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CBSE

**CENTRAL BOARD SECONDARY
EXAMINATION**

2023

**CLASS
XII**

Questions & Solutions

Date: 28 February 2023 | TIME : (10:30 a.m. to 01:30 p.m)

Duration: 3 hr | Max. Marks: 70






SUBJECT: CHEMISTRY

Resonance Eduventures Ltd.

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SET-3

Series HFG1E/2

Code No. 56/2/3

Roll No.

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परिक्षार्थी 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

रसायन विज्ञान (सैद्धांतिक)

CHEMISTRY (Theory)

निर्धारित समय : 3 घण्टे

Time allowed : 3 Hours

अधिकतम अंक : 70

Maximum Marks : 70

- कृपया जाँच कर ले कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 है।
- प्रश्न पत्र में दाहिने हाथ की ओर दिए गए प्रश्न – पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख – पृष्ठ पर लिखें।
- कृपया जाँच कर ले कि इस प्रश्न-पत्र में 35 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 पूर्वान्ह में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक परीक्षार्थी 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 23 printed pages.
- Q.P.Code 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 35 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.

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General Instructions:

Read the following instructions very carefully and follow them:

- (i) This Question Paper contains **35** questions. All questions are compulsory.
- (ii) Question Paper is divided into **FIVE** sections - Section **A, B, C, D** and **E**.
- (iii) **In section A** - question number **1** to **18** are Multiple Choice (MCQ) type questions carrying **1** mark each.
- (iv) **In section B** - question number **19** to **25** are Very Short Answer (VSA) type questions carrying **2** marks each
- (v) **In section C** - question number **26** to **30** are Short Answer (SA) type questions carrying **3** marks each
- (vi) **In section D** - question number **31 & 32** are case-based questions carrying **4** marks each.
- (vii) **In section E** - question number **33** to **35** are Long Answer (LA) questions carrying **5** marks each.
- (viii) There is no overall choice. However, an internal choice has been provided in **2** questions in Section **B**, **2** questions in Section **C**, **2** questions in Section **D** and **2** questions in Section **E**.
- (ix) Use of calculator is NOT allowed.

सामान्य निर्देश :

निम्नलिखित निर्देशों को ध्यान से पढ़ें और उनका सख्ती से पालन करें :


- (i) इस प्रश्न – पत्र में कुल 35 प्रश्न हैं। सभी प्रश्न अनिवार्य हैं।
- (ii) प्रश्न – पत्र **पाँच खण्डों** में विभाजित है— खण्ड **क, ख, ग, घ, तथा ङ**
- (iii) **खण्ड क** – प्रश्न संख्या 1 से 18 तक बहुविकल्पीय प्रकार के **एक – एक** अंकों के प्रश्न हैं।
- (iv) **खण्ड ख** – प्रश्न संख्या 19 से 25 तक अति उत्तरीय प्रकार के **दो – दो** अंकों के प्रश्न हैं।
- (v) **खण्ड ग** – प्रश्न संख्या 26 से 30 तक लघु उत्तरीय प्रकार के **तीन – तीन** अंकों के प्रश्न हैं।
- (vi) **खण्ड घ** – प्रश्न संख्या 31 से 32 केस आधारित **चार – चार** अंकों के प्रश्न हैं।
- (vii) **खण्ड ङ** – प्रश्न संख्या 33 से 35 तक दीर्घ उत्तरीय प्रकार के **पाँच – पाँच** अंकों के प्रश्न हैं।
- (viii) प्रश्न पत्र में समग्र विकल्प नहीं दिया गया है। यद्यपि, **खण्ड ख** के **2** प्रश्नों में **खण्ड ग** के **2** प्रश्नों में, **खण्ड घ** के **2** प्रश्नों में तथा **खण्ड ङ** के **2** प्रश्नों में आंतरिक विकल्प का प्रावधान दिया गया है।
- (ix) कैल्कुलेटर का उपयोग वर्जित है।

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SECTION - A / खण्ड -क

1. Auto oxidation of chloroform in air and sunlight produces a poisonous gas known as 1
 (a) Tear gas (b) Mustard gas
 (c) Phosgene gas (d) Chlorine gas

प्रकाश की उपस्थिति में वायु द्वारा क्लोरोफॉर्म से निम्नलिखित में से कौन सी विषैली गैस बनती है?

- (a) अश्रु गैस (b) मस्टर्ड गैस
 (c) फॉस्जीन गैस (d) क्लोरीन गैस

Sol.



2. Which of the following ligands is an ambidentate ligand ? 1
 (b) CO (b) NO₂ (c) NH₃ (d) H₂O

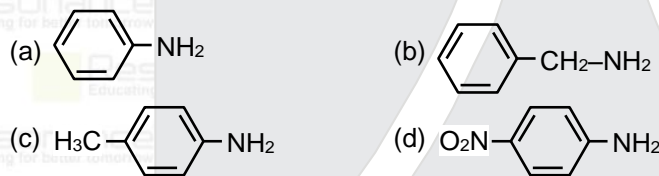
निम्नलिखित लिगण्डों में से कौन उभदंती लिगण्ड है?

- (a) CO (b) NO₂ (c) NH₂ (d) H₂O

Sol.

(b) Ligand which can ligate through two different atoms is called ambidentate ligand.

3. Among the following which has the highest value of pK_b? 1
 निम्नलिखित में से किसका pK_b मान उच्चतम है?



Sol.

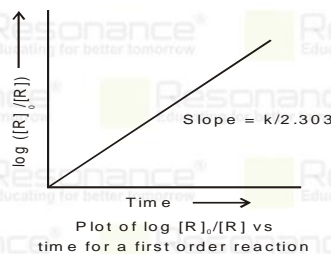
(d) Greater the value of pK_b, lesser the basic behaviour.

4. The slope in the plot of $\log \frac{[R]_0}{[R]}$ vs. time for a first order reaction is 1

प्रथम कोटि की अभिक्रिया के लिए $\log \frac{[R]_0}{[R]}$ एवं समय के मध्य आलेख में ढाल है

- (a) $\frac{+k}{2.303}$ (b) +k (c) $\frac{-k}{2.303}$ (d) -k

Sol.








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5. When D-glucose reacts with HI, it forms

- (a) Gluconic acid' (b) n-hexane
(c) Saccharic acid (d) Iodohexane

जब D -ग्लूकोस, HI के साथ अभिक्रिया करता है तो यह निर्मित करता है

- (a) ग्लूकोनिक अम्ल (b) n -हैक्सेन
(c) सैकैरिक अम्ल (d) आयडोहैक्सेन

Sol. (b)

6. Inversion of configuration occurs in

- (a) S_N2 reaction (b) S_N1 reaction
(c) Neither S_N2 nor S_N1 (d) S_N1 as well as S_N2 reaction

विन्यास में प्रतिलोमन होता है

- (a) S_N2 अभिक्रिया में (b) S_N1 अभिक्रिया में
(c) न तो S_N2 में और न ही S_N1 अभिक्रिया में (d) S_N1 और S_N2 दोनों अभिक्रियाओं में

Sol. (a)

Optically active alkyl halide undergo inversion of configuration in S_N2 reaction .

7. Solubility of gas in liquid decreases with increase in

- (a) Pressure (b) Temperature
(c) Volume (d) Number of solute molecules

निम्नलिखित में से किसकी वृद्धि के साथ गैस की द्रव में विलेयता घटती है?

- (a) दाब (b) ताप
(c) आयतन (d) विलेय अणुओं की संख्या

Sol. (b)

8. Which of the following relations is incorrect ?

निम्नलिखित में से कौन सा संबंध गलत है?

- (a) $R = \frac{1}{k} \left(\frac{1}{a} \right)$ (b) $G = k \left(\frac{a}{l} \right)$
(c) $G = k \left(\frac{l}{a} \right)$ (d) $\wedge_m = \frac{k}{c}$

Sol. (c)

9. The reagent that can be used to distinguish acetophenone and bezophenone is

- (a) 2,4 - dinitrophenyl hydrazine (b) aqueous NaHSO₃
(c) Fehling solution (d) I₂ and NaOH

ऐसीटोफीनोन और बेन्जोफीनोन में विभेद करने के लिए निम्नलिखित में से कौनसा अभिकारक प्रयुक्त किया जा सकता है?

- (a) 2,4 डाईनाइट्रोफेनिल हाइड्रैज़ीन (b) जलीय NaHSO₃
(c) फेलिंग विलयन (d) I₂ और NaOH

Sol. (d)

Methyl ketone give iodoform test

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10. Which of the following reactions are feasible ? 1

निम्नलिखित अभिक्रियाओं में से कौन सी संभव है?

- (a) $\text{CH}_3\text{CH}_2\text{Br} + \text{Na}^+ \text{O}^-\text{C}(\text{CH}_3)_3 \rightarrow \text{CH}_3\text{CH}_2\text{O} - \text{C}(\text{CH}_3)_3$
 (b) $(\text{CH}_3)_3\text{C} - \text{Cl} + \text{Na}^+ \text{O}^-\text{CH}_2\text{CH}_3 \rightarrow \text{CH}_3\text{CH}_2\text{O} - \text{C}(\text{CH}_3)_3$
 (c) Both (a) and (b)
 (d) neither (a) nor (b)

Sol. (a)
 $\text{CH}_3\text{CH}_2\text{Br} + \text{Na}^+ \text{O}^-\text{C}(\text{CH}_3)_3 \rightarrow \text{CH}_3\text{CH}_2\text{O} - \text{C}(\text{CH}_3)_3$ is feasible as alkyl halide is primary.
 (Williamson's synthesis method)

11. Which of the following compounds will undergo self-condensation in the presence of dilute NaOH solution 1

निम्नलिखित यौगिकों में से कौन तनु NaOH विलयन की उपस्थिति में स्व-संघनन करेगा ?

- (a) $\text{C}_6\text{H}_5\text{CHO}$ (b) $\text{CH}_3\text{CH}_2\text{CHO}$
 (c) $(\text{CH}_3)_3\text{C} - \text{CHO}$ (d) $\text{H} - \text{CHO}$

Sol. (b)

12. For the reaction $3\text{A} \rightarrow 2\text{B}$ rate of reaction $-\frac{d[\text{A}]}{dt}$ is equal to 1

अभिक्रिया $3\text{A} \rightarrow 2\text{B}$ के लिए अभिक्रिया वेग $-\frac{d[\text{A}]}{dt}$ बराबर है

- (a) $\frac{+3}{2} \frac{d[\text{B}]}{dt}$ (b) $\frac{+2}{3} \frac{d[\text{B}]}{dt}$
 (c) $\frac{+1}{3} \frac{d[\text{B}]}{dt}$ (d) $\frac{+1}{2} \frac{d[\text{B}]}{dt}$

Sol. (a)

13. Which of the following transition metals shows +1 and +2 oxidation states ? 1

निम्नलिखित संक्रमण धातुओं में से कौन +1 और +2 ऑक्सीकरण अवस्थाएँ प्रदर्शित करती है?

- (a) Mn (b) Zn (c) Sc (d) Cu

Sol. (d)

Mn^{2+} to Mn^{7+} , Zn^{2+} , Sc^{3+} , Cu^{2+} and Cu^+

14. The formula of the complex Iron (III) hexacyanidoferrate (II) is : 1

संकुल आयरन (III) हेक्सासाइनिडोफेरेट (II) का सूत्र है:

- (a) $\text{Fe}_2[\text{Fe}(\text{CN}_6)]_3$ (b) $\text{Fe}_4[\text{Fe}(\text{CN}_6)]_3$ (c) $\text{Fe}_2[\text{Fe}(\text{CN}_6)]$ (d) $\text{Fe}_3[\text{Fe}(\text{CN}_6)]_2$

Sol. (b)

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Given below are two statements labelled as Assertion (A) and Reason (R) .

Select the most appropriate answer from the options given below :

- (a) Both (A) and (R) are true and (R) is the Correct explanation of (A) .
 (b) Both (A) and (R) are true , but (R) is not the correct explanation of (A).
 (c) (A) is true but (R) is false.
 (d) (A) is false , but (R) is true

अभिकथन (A) और कारण (R) से अंकित नीचे दो कथन दिए गए हैं। निम्नलिखित विकल्पों में से सर्वाधिक उपयुक्त उत्तर का चयन कीजिए :

- (a) (A) और (R) दोनों सत्य है तथा (R), (A) की सही व्याख्या है।
 (b) (A) और (R) दोनों सत्य है तथा (R), (A) की सही व्याख्या नहीं है।
 (c) (A) सत्य (R) , लेकिन (R) असत्य है।
 (d) (A) असत्य है, लेकिन (R) सत्य है

15. **Assertion (A) :** The enthalpy of mixing $\Delta_{\text{max}} H$ is equal to zero for an ideal solution. **1**

Reason (R) : For an ideal solution the interaction between solute and solvated molecules is stronger than the interactions between solute – solute or solvent – solvent molecules

अभिकथन (A) एक आदर्श विलयन के लिए मिश्रण बनाने की एन्थैल्पी $\Delta_{\text{मिश्रण}} H$ शून्य के बराबर होती है।

कारण (R) एक आदर्श विलयन के लिए विलेय – विलेय और विलायक – विलायक अणुओं के मध्य अन्योन्यक्रियाओं की तुलना में विलेय – विलायक अणुओं के मध्य अन्योन्य क्रियाएँ मजबूत होती है।

Sol. (c)

16. **Assertion (A) :** Molar conductivity decreases with increase in concentration. **1**

Reason (R) : When concentration approaches zero. the molar conductivity is known as limiting molar conductivity

अभिकथन (A) : सांद्रता में वृद्धि के साथ मोलर चालकता घटती है।

कारण (R) : जब सांद्रता शून्य की ओर पहुँचने लगती है तब मोलर चालकता सीमांत मोलर चालकता कहलाती है।

Sol. (b)

17. **Assertion (A) :** Transition metals show their highest oxidation state with oxygen. **1**

Reason (R) : The ability of oxygen to form multiple bonds to metals.

अभिकथन (A) संक्रमण धातुएँ ऑक्सीजन के साथ अपनी उच्चतम ऑक्सीकरण अवस्थाएँ प्रदर्शित करती है।

कारण (R) : धातुओं के साथ ऑक्सीजन की बहु आबंध बनाने की क्षमता होना।

Sol. (a)

18. **Assertion (A) :** Chlorobenzene is resistant to nucleophilic substitution reaction at room temperature : **1**

Reason (R) : C – Cl bond gets weaker due to resonance.

अभिकथन (A) कक्ष ताप पर, नाभिकरागी प्रतिस्थापन अभिक्रियाओं के लिए क्लोरोबेन्जीन प्रतिरोधी होती है।

कारण (R) अनुनाद के कारण C-Cl आबंध अधिक दुर्बल हो जाता है।

Sol. (c)

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SECTION - B/ खण्ड – ख

19. What are nucleic acids ? Why two strands in DNA are not identical but are complementary ? 1 × 2

न्यूक्लिक अम्ल क्या है? क्यों DNA में दो रज्जुक एकसमान नहीं होते हैं, लेकिन एक-दूसरे के पूरक होते हैं?



Sol. Nucleic acids are biomolecules which are found in the nuclei of all living cells in form of nucleoproteins or chromosomes (proteins containing nucleic acids as the prosthetic group). These are polymers of polynucleotides.

The two strands in DNA molecule are held together by hydrogen bonds between purine base of one strand and pyrimidine base of the other and vice versa. Because of different sizes and geometries of the bases, the only possible pairing in DNA are G (guanine) and C (cytosine) through three H-bonds, i.e., (C == G) and between A (adenine) and T (thymine) through two H-bonds. Due to this base-pairing principle, the sequence of bases in one strand automatically fixes the sequence of bases in the other strand. Thus, the two strands are complimentary and not identical.

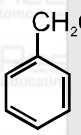
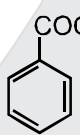
20. Do the following conversions in not more than two steps 2 × 1

निम्नलिखित रूपान्तरण अधिकतम दो चरणों में किजिए:

(a) CH_3COOH to CH_3COCH_3

(b)  to 

Sol. (a) $2 \text{CH}_3\text{COOH} \xrightarrow{\text{Ca(OH)}_2} \begin{matrix} \text{H}_3\text{CCOO} \\ \diagdown \\ \text{Ca} \\ \diagup \\ \text{H}_3\text{CCOO} \end{matrix} \xrightarrow{\Delta} \text{CH}_3\text{COCH}_3$

(b)  $\xrightarrow[\text{heat}]{\text{KMnO}_4/\text{KOH}, 6[\text{O}]}$ 

Ethylbenzene Benzoic acid

21. Write the chemical equation involved in the following reactions

- (a) Reimer-Tiemann reaction
(b) Acetylation of Salicylic acid

निम्नलिखित अभिक्रियाओं में सम्मिलित रासायनिक समीकरण लिखिए:


- (a) राइमर –टीमन अभिक्रिया
(b) सैलेसिलिक अम्ल का ऐसीटिलन

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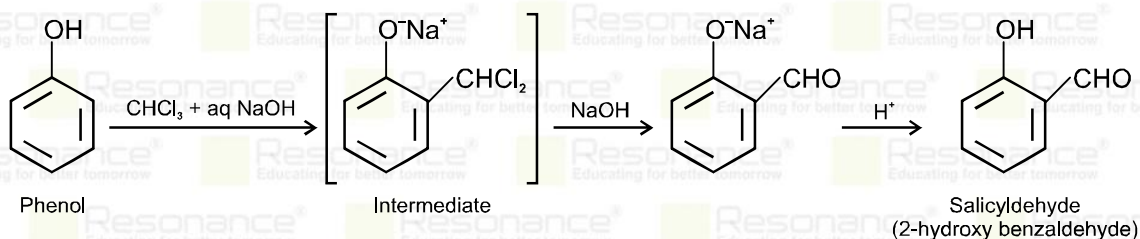
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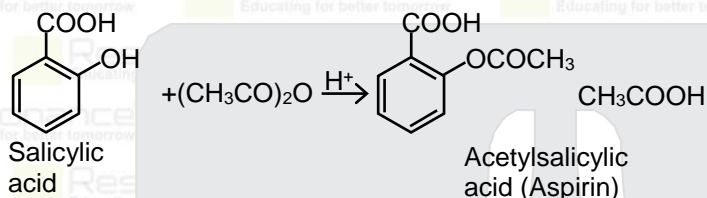
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Sol. (a) Reimer-Tiemann reaction : Chloroform reacts with phenol in aqueous sodium hydroxide at 340 K to give salicylaldehyde



(b) Acetylation of Salicylic acid



22. (a) The conversion of molecule A to B followed second order kinetics. If concentration of A increased to three times, how will it affect the rate **2 x 1**

(b) Define Pseudo first order reaction with an example.

(a) अणु A का B में रूपान्तरण द्वितीय कोटि की बलगतिकी के अनुरूप होता है। यदि A की सांद्रता तीन गुनी कर दी जाए तो B के निर्माण होने के वेग पर क्या प्रभाव पड़ेगा?

(b) एक उदाहरण सहित छद्म प्रथम कोटि अभिक्रिया की परिभाषा लिखिए।

Sol. (a)

For the reaction, $A \rightarrow B$, as it follows second order kinetics, the rate law equation will be

$$\text{Rate} = k[A]^2 = ka^2 \quad \{\text{if } [X] = a \text{ mol L}^{-1}\}$$

If concentration of A is increased three times, now, $[A] = 3a \text{ mol L}^{-1}$

$$\therefore \text{Rate} = k(3a)^2 = 9ka^2$$

Thus, the rate of reaction will become 9 times. Hence, the rate of formation of Y will increase 9 times.

(b) When a reaction is of higher order but follows the kinetics of first order, is known as Pseudo first order reaction. Example- Hydrolysis of ethyl acetate.

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23. The vapour pressure of pure liquid X and pure liquid Y at 25 °C are 120 mm Hg and 160 mm Hg respectively. If equal moles of X and Y are mixed to form an ideal solution, calculate the vapour pressure of the solution.

25° पर शुद्ध द्रव X और शुद्ध द्रव Y का वाष्प दाब क्रमशः 120 mm Hg और 160 mm Hg है यदि X और Y के समान मॉलो को मिलाकर एक आदर्श विलयन बनाया जाता है, तो विलयन का वाष्प दाब परिकलित कीजिए ।

Sol. Given $P_x^0 = 120 \text{ mm Hg}$, $P_y^0 = 160 \text{ mm Hg}$

$$n_x = n_y = 1$$

$$x_x = x_y = \frac{1}{2}$$

$$P_s = P_x + P_y$$

$$= x_x P_x^0 + x_y P_y^0$$

$$= \frac{1}{2} \times 120 + \frac{1}{2} \times 160$$

$$= 60 + 80$$

$$= 140 \text{ mm Hg}$$

24. (a) Give reasons

(i) Mercury cell delivers a constant potential during its life time.

(ii) In the experimental determination of electrolytic conductance Direct Current (DC) is not used.

OR

- (b) Define fuel cell with an example. What advantages do the fuel cells have over primary and secondary batteries ?

- (a) कारण दीजिए :

(i) मर्क्युरी सेल अपने संपूर्ण कार्य अवधि में स्थिर विभव प्रदान करता है ।

(ii) वैद्युत-अपघटनी चालकत्व के प्रायोगिक निर्धारण में दिष्ट धारा (DC) प्रयुक्त नहीं की जाती है ।

अथवा

- (b) एक उदाहरण सहित ईंधन सेल को परिभाषित कीजिए । प्राथमिक और संचायक बैटरियों की तुलना में ईंधन सेल के क्या लाभ हैं?

Sol.

- (a) (i) The cell potential is approximately 1.35 V and remains constant during its life as the overall reaction does not involve any ion in solution whose concentration can change during its life time.

(ii) passing direct current (DC) changes the composition of the solution.

OR

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- (b) Fuel cells are galvanic cells which convert energy of combustion of fuel directly into electrical energy
Example - $H_2 - O_2$ fuel cell.

Advantages of the fuel cells -

- (i) Fuel cells have very high efficiency of 70% as against 40% efficiency of a thermal power plant.
(ii) The by-products of $H_2 - O_2$ fuel cell is H_2O which is not polluting.

25.

- (a) Write the IUPAC names of the following:

- (i) $[Co(NH_3)_5(ONO)]^{2+}$
(ii) $K_2[NiCl_4]$

OR

- (b) (i) What is a chelate complex ? Give one example.
(ii) What are heteroleptic complexes ? Give one example.

2 × 1

- (a) निम्नलिखित के आई यूपी ए सी नाम लिखिए:

- (i) $[Co(NH_3)_5(ONO)]^{2+}$
(ii) $K_2[NiCl_4]$

अथवा

- (b) (i) कीलेट संकुल क्या है? एक उदाहरण दीजिए।
(ii) हेटेरोलेप्टिक संकुल क्या है? एक उदाहरण दीजिए।

Sol.

- (a) (i) Pentaamminenitritocobalt(III) ion
(ii) Potassium tetrachloride nickelate (II)

OR

- (b) (i) When a di- or polydentate ligand uses its two or more donor atoms to bind a single metal ion, it is said to be a **chelate ligand**. The number of such ligating groups is called the **denticity** of the ligand. Such complexes, called chelate complexes
(ii) Complexes in which a metal is bound to more than one kind of donor groups, e.g., $[Co(NH_3)_4Cl_2]^+$, are known as heteroleptic.

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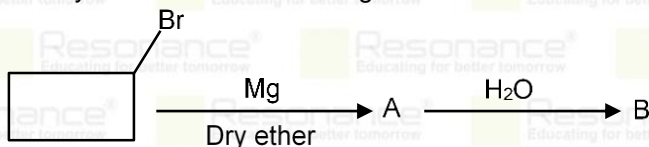
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SECTION - C/ खण्ड - ग

26. Answer any 3 of the following:

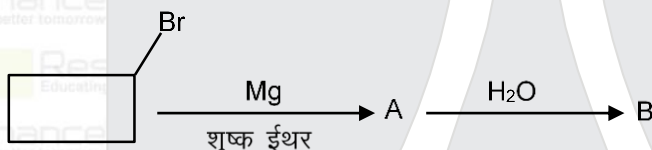
3×1

- (a) Which isomer of C_5H_{10} gives a single monochloro compound C_5H_9Cl in bright sunlight
 (b) Arrange the following compounds in increasing order of reactivity towards S_N2 reaction.
 2-Bromopentane, 1-Bromopentane, 2-Bromo-2-methylbutane
 (c) Why p-dichlorobenzene has higher melting point than those of ortho and meta isomers?
 (d) Identify A and B in the following:

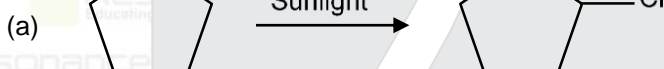


निम्नलिखित में से किन्ही तीन के उत्तर दीजिए:

- (a) C_5H_{10} का कौन सा समावयव उज्ज्वल सूरज की रोशनी में एकल मोनोक्लोरो यौगिक C_5H_9Cl देता है?
 (b) निम्नलिखित यौगिकों को S_N2 अभिक्रिया के प्रति बढ़ती हुई अभिक्रियाशीलता के क्रम में व्यवस्थित कीजिए:
 2 - ब्रोमोपेन्टेन, 1 - ब्रोमोपेन्टेन, 2 - ब्रोमो - 2 मेथिलब्यूटेन
 (c) आर्थो - तथा मेटा - समावयवियों की अपेक्षा पैरा - डाइक्लोरोबेन्जीन का गलनांक उच्च क्यों होता है?
 (d) निम्नलिखित में A और B की पहचान कीजिए

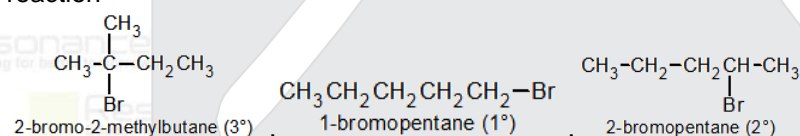


Sol.



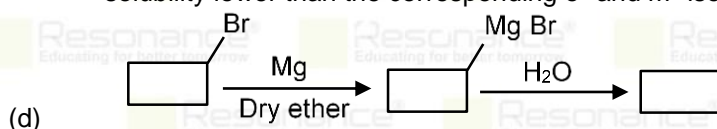
Cyclopentane (C_5H_{10})

- (b) The reactivity in S_N2 reaction depends upon steric hindrance; more the steric hindrance slower the reaction



Since due to steric reasons the order of reactivity in S_N2 reactions follows the order: $1^\circ > 2^\circ > 3^\circ$ therefore, order of reactivity of the given alkyl bromides is :
 1-Bromopentane > 2-Bromopentane > 2-Bromo-2-methylbutane.

- (c) The p-isomer being more symmetrical fits closely in the crystal lattice and thus has stronger intermolecular forces of attraction than those of o- and m-isomers. Since during melting or dissolution the crystal lattice breaks, therefore, a larger amount of energy is needed to melt or dissolve the p-isomer than the corresponding o- and m-isomers. In other words, the melting point of the p-isomer is higher and its solubility lower than the corresponding o- and m- isomers.



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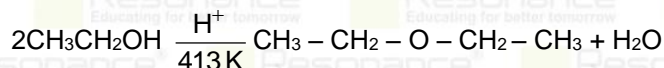
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27. (a) (i) Write the mechanism of the following reaction:

2 + 1



(b) Why ortho-nitrophenol is steam volatile while para-nitrophenol is not?

OR

(b) What happens when.

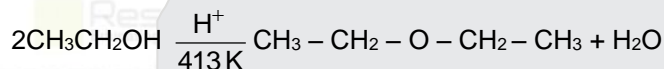
(i) Anisole is treated with CH_3Cl /anhydrous AlCl_3 ?

(i) Phenol is oxidised with $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$?

(ii) $(\text{CH}_3)_3\text{C} - \text{OH}$ is heated with $\text{Cu}/573\text{K}$?

Write chemical equation in support of your answer.

(a) (i) निम्नलिखित अभिक्रिया की कार्यविधि लिखिए:



(ii) क्यों आर्थो- नाइट्रोफीनॉल भाप द्वारा वाष्पित होती है जबकि पैरा- नाइट्रोफीनॉल नहीं ?

अथवा

(b) क्या होता है जब

(i) एनिसोल की CH_3Cl / निर्जल AlCl_3 के साथ अभिक्रिया की जाती है?

(ii) फीनॉल का $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$ द्वारा ऑक्सीजन किया जाता है?

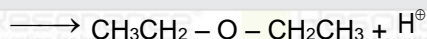
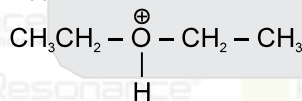
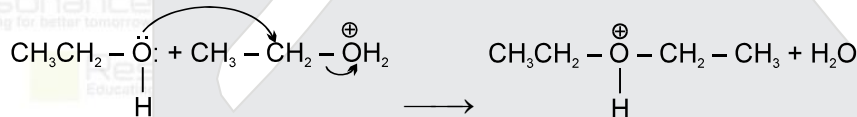
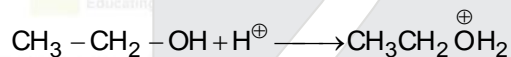
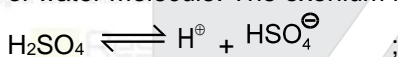
(iii) $(\text{CH}_3)_3\text{C} - \text{OH}$ को 573K पर Cu के साथ गरम किया जाता है?

अपने उत्तर के समर्थन में रासायनिक समीकरण लिखिए।

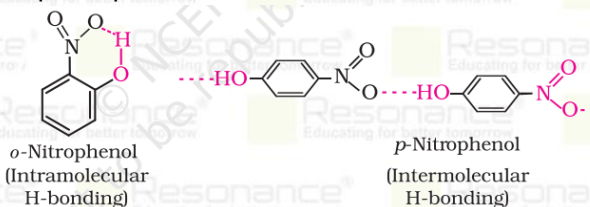
Sol.

(a) (i) The mechanism of this reaction involves the protonation of alcohol.

An unprotonated molecule of alcohol, when combines with the protonated molecule of alcohol with a loss of water molecule. The oxonium ion formed gives ether by loss of a proton as given under :



(b) o-Nitrophenol is steam-volatile due to chelation (intramolecular H-bonding) and hence can be separated by steam distillation from p-nitrophenol which is not steam volatile because of intermolecular H-bonding.



OR

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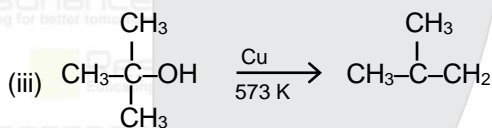
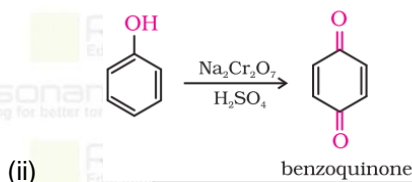
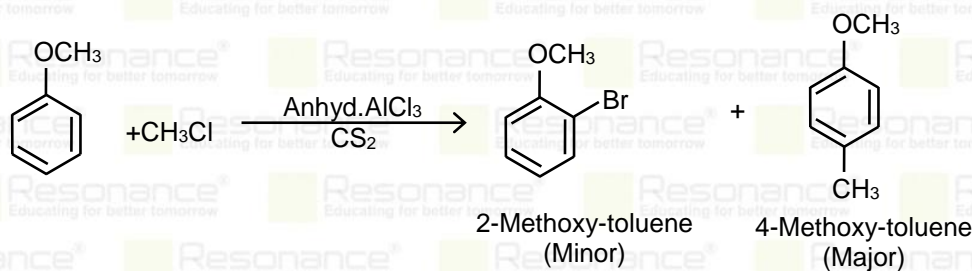
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(b)

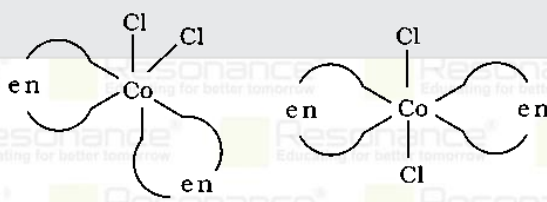
(i) **Friedel Craft's alkylation of anisole** : When chlorobenzene reacts with alkyl halides in the presence of anhydrous AlCl_3 , the alkyl are introduced at ortho and para positions.



28.

- (a) Draw the geometrical isomers of $[\text{Co}(\text{en})_2\text{Cl}_2]^{2+}$. Which geometrical isomer of $[\text{Co}(\text{en})_2\text{Cl}_2]^{2+}$ is not optically active and why? 2 + 1
- (b) Write the hybridisation and magnetic behaviour of $[\text{CoF}_6]^{3-}$ [Given: Atomic number of Co = 27]
- (a) $(\text{Co}(\text{en})_2\text{Cl})^{2+}$ के ज्यामितिय समावयव खींचिए। $(\text{Co}(\text{en})_2\text{Cl})^{2+}$ का कौन सा ज्यामितिय समावयव ध्रुवण घूर्णन नहीं है और क्यों?
- (b) $[\text{CoF}_6]^{3-}$ का संकरण एवं चुम्बकीय व्यवहार लिखिए।
(दिया है: Co का परमाणु क्रमांक = 27)

Sol. (a)



Geometrical isomers (cis and trans) of $[\text{CoCl}_2(\text{en})_2]$

Trans geometrical isomer of $[\text{Co}(\text{en})_2\text{Cl}_2]^{2+}$ is not optically active.

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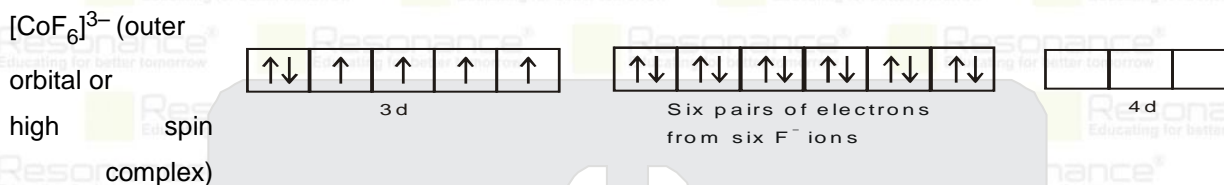
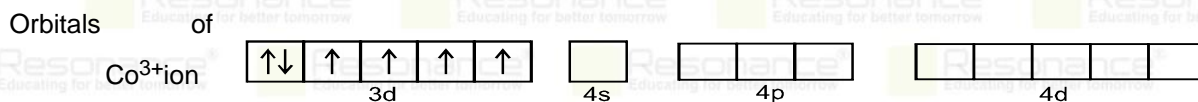
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(b)



29. A first order reaction is 50% complete in 30 minute at 300 K and in 10 minutes at 320 K. Calculate activation energy (E_a) for the reaction. [$R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$]

[Given : $\log 2 = 0.3010, \log 3 = 0.4771, \log 4 = 0.6021$]

3

एक प्रथम कोटि की अभिक्रिया को 50% पूर्ण होने में 300K पर 30 मिनट लगते हैं और 320 K पर 10 मिनट लगते हैं।

अभिक्रिया के लिए सक्रियण ऊर्जा (E_a) परिकलित कीजिए।

Sol. Given t_1 at 300 K = 30 min. , t_1 at 320 K = 10 min.

$$\therefore K_1 = \frac{0.693}{30} \quad \text{and} \quad K_2 = \frac{0.693}{10}$$

$$\log \frac{K_2}{K_1} = \frac{E_a}{2.303 R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\frac{K_2}{K_1} = 3$$

$$\log 3 = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{300} - \frac{1}{320} \right]$$

$$E_a = 0.4771 \times 2.303 \times 8.314 \left(\frac{300 \times 320}{20} \right)$$

$$= 43832.59 \text{ Jmol}^{-1} = 43.8 \text{ kJ.}$$

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30. When 19.5 g of $F - CH_2 - COOH$ (Molar mass = 78 g mol^{-1}), is dissolved in 500 g of water, the depression in freezing point is observed to be 1°C . Calculate the degree of dissociation of $F - CH_2 - COOH$. [Given: K_f for water = $1.86 \text{ K kg mol}^{-1}$] 3

$F - CH_2 - COOH$ (मोलर द्रव्यमान) = 78 g mol^{-1} के 19.5g को 500g जल में घोलने पर हिमांक में 1°C का अवनमन देखा गया। $F - CH_2 - COOH$ के लिए वियोजन-मात्रा परिकल्पित कीजिए।
(दिया है: जल के लिए $K_f = 1.86 \text{ K kg mol}^{-1}$)

Sol. Here, $w_2 = 19.5 \text{ g}$, $w_1 = 500 \text{ g}$, $K_f = 1.86 \text{ K kg mol}^{-1}$, $(\Delta T_f)_{\text{obs}} = 1.0^\circ$

$$\therefore M_2 = (\text{observed}) = \frac{1000K_f w_2}{w_1 \Delta T_f}$$

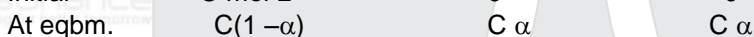
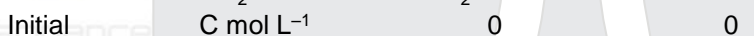
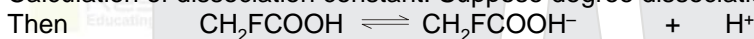
$$= \frac{(1000 \text{ g kg}^{-1})(1.86 \text{ K kg mol}^{-1})(19.5 \text{ g})}{(500 \text{ g})(1.0 \text{ K})}$$

$$= 72.54 \text{ g mol}^{-1}$$

$$\text{van't Hoff factor } (i) = \frac{(M_2)_{\text{cal}}}{(M_2)_{\text{obs}}} = \frac{78}{72.54}$$

$$= 1.0753.$$

Calculation of dissociation constant. Suppose degree dissociation at the given concentration is α .



$$\therefore i \frac{C(1 + \alpha)}{C} = 1 + \alpha$$

$$\text{or } \alpha = i - 1 = 1.0753 - 1$$

$$= 0.0753$$

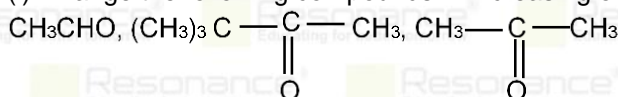
SECTION - D / खण्ड -घ

The following questions are case based questions. Read the passage carefully and answer the questions that follow:

31. The carbon - oxygen double bond is polarised in aldehydes and ketones due to higher electronegativity of oxygen relative to carbon. Therefore they undergo nucleophilic addition reactions with a number of nucleophiles such as HCN, NaHSO_3 , alcohols, ammonia derivatives and Grignard reagents. Aldehydes are easily oxidised by mild oxidising agents as compared to ketones. The carbonyl group of carboxylic acid does not give reactions of aldehydes and ketones. Carboxylic acids are considerably more acidic than alcohols and most of simple phenols.

Answer the following:

- (a) Write the name of the product when an aldehyde reacts with excess alcohol in presence of dry HCl.
- (b) Why carboxylic acid is a stronger acid than phenol?
- (c) (i) Arrange the following compounds in increasing order of their reactivity towards CH_3MgBr :



- (ii) Write a chemical test to distinguish between propanal and propanone

2 x 1

OR

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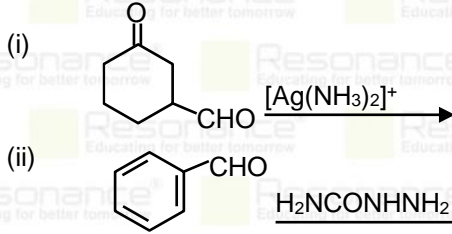
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(c) Write the main product in the following:

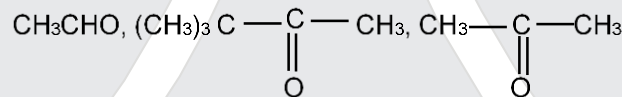


निम्नलिखित प्रश्न, केस आधारित प्रश्न है। अनुच्छेद को सावधानीपूर्वक पढ़िए और दिए गए प्रश्नों के उत्तर दीजिए: कार्बन की अपेक्षा ऑक्सीजन की विद्युत -वृणात्मकता उच्च होने के कारण कार्बन-ऑक्सीजन द्विक आबंध ऐल्डिहाइड और कीटोनो में ध्रुवित हो जाता है। अतः वे अनेक नाभिकरागियों जैसे HCN, NaHSO₃ ऐल्कोहॉलो, अमोनिया व्युत्पन्नो और ग्रीन्यार अभिकर्मको के साथ नाभिकरागी योगज अभिक्रियाएँ देते हैं। कीटोनो की अपेक्षा ऐल्डिहाइड मृदु ऑक्सीकरण अभिकर्मको द्वारा आसानी से ऑक्सीकृत हो जाते हैं। कार्बोक्सिलिक अम्ल का कार्बोनिल समूह ऐल्डिहाइडो और कीटोनो की अभिक्रियाएँ नहीं देता है। कार्बोक्सिलिक अम्ल ऐल्कोहॉलो एवं अधिकतर अति सरल फीनॉलो से काफी अधिक अम्लीय होते हैं।

(a) जब एक ऐल्डिहाइड शुष्क HCl की उपस्थिति में ऐल्कोहॉल के आधिक्य के साथ अभिक्रिया करता है तो निर्मित उत्पाद का नाम लिखिए।

(b) फीनॉल की तुलना में कार्बोक्सिलिक अम्ल अधिक प्रबल क्यों होता है?

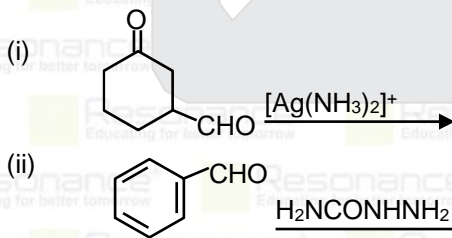
(c) (i) निम्नलिखित यौगिकों को CH₃MgBr के प्रति उनकी अभिक्रियाशीलता के बढ़ते क्रम में व्यवस्थित कीजिए:



(ii) प्रोपेनॉल और प्रोपेनोन में विभेद करने के लिए रासायनिक परीक्षण लिखिए।

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(c) निम्नलिखित में मुख्य उत्पाद लिखिए:



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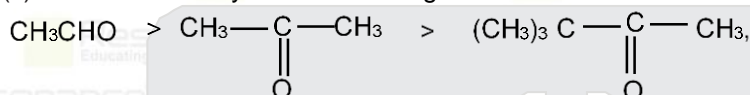


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Sol. (a) Acetal

(b) The higher acidity of carboxylic acids as compared to phenols can be understood by two reasons - . The conjugate base of carboxylic acid, a carboxylate ion, is stabilised by two equivalent resonance structures in which the negative charge is at the more electronegative oxygen atom. The conjugate base of phenol, a phenoxide ion, has non-equivalent resonance structures in which the negative charge is at the less electronegative carbon atom. Therefore, resonance in phenoxide ion is not as important as it is in carboxylate ion. Further, the negative charge is delocalised over two electronegative oxygen atoms in carboxylate ion whereas it is less effectively delocalised over one oxygen atom and less electronegative carbon atoms in phenoxide ion. Thus, the carboxylate ion is more stabilised than phenoxide ion, so carboxylic acids are more acidic than phenols.

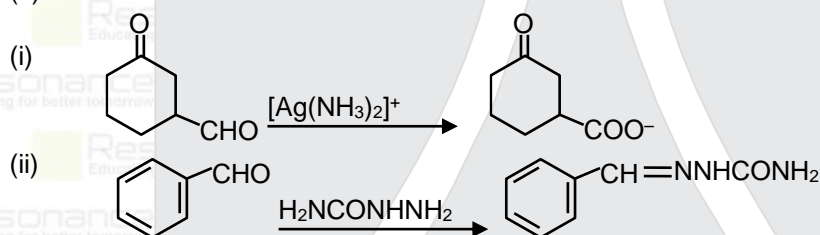
(c) order of reactivity towards CH_3MgBr



(d) By Iodoform test = as propanone will give this test and will form yellow solid iodoform but propanal will not .

OR

(c)



32. Carbohydrates are optically active polyhydroxy aldehydes and ketones. They are also called saccharides. All those 'carbohydrate which reduce. Fehling's solution and Tollen's reagent are referred to as reducing sugars. Glucose, the most important source of energy for mammals, is obtained by the hydrolysis of starch. Vitamins are. accessory food factors required in the diet. Proteins are the polymers of α -amino acids and perform various structural and dynamic functions in the organisms. Deficiency of vitamins leads to many diseases.

Answer the following:

- (a) The penta-acetate of glucose does not react with Hydroxylamine. What does it indicate?
 (b) Why cannot vitamin C be stored in our body?
 (c) Define the following as related to proteins:
 (i) Peptide linkage
 (ii) Denaturation

OR

- (c) Define the following as related to carbohydrates:
 (i) Anomers
 (ii) Glycosidic linkage

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कार्बोहाइड्रेट, ध्रुवण घूषक ऐल्हाइड और कीटोन होते हैं। उन्हें सेकैराइड भी कहते हैं। उन सभी कार्बोहाइड्रेटों को फेलिंग विलयन तथा टॉलेन अभिकर्मक को अपचित कर देते हैं, अपचायी शर्करा कहते हैं। ग्लूकोस, जो कि स्तनधारियों के लिए ऊर्जा का प्रमुख स्रोत है, स्टार्च के जलअपघटन से प्राप्त होता है। विटामिन आहार में आवश्यक सहायक भोज्यकारक है। प्रोटीन α ऐमीनो अम्लों के बहुलक है और जीवधारियों में विभिन्न संरचनात्मक एवं गतिज क्रियाओं को संपादित करते हैं। विटामिनो की कमी से अनेकों रोग हो जाते हैं।

- (a) ग्लूकोस का पेन्टाऐसीटेट, हाइड्रोक्सिलऐमीन के साथ अभिक्रिया नहीं करता है। यह क्या इंगित करता है ?
 (b) विटामिन C को हमारे शरीर में संचित क्यों नहीं किया जा सकता है ?
 (c) प्रोटीनो से संबंधित निम्नलिखित की परिभाषा लिखिए:
 (i) पेप्टाइड बंध
 (ii) विकृतिकरण

अथवा

- (c) कार्बोहाइड्रेटों से संबंधित निम्नलिखित की परिभाषा लिखिए:
 (i) ऐनोमेर
 (ii) ग्लाइकोसिडिक बंध

Sol.

- (a) The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free —CHO group.
 (b) Vitamin C is a water soluble vitamin. It is readily excreted in urine and cannot be stored in our body.
 (c) (i) proteins are the polymers of α -amino acids and they are connected to each other by peptide bond or **peptide linkage**.
 (ii) When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called **denaturation** of protein.

OR






- (i) The two cyclic hemiacetal forms of glucose differ only in the configuration of the hydroxyl group at C1, called anomeric carbon (the aldehyde carbon before cyclisation). Such isomers, i.e., α -form and β -form, are called **anomers**.
 (ii) The two monosaccharides are joined together by an oxide linkage formed by the loss of a water molecule. Such a linkage between two monosaccharide units through oxygen atom is called **glycosidic linkage**.

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SECTION – E खण्ड ड

33.

- (I) Give reasons: 3 + 2
 (i) Aniline on nitration gives good amount of m-nitroaniline, though –NH₂ group is o/p directing in electrophilic substitution reactions.
 (ii) (CH₃)₂NH is more basic than (CH₃)₃N in an aqueous solution.
 (iii) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.

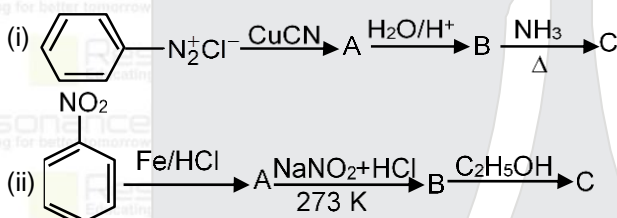
(II) Write the reaction involved in the following :

- (i) Carbyl amine test
 (ii) Gabriel phthalimide synthesis

OR

(b)

(I) Write the structures of A, B and C in the following reactions o: 3 + 1 + 1



- (II) Why aniline does not undergo Friedel-Crafts reaction?
 (III) Arrange the following in increasing order of their boiling point?
 C₂H₅OH, C₂H₅NH₂, (C₂H₅)₃N

(a) (I) कारण दीजिए:

- (i) यद्यपि ऐमीनो समूह इलेक्ट्रॉनरागी प्रतिस्थापन अभिक्रियाओं में आर्थो एवं पैरा निर्देशक होता है फिर भी ऐनिलीन नाइट्रीकरण द्वारा यथेष्ट मात्रा में मेटानाइट्रोऐनिलीन देती है।

(ii) जलीय विलयन में (CH₃)₃N की अपेक्षा (CH₃)₂NH अधिक क्षारकीय होती है।

(iii) ऐल्किल हैलाइडों का अमीनो-अपघटन शुद्ध प्राथमिक ऐमीनो के विरचन के लिए अच्छी विधि नहीं है।

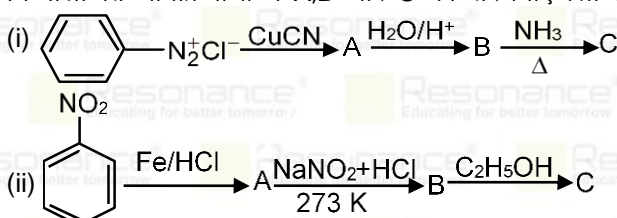
(II) निम्नलिखित में सम्मिलित अभिक्रिया लिखिए:

(i) कार्बिल ऐमीन परीक्षण

(ii) गैब्रिएल थैलिमाइड संश्लेषण

अथवा

(b) निम्नलिखित अभिक्रियाओं में A, B और C की संरचनाएँ लिखिए:



(II) ऐनिलीन फ्रीडेल-क्राफ्ट अभिक्रिया क्यों नहीं देती है?

(III) निम्नलिखित को उनके क्वथनांकों के बढ़ते क्रम में व्यवस्थित कीजिए:


C₂H₅OH, C₂H₅NH₂, (C₂H₅)₃N

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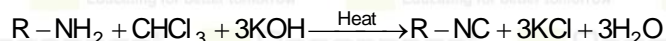
Sol.

(a) (I) (i) As in the strongly acidic medium, aniline is protonated to form the anilinium ion which is meta directing.

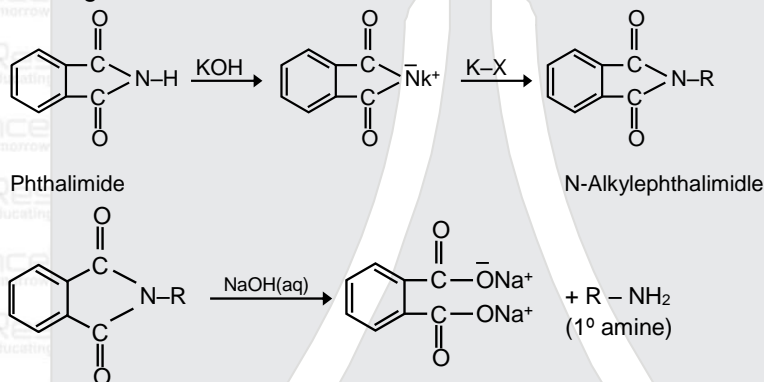
(ii) The greater the size of the ion, lesser will be the solvation and the less stabilised is the ion.

(iii) Ammonolysis has the disadvantage of yielding a mixture of primary, secondary and tertiary amines and also a quaternary ammonium salt.

(II) (i) **Carbylamine reaction.** Both aliphatic or aromatic 1° amines on warming with CHCl_3 in presence of alcoholic KOH solution. produce an offensive smell of carbylamines. This reaction is used as a test to distinguish 1° amines from 2° and 3° amines

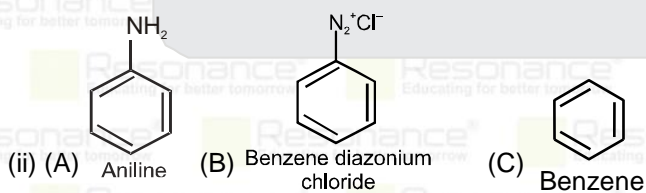
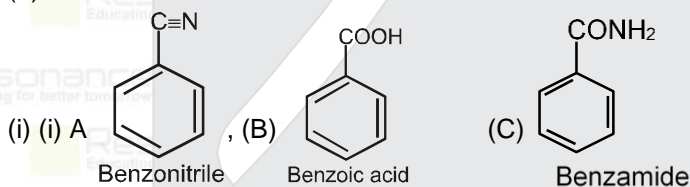


(ii) **Gabriel phthalimide Synthesis:-** Potassium phthalimide on treatment with alkylhalides gives the corresponding N-substituted phthalimides which upon hydrolysis with dil. HCl or alkali or hydrazinolysis with hydrazine gives 1° amines. Aromatic 1° amines, however cannot be prepared by this method.



OR

(b)



(II) As aniline reacts with Lewis acid AlCl_3 and forms salt with it

(III) $(\text{C}_2\text{H}_5)_3\text{N} < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_2\text{H}_5\text{OH}$,

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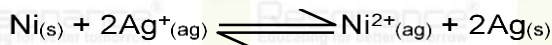
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34.

(a) Conductivity of 2×10^{-3} M methanoic acid is 8×10^{-5} S cm⁻¹ Calculate its molar conductivity and degree of dissociation if Λ_m^0 for methanoic acid is 404 S cm² Mol⁻¹ 3+2

(b) Calculate the $\Delta_r G^\circ$ and log K_c for the given reaction at 298 K:

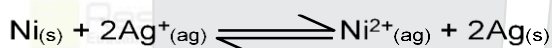


Given : $E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25\text{V}$, $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80\text{V}$

$1F = 96500$ C mol⁻¹.

(a) 2×10^{-3} M मेथेनाइक अम्ल की चालकता 8×10^{-5} S cm⁻¹ है। यदि मेथेनॉइक अम्ल के लिए Λ_m^0 का मान 404 S cm² mol⁻¹ है तो इसकी मोलर चालकता एवं वियोजन – मात्रा परिकलित कीजिए।

(b) 298 K पर दी हुई अभिक्रिया के लिए $\Delta_r G^\circ$ और log K_c परिकलित कीजिए।

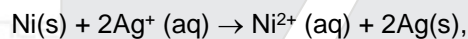


Sol. (a) $\Lambda_m = \frac{k}{C} = \frac{8 \times 10^{-5} \text{ S cm}^{-1}}{2 \times 10^{-3} \text{ mol L}^{-1}} \times \frac{1000 \text{ cm}^3}{\text{L}}$

$$= 40 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^0} = \frac{40}{404} = 0.099$$

(b) The cell reaction is



$$\Delta G^\circ = -nFE^\circ$$

$$E^\circ = 1.05 \text{ V}, n = 2, f = 96500 \text{ C/mol.}$$

$$\Delta G^\circ = -(2 \text{ mol}) \times (96500 \text{ C/mol}) \times (1.05 \text{ V}) = -202650 \text{ CV} = -202650 \text{ J}$$

Calculation of K in the form ΔG° ,

$$\Delta G^\circ = -202650 \text{ J}, R = 8.314 \text{ J/mol/K.}$$

$$T = 298 \text{ K.}$$

$$\log K = -\frac{\Delta G^\circ}{2.303RT}$$

$$= \frac{-202650}{-(2.303) \times (8.314 \text{ J/mol/K}) \times (298\text{K})}$$

$$= \frac{202650}{(2.303) \times (8.314 \text{ J/mol/K}) \times (298\text{K})}$$

$$= \frac{202650}{5705.8432} = 35.5162$$

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35. (a) (I) Account for the following 3+2

- (i) E° value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+}
 - (ii) Sc^{3+} is colourless whereas Ti^{3+} is coloured in an aqueous solution.
 - (iii) Actinoids show wide range of oxidation states.
- (II) Write the chemical equations for the preparation of $KMnO_4$ from MnO_2

OR

(b) (I) Account for the following: 2+2+1

- (i) Transition metals form alloys.
- (ii) Ce^{4+} is a strong oxidising agent.

(II) Write one similarity and one difference between chemistry of Lanthanoids and Actinoids.

(III) Complete the following ionic equation:



निम्नलिखित के कारण दीजिए-

- (i) Mn^{3+}/Mn^{2+} युग्म के लिए E° का मान Cr^{3+}/Cr^{2+} के मान से बहुत अधिक धनात्मक होता है।
- (ii) जलीय विलयन में Sc^{3+} रंगहीन है जबकि Ti^{3+} रंगीन है।
- (iii) ऐक्टिनॉयड ऑक्सीकरण अवस्थाओं का विस्तृत परास प्रदर्शित करते हैं।

(II) MnO_2 से $KMnO_4$ के विरचन के लिए रासयनिक समीकरण लिखिए।

अथवा

(b) (I) निम्नलिखित के कारण लिखिए:

- (i) संक्रमण धातुएँ मिश्रातुएँ बनाती हैं।
- (ii) Ce^{4+} एक प्रबल ऑक्सीकारक है।

(II) लैन्थेनॉयडों और ऐक्टिनॉयडों के रसायन में एक समानता और एक अंतर लिखिए

(iii) निम्नलिखित आयनिक समीकरण को पूर्ण कीजिए:



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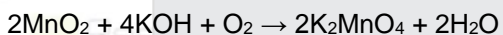
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- Sol.** (a)
- (I) (i) The large positive E° value for Mn^{3+}/Mn^{2+} shows that Mn^{2+} is much more stable than Mn^{3+} . This is because of the fact that Mn^{2+} has $3d^6$ configuration. This means that the d -orbital is half-filled. Half-filled and fully-filled configurations are very stable. Thus, the third ionization energy of Mn will be very high.
- (ii) In aqueous solution, the configuration of Sc^{+3} is $3d^0 4s^0$, so it does not have any unpaired electron which makes it colourless, but, Ti^{+3} in aqueous solution has outer configuration $3d^1 4s^0$, so it has unpaired electron which makes it coloured.
- (iii) There are a greater range of oxidation states which is in part attributed to the fact that the 5f, 6d and 7s levels are of comparable energies.

- (II) Potassium permanganate is prepared by fusion of MnO_2 with an alkali metal hydroxide and an oxidising agent like KNO_3 . This produces the dark green K_2MnO_4 which disproportionates in a neutral or acidic solution to give permanganate.



OR

- (b)
- (I) (i) Because of similar radii and other characteristics of transition metals, alloys are readily formed by these metals. The best known are ferrous alloys: chromium, vanadium, tungsten, molybdenum and manganese are used for the production of a variety of steels and stainless steel.

(ii) $Ce^{4+}(4f^0)$ in +4 oxidation state tend to revert to the more stable oxidation state of +3 by gain of an electron so it behaves as strong oxidising agent.

- (II) **Similarity** : Both are highly electropositive and very reactive in nature.

Difference : Lanthanoids 4f orbital is progressively filled but Actinoids 5f orbital is progressively filled.

- (iii) $Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$

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CUET (UG)

2023

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- CUET, known as Common Universities Entrance Test (CUET), is a Computer Based All - India Test for admission to various Undergraduate Programmes in 44 Central Universities and other State Private + Deemed Universities of India.
- CUET (UG) is organized by National Testing Agency (NTA).
- Official Website: <www.samarth.cuet.ac.in> OR <www.cuet.nta.ac.in>

Points to Remember: CUET (UG) 2023

- Candidates can choose any Language/Domain Specific Subjects/General Test or a combination as per the requirements of the course in the specific University.
- The choice of Tests/Subjects depend on the course/s chosen by the candidate and the University/ies where admission is sought.
- A Candidate can take a maximum of **10 tests**.



S.No.	SECTION	NO. OF QUESTIONS	QUESTIONS TO ATTEMPT	DURATION
1.	SECTION-I (A+B)	50	40	45 Minutes
2.	SECTION-II	50/45	40/35	45 Minutes*
3.	SECTION-III	60	50	45 Minutes*

*Not yet announced by NTA.

- **Section IA – 13 Languages (As a medium and “Language”)**

Assamese | Bengali | English | Gujarati | Hindi | Kannada | Malayalam | Marathi | Odia | Punjabi | Tamil | Telugu | Urdu

- **Section IB – 20 Languages**

Arabic | Bodo | Chinese | Dogri | French | German | Persian | Russian | Sindhi | Tibetan | Italian | Japanese | Kashmiri | Konkani | Maithili | Manipuri | Nepali | Santhali | Spanish | Sanskrit

- **Section II – 27 Domain-Specific Subjects**

There are 27 Domains specific Subjects being offered under this Section. Candidate may choose a maximum of Six (06) Domains as desired by the applicable University/Universities.

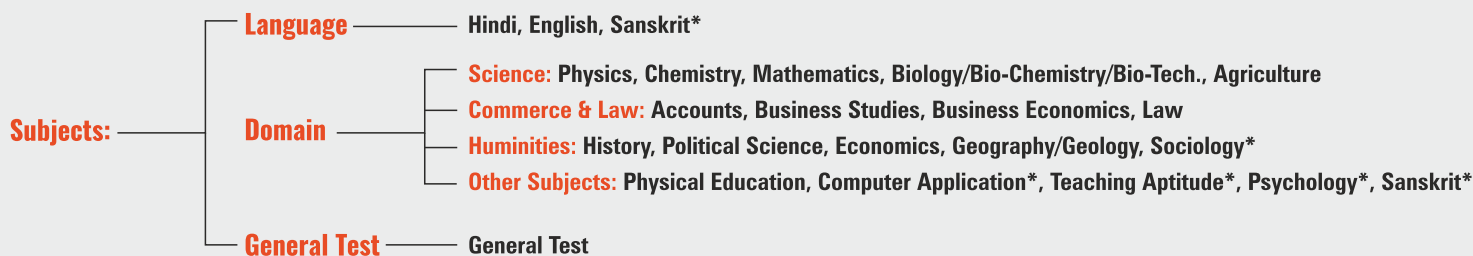
- **Section III – General Test**

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