-phenyl-1-bromopropane
- (c) 1-phenyl-3-bromopropane (d) 1-phenyl-2-bromopropane

Q.11 The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is _____.

- (a) 1F (b) 6F (c) 3F (d) 2F

Q.12 Which of the following aqueous solutions should have the highest boiling point?

- (a) 1.0 M NaOH (b) 1.0 M Na_2SO_4 (c) 1.0 M NH_4NO_3 (d) 1.0 M KNO_3

Q.13 Which of the following alkyl halides will undergo $\text{S}_\text{N}1$ reaction most readily?

- (a) $(\text{CH}_3)_3\text{C}-\text{F}$ (b) $(\text{CH}_3)_3\text{C}-\text{Cl}$ (c) $(\text{CH}_3)_3\text{C}-\text{Br}$ (d) $(\text{CH}_3)_3\text{C}-\text{I}$

Q.14 What should be the correct IUPAC name for diethylbromomethane?

- (a) 1-Bromo-1,1-diethylmethane (b) 3-Bromopentane
- (c) 1-Bromo-1-ethylpropane (d) 1-Bromopentane

Q.15 Assertion : Vanadium had the ability to exhibit a wide range of oxidation states.

Reason : The standard potentials Vanadium are rather small, making a switch between oxidation states relatively easy.

- (a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
- (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (c) Assertion is fake but Reason is true.
- (d) Assertion is true but Reason is fake.

Q.16 Assertion : Cu cannot liberate hydrogen from acids.

Reason : Cu has positive electrode potential.

- (a) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (c) Assertion is false but Reason is true.
- (d) Assertion is true but Reason is false.

Q.17 Assertion : KCN reacts with methyl chloride to give methyl isocyanide

Reason : CN^- is an ambident nucleophile

- (a) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (c) Assertion is false but Reason is true.
- (d) Assertion is true but Reason is false.

Q.18 Assertion : Molarity of a solution in liquid state changes with temperature.

Reason : The volume of a solution changes with change in temperature

- (a) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (c) Assertion is false but Reason is true.
- (d) Assertion is true but Reason is false.

(SECTION-B)

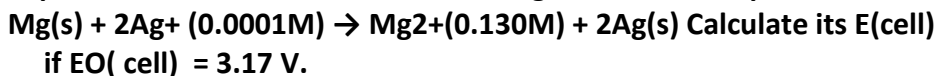
Directions (Q. Nos. 19-25) : This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

Q.19 Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

Q.20 Which compound in each of the following pairs will react faster in $\text{S}_\text{N}2$ reaction with OH^- ?

- (i) CH_3Br or CH_3I (ii) $(\text{CH}_3)_3\text{CCl}$ or CH_3Cl

Q.21 Represent the cell in which the following reaction takes place



Q.22 How the following conversions can be carried out?

- (i) 2-Bromopropane to 1-bromopropane (ii) Chloroethane to butane

Or

What happens when ?

- (i) n-butyl chloride is treated with alcoholic KOH ,
(ii) bromobenzene is treated with Mg in the presence of dry ether.

Q.23 Calculate the mass of urea (NH_2CONH_2) required in making 2.5 kg of 0.25 molal aqueous solution.

Q.24 For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction.

Q.25 (i) Give the electronic configuration of the d-orbitals of Ti in $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion and explain why this complex is coloured ? [At. No. of $\text{Ti} = 22$]

- (ii) Write IUPAC name of $[\text{Cr}(\text{NH}_3)_3(\text{H}_2\text{O})_3]\text{Cl}_3$.

Or

Determine the structure and magnetic behaviour of $[\text{CoCl}_4]^{2-}$ using valence bond theory.

(SECTION-C)

Directions (Q. Nos. 26-30) : This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

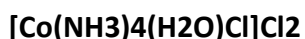
Q.26 Arrange the compounds of each set in order of reactivity towards $\text{S}_\text{N}2$ displacement:

- (i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane
(ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 2-Bromo-3-methylbutane
(iii) 1-Bromobutane, 1-Bromo-2,2-dimethylpropane, 1-Bromo-2-methylbutane, 1-Bromo-3-methylbutane.

Q.27 Answer the following questions : (Any three)

- (i) What do you mean by depression in freezing point?
(ii) How can the molecular weight of a non-volatile substance be calculated by freezing point depression method? Only give the formula.
(iii) Measurement of osmotic pressure method is preferred for the determination of molar mass of macromolecules such as proteins and polymers.
(iv) Elevation of boiling point of 1M KCl solution is nearly double than that of 1 M sugar solution.

Q.28 (i) Write the IUPAC name of the following complex :



- (ii) What is the difference between an Ambidentate ligand and a Bidentate ligand?
(iii) Out of $[\text{Fe}(\text{NH}_3)_6]^{3+}$ and $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$, which complex is more stable and why ?

Q.29 Vapour pressure of pure water at 298 K is 23.8 mm Hg. 50 g of urea (NH_2CONH_2) is dissolved in 850 g of water. Calculate the vapour pressure of water for this solution and its relative lowering.

Or

Boiling point of water at 750 mm Hg is 99.63°C . How much sucrose is to be added to 500 g of water such that it boils at 100°C .

Q.30 Explain giving reasons:

- (i) Transition metals and many of their compounds show paramagnetic behaviour.
- (ii) The enthalpies of atomisation of the transition metals are high.
- (iii) The transition metals generally form coloured compounds.

(SECTION-D)

Directions (Q. Nos. 31-32) : The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

Q.31 The rate law for a chemical reaction relates the reaction rate with the concentrations or partial pressures of the reactants. For a general reaction

$aA + bB \rightarrow C$ with no intermediate steps in its reaction mechanism, meaning that it is an elementary reaction, the rate law is given by $r = k[A]^x[B]^y$ where $[A]$ and $[B]$ express the concentrations of A and B in moles per litre. Exponents x and y vary for each reaction and are determined experimentally. The value of k varies with conditions that affect reaction rate, such as temperature, pressure, surface area, etc. The sum of these exponents is known as overall reaction order. A zero order reaction has a constant rate that is independent of the concentration of the reactants. A first order reaction depends on the concentration of only one reactant. A reaction is said to be second order when the overall order is two. Once we have determined the order of the reaction, we can go back and plug in one set of our initial values and solve for k .

In the context of the given passage, answer the following questions :

- (i) Calculate the overall order of a reaction which has the following rate expression : $\text{Rate} = k[A]^{1/2}[B]^{3/2}$
- (ii) What is the effect of temperature on rate of reaction?
- (iii) A first order reaction takes 77.78 minutes for 50% completion. Calculate the time required for 30% completion of this reaction $\log 10 = 1$, $\log 7 = 0.8450$.

OR

- (iv) A first order reaction has a rate constant 1×10^{-3} per sec. How long will 5g of this reactant take to reduce to 3 g? ($\log 3 = 0.4771$; $\log 5 = 0.6990$)

Q.32 The polarity of carbon-halogen bond of alkyl halides is responsible for their nucleophilic substitution, elimination and their reaction with metal atoms to form organometallic compounds. Nucleophilic substitution reactions are categorised into SN_1 and SN_2 on the basis of their kinetic properties. Chirality has a profound role in understanding the reaction mechanisms of SN_1 and SN_2 reactions. SN_2 reactions of chiral alkyl halides are characterised by the inversion of configuration while SN_1 reactions are characterised by racemisation.

Give the definition of – (i) SN_1 reaction

(ii) SN_2 reaction

(iv) Polarity of alkyl halides

(iii) Elimination reaction

(SECTION-E)

Directions (Q. Nos. 33-35) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

Q.33 Depict the galvanic cell in which the reaction



- (i) Which of the electrode is negatively charged?
- (ii) The carriers of the current in the cell.
- (iii) Individual reaction at each electrode.

Q.34 How much charge is required for the following reductions:

(i) 1 mol of Al^{3+} to Al ? (ii) 1 mol of Cu^{2+} to Cu ? (iii) 1 mol of MnO_4^- to Mn^{2+} ?

Or

Explain with two examples each of the following:

coordination entity, ligand, coordination number

Q.35 Primary alkyl halide $\text{C}_4\text{H}_9\text{Br}$ (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

Or

Write the structures of the following organic halogen compounds. (i) 2-Chloro-3-methylpentane (ii) p-Bromochlorobenzene (iii) 1-Chloro-4-ethylcyclohexane (iv) 2-(2-Chlorophenyl)-1-iodooctane (v) 2-Bromobutane