

Series : AABB3/1



SET-1

प्रश्न-पत्र कोड 56/1/1  
Q.P. Code

रोल नं.

Roll No.

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परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें।

Candidates must write the Q.P. Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 12 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 12 प्रश्न हैं।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें।
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।
- Please check that this question paper contains 12 printed pages.
- Q.P. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 12 questions.
- **Please write down the Serial Number of the question in the answer-book before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.



## रसायन विज्ञान (सैद्धांतिक) CHEMISTRY (Theory)

निर्धारित समय : 2 घण्टे

Time allowed : 2 hours

अधिकतम अंक : 35

Maximum Marks : 35

56/1/1

221 A

1

P.T.O.

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**General Instructions :**

**Read the following instructions very carefully and strictly follow them.**

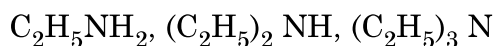
- (i) *This question paper contains **12** questions. All questions are compulsory.*
- (ii) *This question paper is divided into **three** Sections – **Section A, B and C.***
- (iii) ***Section - A** Q. Nos. **1** to **3** are very short answer type questions carrying **2** marks each.*
- (iv) ***Section - B** Q. Nos. **4** to **11** are short answer type questions carrying **3** marks each.*
- (v) ***Section - C** Q. No. **12** is case based question carrying **5** marks.*
- (vi) *Use of log tables and calculators is **NOT** allowed.*

**SECTION – A**

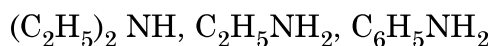
1. Define rate of reaction. Write two factors that affect the rate of reaction. **2**

2. Arrange the following compounds as directed : (any **Two**)

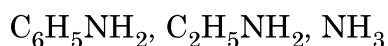
(i) In decreasing order of basic strength in aqueous solution :



(ii) In increasing order of solubility in water :



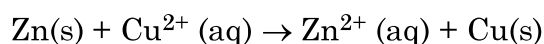
(iii) In decreasing order of their  $\text{pK}_b$  values :



$$1 \times 2 = 2$$



3. Write the Nernst equation for the following cell reaction :



How will the  $E_{\text{cell}}$  be affected when concentration of

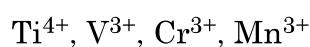
(i)  $\text{Cu}^{2+}$  ions is increased and

(ii)  $\text{Zn}^{2+}$  ions is increased ?

**1 × 2 = 2**

### SECTION – B

4. Following ions of 3d-transition series are given :



(Atomic number : Ti = 22, V = 23, Cr = 24, Mn = 25)

Identify the ion which is

(i) most stable in aqueous solution.

(ii) a strong oxidising agent.

(iii) colourless in aqueous solution.

Give suitable reason in each.

**1 × 3 = 3**

5. (a) (i) On the basis of crystal field theory, write the electronic configuration for  $d^4$  ion if  $\Delta_0 < P$ .

(ii) Using valence bond theory, predict the hybridization and magnetic character of  $[\text{Ni}(\text{CN})_4]^{2-}$ .

(Atomic number of Ni = 28)

(iii) Write the formula of the following complex using IUPAC norms :

Dichloridobis (ethane-1,2-diamine) cobalt (III)

**1 × 3 = 3**

### OR

- (b) When a co-ordination compound  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$  mixed with  $\text{AgNO}_3$ , 2 moles of  $\text{AgCl}$  are precipitated per mole of the compound. Write

(i) Structural formula of the complex.

(ii) Secondary valency of 'Ni' in the complex.

(iii) IUPAC name of the complex.

**1 × 3 = 3**



6. A first order reaction is 50% complete in 40 minutes. Calculate the time required for the completion of 90% of reaction.  
[Given :  $\log 2 = 0.3010$ ,  $\log 10 = 1$ ] 3
7. (a) Illustrate the following reactions giving suitable example in each case :  
 (i) Gabriel phthalimide synthesis.  
 (ii) Carbylamine reaction.  
 (iii) Hoffmann bromamide degradation reaction. 1 × 3 = 3
- OR**
- (b) Write the structures of A, B and C in the following reactions :  
 (i)  $\text{CH}_3\text{CH}_2\text{Cl} \xrightarrow{\text{KCN}} \text{A} \xrightarrow{\text{LiAlH}_4} \text{B} \xrightarrow[0^\circ\text{C}]{\text{HNO}_2} \text{C}$   
 (ii)  $\text{CH}_3\text{COOH} \xrightarrow[\Delta]{\text{NH}_3} \text{A} \xrightarrow[\text{(b) H}_2\text{O}]{\text{(a) LiAlH}_4} \text{B} \xrightarrow{\text{C}_6\text{H}_5\text{SO}_2\text{Cl}} \text{C}$  1½ × 2 = 3
8. (a) Account for the following :  
 (i) Transition elements have higher enthalpies of atomisation.  
 (ii) Separation of a mixture of Lanthanoid elements is difficult.  
 (iii) The  $E^\circ_{\text{M}^{2+}/\text{M}}$  value for copper is positive. 1 × 3 = 3
- OR**
- (b) Define transition elements. Which of the d-block elements may not be regarded as the transition elements ? Why transition metals generally form coloured compounds ? 3
9. An organic compound 'X' with the molecular formula  $\text{C}_5\text{H}_{10}\text{O}$  forms 2,4-DNP derivative, does not reduce Tollens' reagent but gives positive iodoform test on heating with  $\text{I}_2$  in the presence of  $\text{NaOH}$ . Compound 'X' gives ethanoic acid and propanoic acid on vigorous oxidation. Write the  
 (i) Structure of the compound 'X'.  
 (ii) Structure of the product obtained when compound 'X' reacts with 2,4-DNP reagent.  
 (iii) Structures of the products obtained when compound 'X' is heated with  $\text{I}_2$  in the presence of  $\text{NaOH}$ . 1 × 3 = 3



10. (a) Write any three differences between physisorption and chemisorption. 1 × 3 = 3

**OR**

- (b) Define the following terms with a suitable example in each :
- (i) Lyophilic sol
  - (ii) Macromolecular colloid
  - (iii) Coagulation 1 × 3 = 3
11. (a) The standard Gibbs energy ( $\Delta_r G^\circ$ ) for the following cell reaction is  $-300 \text{ kJ mol}^{-1}$  :
- $$\text{Zn(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
- Calculate  $E_{\text{cell}}^\circ$  for the reaction. (Given:  $1F = 96500 \text{ mol}^{-1}$ )
- (b) Calculate  $\lambda_m^\circ$  for  $\text{MgCl}_2$  if  $\lambda^\circ$  values for  $\text{Mg}^{2+}$  ion and  $\text{Cl}^-$  ion are  $106 \text{ S cm}^2\text{mol}^{-1}$  and  $76.3 \text{ S cm}^2\text{mol}^{-1}$  respectively. 2 + 1 = 3

### SECTION – C

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

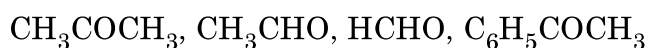
Aldehydes, ketones and carboxylic acids are some of the important classes of organic compounds containing carbonyl group. These are highly polar molecules due to higher electro-negativity of oxygen relative to carbon in the carbonyl group. Aldehydes are prepared by dehydrogenation or controlled oxidation of primary alcohols and controlled reduction of acyl halides. Ketones are prepared by oxidation of secondary alcohols and hydration of alkynes.

Aldehydes and ketones undergo nucleophilic addition reactions onto the carbonyl group but carboxylic acid does not undergo nucleophilic addition reaction. The alpha ( $\alpha$ ) – hydrogens of aldehydes and ketones are acidic. Therefore aldehydes and ketones having at least one  $\alpha$ -hydrogen undergo Aldol condensation.

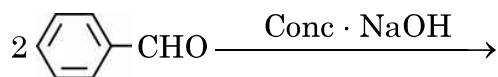


Aldehydes are easily oxidised by mild oxidising agents such as Tollens' reagent and Fehling's reagent. Carboxylic acids are prepared by the oxidation of primary alcohols, aldehydes and by hydrolysis of nitriles. Aromatic carboxylic acids are prepared by side-chain oxidation of alkyl benzenes. Carboxylic acids are considerably more acidic than alcohols and most of simple phenols.

- (a) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction. : 1

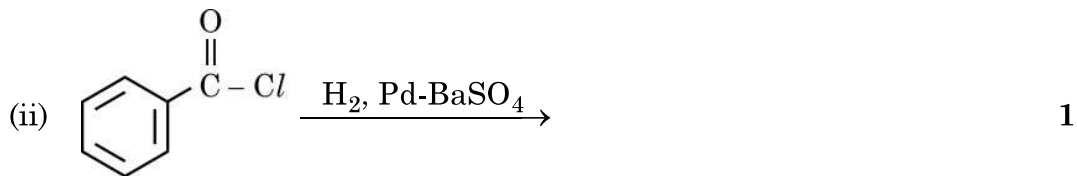
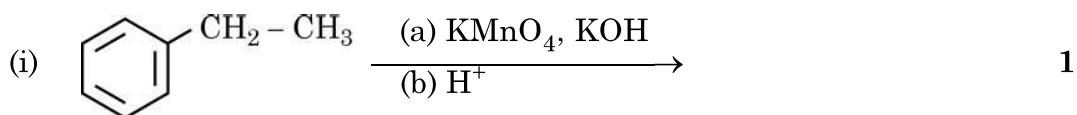


- (b) Give a simple chemical test to distinguish between Ethanal and Propanone. 1
- (c) Why carboxylic acid does not give nucleophilic addition reactions like aldehydes and ketones ? 1
- (d) (i) Why  $\alpha$ -hydrogen of aldehydes and ketones are acidic in nature ?
- (ii) Write the products in the following : 1 + 1 = 2



**OR**

Write the major products of the following reactions :



$$1+1+1+2=5$$

