Roll Number				

SET A

INDIAN SCHOOL MUSCAT
SECOND PRE - BOARD EXAMINATION
CHEMISTRY-043

CLASS: XII | TERM 2 | Time Allotted: 2 hrs

23.02.2022 | Max. Marks: 35

GENERAL INSTRUCTIONS

1. **There are 12 questions in this question paper with internal choice.**
2. **SECTION A - Q. No. 1 to 3 are very short answer questions carrying 2 marks each.**
3. **SECTION B - Q. No. 4 to 11 are short answer questions carrying 3 marks each.**
4. **SECTION C- Q. No. 12 is case based question carrying 5 marks.**
5. **All questions are compulsory.**

SECTION A

1. (i) Using IUPAC norms, write the formula for the following complex: Tetraamminediaquacobalt(III) chloride 2

   (ii) Write the IUPAC name of the coordination complex: $[CoCl_2(en)_2]NO_3$

2. The molar conductivity of a 1.5 M solution of an electrolyte is found to be 138.9 S cm^2 mol^{-1}. Calculate the conductivity of this solution. 2

3. Name the reagents used in the following reactions (Any two) 2

   (i) $RCH_2NH_2 \xrightarrow{A} RCH_2NC$

   (ii) $C_6H_5CONH_2 \xrightarrow{B} C_6H_5NH_2$

   (iii) $CH_3NO_2 \xrightarrow{C} CH_3NH_2$

SECTION B

4. Calculate $\Delta_r G^0$ and equilibrium constant K_c for the following reaction at 298 K: 3

   $2Cr_{(s)} + 3Fe^{2+}_{(aq)} \rightarrow 2Cr^{3+}_{(aq)} + 3Fe_{(s)}$ Given: E^0 cell = 0.30 V

OR

Write the cell reaction and calculate the e.m.f. of the following cell at 298 K:

$Sn(s) \mid Sn^{2+}(0.004\ M) \parallel H^{+}(0.020\ M) \mid H_2(g)\ (1\ bar) \mid Pt(s)$

(Given : E^0 cell = 0.14 V)

5. (i) What happens when a freshly precipitated $Fe(OH)_3$ is shaken with a little amount of dilute solution of $FeCl_3$? 3

(ii) Why are lyophilic colloidal sols more stable than lyophobic colloidal sols?

(iii) On the basis of Hardy-Schulze rule explain why the coagulating power of phosphate is higher than chloride.

OR

Define the following terms

(i) Electrophoresis
(ii) Zeta potential
(iii) Tyndall effect

6. Account for the following: 3

(i) Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7.

(ii) Transition metals and their compounds show catalytic properties.

(iii) Zirconium and Hafnium exhibit similar properties.

7. (i) Predict the geometry and magnetic character of of $[Ni(CN)_4]^{2-}$ using valence bond theory. (Atomic no of Ni=28) 3

(ii) Give one limitation of valence bond theory.

8. (i) Draw the structure of the semicarbazone of propanal. 3

(ii) Why pKa of $F\text{-}CH_2\text{-}COOH$ is lower than that of $Cl\text{-}CH_2\text{-}COOH$?

(iii) Give a chemical test to distinguish between the following pair of compounds:

Benzaldehyde and Acetaldehyde

9. Write the equations involved in the following reactions : 3

(i) Stephen reaction

(ii) Aldol condensation

(iii) Rosenmund reduction

OR

Convert

(i) P-nitrotoluene to p-nitrobenzaldehyde

(ii) Propanal to butan-2-one

(iii) Benzene to benzoic acid

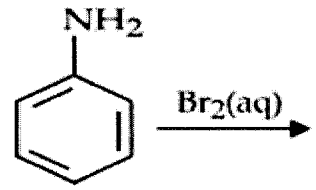
10. Account for the following : 3

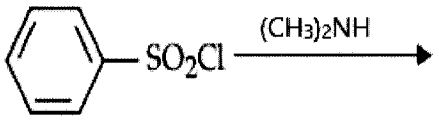
(i) Aldehydes are more reactive than ketones towards nucleophilic addition reaction.

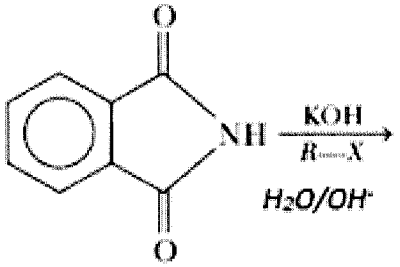
(ii) Boiling point of aldehydes are lower than that of alcohols.

(iii) Addition reaction of sodium hydrogensulphite is useful for the separation and purification of aldehydes.

11. Complete the following 3

(i) 

(ii) 

(iii) 

OR

(i) Give the IUPAC name of $CH_3NHCH_2CH_3$

(ii) Arrange the following in the increasing order of basic strength

$C_6H_5NH_2$, $(C_2H_5)_2NH$, $C_2H_5NH_2$, NH_3

(iii)Complete the following reaction:

$CH_3NH_2 + C_6H_5COCl \rightarrow$ .....

SECTION C

12. Read the passage given below and answer the questions that follow. 5

Chemical kinetics is one of the oldest branches of physical chemistry, and its study is intrinsically tied to understand mechanisms and assigning rate constants to individual mechanistic steps. Progress in theoretical kinetics involves not only sorting out the individual steps but also calculating the rate constants. For simple reactions one can even calculate rate constants for individual reaction steps by accurate solution of the Schrodinger equation. A key theme running through the progress in theoretical chemical kinetics is complexity. Mechanisms can have many steps, including non-equilibrated intermediates, and methods have been developed for including this. However, in many cases in liquids and disordered solids, one cannot even develop a catalog of well-defined individual steps. Thus we must study complex processes that are too complicated to be broken into a countable number of individual kinds of steps.

a) For the elementary reaction, $\mathbf{H_{2(g)} + Br_{2(g)} \rightarrow 2HBr(g)}$. The experimental data suggests, Rate = $k[H_2][Br_2]^{1/2}$ .Write the molecularity and order for the reaction

b) Define the term: Pseudo first order reaction.

c) The conversion of X to Y follows the second order of kinetics. How is the rate of reaction affected if the concentration of X is increased 3 times?

d) Rate constant k for first order reaction has been found to be $2.54 \times 10^{-3}\ s^{-1}$. Calculate its three-fourth life.

OR

A first order reaction has a rate constant of $0.0051\ min^{-1}$. If we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours? **(1+1+1+2)**

End of the Question Paper

Roll Number				

SET B

INDIAN SCHOOL MUSCAT
SECOND PRE - BOARD EXAMINATION
CHEMISTRY-043

CLASS: XII | TERM 2 | Time Allotted: 2 hrs

23.02.2022 | Max. Marks: 35

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5. **All questions are compulsory.**

SECTION A

1. Name the reagents used in the following reactions(Any two) 2

(i) $RCH_2NH_2 \xrightarrow{A} RCH_2NC$

(ii) $C_6H_5CONH_2 \xrightarrow{B} C_6H_5NH_2$

(iii) $CH_3NO_2 \xrightarrow{C} CH_3NH_2$

2. The conductivity of 0.20 M solution of KCl at 298 K is 0.025 S cm^{-1}. Calculate its molar conductivity 2

3. (i) Using IUPAC norms, write the formula for the following complex 2

Pentaamminenitrito-O-Cobalt(III) chloride

(ii) Write the IUPAC name of the coordination complex: $K[Cr(H_2O)_2(CN)_4]$

SECTION B

4. Calculate $\Delta_r G°$ and equilibrium constant K_c for the following reaction at 298 K: 3

$Fe(s) + Cd^{2+}(aq) \rightarrow Fe^{2+}(aq) + Cd(s)$
Given $E^0_{cell} = 0.04$ V

OR

Represent the cell in which the following reaction takes place:

$2Al_{(s)} + 3Ni^{2+}_{(0.1M)} \rightarrow 2Al^{3+}_{(0.01M)} + 3Ni_{(s)}$ .Calculate the emf if $E^0_{cell} = 1.41$ V

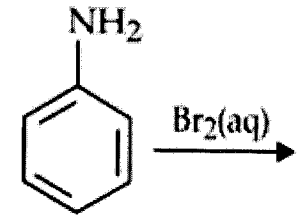
5. (i) Draw the structure of the semicarbazone of ethanal. 3

(ii) Why pKa of F-CH_2-COOH is lower than that of Cl-CH_2-COOH?

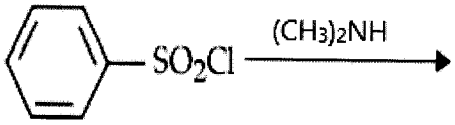
(iii) Give a simple chemical test to distinguish between the following pair of compounds: Ethanal and Propanal

6. Complete the following 3

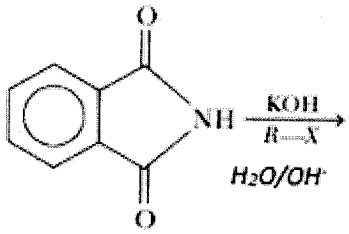
(i)



(ii)



(iii)



OR

(i) Give the IUPAC name of $CH_3NHCH_2CH_3$

(ii) Arrange the following in the increasing order of basic strength

$C_6H_5NH_2$, $(C_2H_5)_2NH$, $C_2H_5NH_2$, NH_3

(iii) Complete the following reaction:

$CH_3NH_2 + C_6H_5COCl \rightarrow$ .....

7. Account for the following: 3

(i) Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7.

(ii) Transition metals and their compounds show catalytic properties

(iii) Zirconium and Hafnium exhibit similar properties

8. Account for the followings : 3

(i) Aldehydes are more reactive than ketones towards nucleophilic addition reaction.

(ii) Boiling point of aldehydes are lower than alcohols.

(iii) Addition reaction of sodium hydrogensulphite is useful for the separation and purification of aldehydes

9. Write the equations involved in the following reactions 3

(i) Gattermann-Koch reaction

(ii) HVZ reaction

(iii) Wolff Kishner reduction

OR

Convert

(i) Ethanal to But-2-enal

(ii) Propanone to propene

(iii) Bromobenzene to benzoic acid

10. (i) Using the valence bond approach, deduce the shape and magnetic character of $[Co(NH_3)_6]^{3+}$ ion. [Given : Atomic no. of Co = 27] 3

(ii) Write the electronic configuration of d^4 in terms of t_2g and eg in an octahedral field when
(a) $\Delta o > P$ (b) $\Delta o < P$

11. (i) What happens when a freshly precipitated $Fe(OH)_3$ is shaken with a little amount of dilute solution of $FeCl_3$? 3

(ii) Why are lyophilic colloidal sols more stable than lyophobic colloidal sols?

(iii) On the basis of Hardy-Schulze rule explain why the coagulating power of phosphate is higher than chloride

OR

Define the following terms

(i) Electrophoresis
(ii) Zeta potential
(iii) Tyndall effect

SECTION C

12. Read the passage given below and answer the questions that follow. 5

Chemical kinetics is one of the oldest branches of physical chemistry, and its study is intrinsically tied to understand mechanisms and assigning rate constants to individual mechanistic steps. Progress in theoretical kinetics involves not only sorting out the individual steps but also calculating the rate constants. For simple reactions one can even calculate rate constants for individual reaction steps by accurate solution of the Schrodinger equation. A key theme running through the progress in theoretical chemical kinetics is complexity. Mechanisms can have many steps, including non-equilibrated intermediates, and methods have been developed for including this. However, in many cases in liquids and disordered solids, one cannot even develop a catalog of well-defined individual steps. Thus we must study complex processes that are too complicated to be broken into a countable number of individual kinds of steps.

a) For the elementary reaction, $\mathbf{H_{2(g)}+Br_{2(g)} \rightarrow 2HBr(g)}$ .The experimental data suggests,

Rate = $k[H_2][Br_2]^{1/2}$ .Write the molecularity and order for the reaction

b) Define the term: Rate constant

c) The conversion of X to Y follows the second order of kinetics. How is the rate of reaction affected if the concentration of X is increased 3 times?

d) Rate constant k for first order reaction has been found to be $2.54 \times 10^{-3}\ s^{-1}$. Calculate its three-fourth life.

OR

A first order reaction has a rate constant of $0.0051\ min^{-1}$. If we begin with 0.10M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours? **(1+1+1+2)**

End of the Question Paper

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SET C

INDIAN SCHOOL MUSCAT
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5. **All questions are compulsory.**

SECTION A

1. Conductivity of 0.00241 M acetic acid is 7.896×10^{-5} S cm^{-1}. Calculate its molar conductivity. 2

2. Name the reagents used in the following reactions (Any two) 2

(i) $RCH_2NH_2 \xrightarrow{A} RCH_2NC$

(ii) $C_6H_5CONH_2 \xrightarrow{B} C_6H_5NH_2$

(iii) $CH_3NO_2 \xrightarrow{C} CH_3NH_2$

3. (i) Using IUPAC norms, write the formula for the following complex: 2
Dibromidobis(ethane -1,2-diamine)platinum(IV) nitrate
(ii) Write the IUPAC name of the coordination complex $Na[Au(CN)_2]$

SECTION B

4. The cell in which the following reaction occurs: $Ni + 2Ag^+ \rightarrow Ni^{2+} + 2Ag$ has $E^0cell = 1.05$ V at 298 K, Calculate the standard Gibbs energy change and the equilibrium constant of the cell reaction. 3

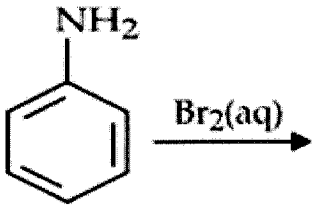
OR

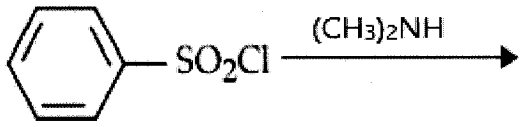
Calculate e.m.f. of the following cell at 298 K

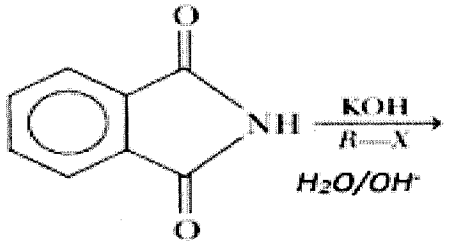
$2Cr(s) + 3Fe^{2+}(0.01M) \rightarrow 2Cr^{3+}(0.1M) + 3Fe(s)$

Given : $E^0_{cell} = 0.3$ V

5. Complete the following 3

(i) 

(ii) 

(iii) 

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(iii) Give a simple chemical test to distinguish between the following pair of compounds:
Propanal and Propanone

7. (i) Using the valence bond approach, deduce the shape and magnetic character of $[CoF_6]^{3-}$ ion. [Given : Atomic no. of Co = 27] 3

(ii) When 1 mole of $CrCl_3.6H_2O$ is treated with excess of $AgNO_3$ soltion,,3 moles of AgCl are obtained. Write the formula of the complex.

8. (i) What happens when a freshly precipitated $Fe(OH)_3$ is shaken with a little amount of dilute solution of $FeCl_3$? 3

(ii) Why are lyophilic colloidal sols more stable than lyophobic colloidal sols?

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(ii) Transition metals and their compounds show catalytic properties

(iii) Zirconium and Hafnium exhibit similar properties.

11. Write the equations involved in the following reactions 3

(i) Etards reaction

(ii) Clemmensen reduction

(iii) Cannizzaro reaction

OR

Convert

(i) Phenylethyne to acetophenone
(ii) Ethanoic acid to ethanal
(iii) Benzene to benzoic acid

SECTION C

12. Read the passage given below and answer the questions that follow. 5

Chemical kinetics is one of the oldest branches of physical chemistry, and its study is intrinsically tied to understand mechanisms and assigning rate constants to individual mechanistic steps. Progress in theoretical kinetics involves not only sorting out the individual steps but also calculating the rate constants. For simple reactions one can even calculate rate constants for individual reaction steps by accurate solution of the Schrodinger equation. A key theme running through the progress in theoretical chemical kinetics is complexity. Mechanisms can have many steps, including non-equilibrated intermediates, and methods have been developed for including this. However, in many cases in liquids and disordered solids, one cannot even develop a catalog of well-defined individual steps. Thus we must study complex processes that are too complicated to be broken into a countable number of individual kinds of steps.

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b) Define the term: Molecularity.

c) The conversion of X to Y follows the second order of kinetics. How is the rate of reaction affected if the concentration of X is increased 3 times?

d) Rate constant k for first order reaction has been found to be 2.54×10^{-3} s^{-1}. Calculate its three-fourth life.

OR

A first order reaction has a rate constant of 0.0051 min^{-1}. If we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours? **(1+1+1+2)**

End of the Question Paper