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RBSE

**RAJASTHAN BOARD
SECONDARY EXAMINATION**

2022

**CLASS
XII**

Questions & Solutions

Date: 11 April, 2022 | TIME : (9.00 a.m. to 11.45 a.m)

Duration: 2hr, 45 min. | Max. Marks: 56

SUBJECT: CHEMISTRY

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Roll No.

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

CHEMISTRY

Time allowed : 2 hr, 45 Min.

Maximum Marks : 56

General Instructions :

परीक्षार्थियों के लिए सामान्य निर्देश:

- Candidate must write first his/her Roll No. on the question paper compulsorily
परीक्षार्थी सर्वप्रथम अपने प्रश्न-पत्र पर नामांक अनिवार्यतः लिखें।
- All the question are compulsory.
सभी प्रश्न करने अनिवार्य है।
- Write the answer to all question in the given answer-book only.
सभी प्रश्नों का उत्तर-पुस्तिका में ही लिखें।
- For questions having more than one part, the answers to those parts are to be written together in continuity.
जिन प्रश्नों में आन्तरिक खण्ड है उन सभी के उत्तर एक साथ ही लिखें।
- If there is any error/ difference/ contradiction in Hindi & English versions of the questions paper, the questions of Hindi version should be treated valid.
प्रश्न-पत्र के हिन्दी व अंग्रेजी रूपान्तरण में किसी प्रकार की त्रुटि/अन्तर/विरोधाभास होने पर हिन्दी भाषा के प्रश्न को ही सही माने।
- Write down the serial number of the question before attempting it.
प्रश्न का उत्तर लिखने से पूर्व प्रश्न का क्रमांक अवश्य लिखें।
- There are internal choices in Questions Nos. 16 to 20.
प्रश्न क्रमांक 16 से 20 में आन्तरिक विकल्प है।

SECTION-A

- Multiple Choice Questions

वस्तुनिष्ठ प्रश्न

निम्नांकित प्रश्नों में दिए गये सही विकल्प का चयन कर उत्तर पुस्तिका में लिखिए

Write the answer of the following questions in answer book by selecting the correct option :

- (i) Efficiency of packing in simple cubic lattice is - [1]
सरल घनीय जालक में संतुलन क्षमता है—
- (A) 52.4 % (B) 62.4% (C) 68% (D) 74%
- Ans. (A)

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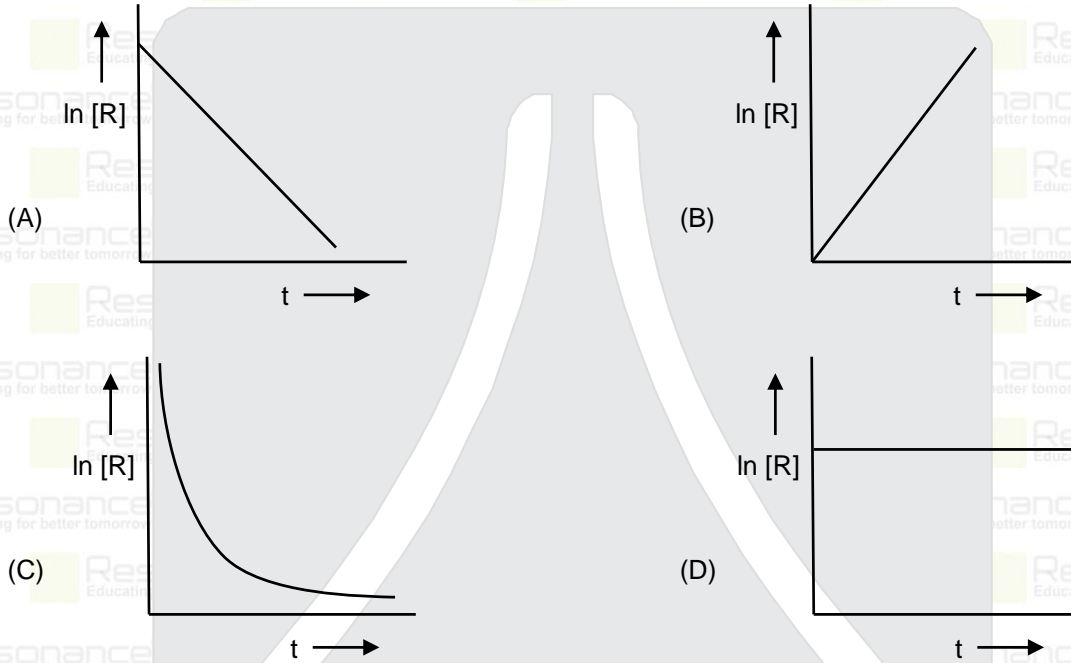
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(ii) The compound having highest value of Van't Hoff factor (i) for complete dissociation of solute in aqueous solution is - [1]

जलीय विलयन में विलेय के पूर्ण वियोजन के लिए वान्ट हॉफ कारक (i) के अधिकतम मान वाला यौगिक है—
(A) KCl (B) NaCl (C) K₂SO₄ (D) MgSO₄

Ans. (C) $K_2SO_4 \rightleftharpoons 2K^+ + SO_4^{2-}$
Van't half factor \propto no. of particals produce by solute
I is maximum for K₂SO₄ (i = 3)

(iii) The plot between ln [R] and t for first order reaction is - [1]
प्रथम कोटि की अभिक्रिया के लिए ln [R] एवं t के मध्य आलेख है।



Ans. For 1st order reaction $kt = \ln \left[\frac{R_0}{R} \right]$

$$kt = \ln [R_0] - \ln [R]$$

$$\ln [R] = \ln [R_0] - kt$$

$$y = C - mx$$

This (A) is correct option.

(iv) The pair of metals that can be purified by Van-Arkel method is - [1]

(A) Na,Al (B) Ga,Zn (C) Ni,Si (D) Zr,Ti

वॉन आरकैल विधि द्वारा शोधित की जा सकने वाली धातुओं का युग्म है।

(A) Na,Al (B) Ga,Zn (C) Ni,Si (D) Zr,Ti

Ans. (D)

(v) The metal showing maximum number of oxidation states is [1]

(A) V (B) Mn (C) Fe (D) Ni

सर्वाधिक संख्या में ऑक्सीकरण अवस्थाएँ दर्शाने वाली धातु है

(A) V (B) Mn (C) Fe (D) Ni

Ans. (B) Due to presence of maximum no. of unpaired-d-electron.

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(vi) The co-ordination compound having tetrahedral geometry is [1]
चतुष्फलकीय ज्यामिति वाला उपसहसंयोजन यौगिक है।

(A) $[\text{Ni}(\text{CN})_4]^{2-}$ (B) $[\text{Ni}(\text{CO})_4]$ (C) $[\text{Fe}(\text{CO})_5]$ (D) $[\text{Cr}(\text{CO})_6]$
Ans. (B)

(vii) The compound having highest carbon halogen (C-X) bond length is [1]

(A) $\text{CH}_3\text{-F}$ (B) $\text{CH}_3\text{-Cl}$ (C) $\text{CH}_3\text{-Br}$ (D) $\text{CH}_3\text{-I}$
सर्वाधिक कार्बन हैलोजन (C-X) आबंध लंबाई वाला यौगिक है।
(A) $\text{CH}_3\text{-F}$ (B) $\text{CH}_3\text{-Cl}$ (C) $\text{CH}_3\text{-Br}$ (D) $\text{CH}_3\text{-I}$

Ans. (D) Due to larger size of iodine atom.

(viii) The correct ascending order of boiling points of, CH_3OCH_3 , $\text{CH}_3\text{CH}_2\text{OH}$ and $\text{CH}_3\text{CH}_2\text{CH}_3$ is: [1]

CH_3OCH_3 , $\text{CH}_3\text{CH}_2\text{OH}$ एवं $\text{CH}_3\text{CH}_2\text{CH}_3$ के क्वथनांकों का सही बढ़ता क्रम है।
(A) $\text{CH}_3\text{CH}_2\text{OH} < \text{CH}_3\text{OCH}_3 < \text{CH}_3\text{CH}_2\text{CH}_3$
(B) $\text{CH}_3\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{OCH}_3$
(C) $\text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{OCH}_3 < \text{CH}_3\text{CH}_2\text{OH}$
(D) $\text{CH}_3\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{OCH}_3$

Ans. (C) $\text{CH}_3 - \text{CH}_2 - \text{CH}_3 < \text{CH}_3 - \text{O} - \text{CH}_3 < \text{CH}_3 - \text{CH}_2 - \text{OH}$

(ix) The amine having lowest p^{kb} value is [1]

न्यूनतम p^{kb} मान वाला ऐमीन है।
(A) CH_3NH_2 (B) $(\text{CH}_3)_2\text{NH}$ (C) $(\text{CH}_3)_3\text{N}$ (D) $\text{C}_6\text{H}_5\text{NH}_2$
Ans. (B)

2. Fill in the blanks :

रिक्त स्थानों की पूर्ति कीजिए

(i) The chemical formula of ionic solid showing Frenkel and schottky both types of point defect is [1]

फ्रेंकेल तथा शॉटकी दोनों प्रकार के बिंदु दोष दर्शाने वाले आयनिक ठोस का रासायनिक सूत्र _____ है।
Ans. AgBr

(ii) The name of metal present in Haemoglobin complex is _____ [1]

हीमोग्लोबीन संकुल में उपस्थित धातु का नाम _____ है।
Ans. Fe

(iii) The value of optical rotation of racemic mixture is _____ [1]

रेसिमिक मिश्रण के ध्रुवण घूर्णन का मान _____ होता है।
Ans. zero

(iv) _____ is less volatile among o-nitrophenol and p-nitrophenol. [1]

o-नाइट्रोफीनॉल तथा p-नाइट्रोफीनॉल में से _____ कम वाष्पशील होता है।
Ans. p-nitrophenol

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3. Very short answer type questions :

अतिलघुतरात्मक प्रश्न

(i) Explain the reason for exhibiting negative deviation from Raoult's law by the solution of chloroform and acetone. [1]

क्लोरोफॉर्म तथा ऐसीटोन के विलयन द्वारा राउल्ट के नियम से ऋणात्मक विचलन प्रदर्शित करने का कारण समझाइए।

Ans. (i) Solution of chloroform and acetone exhibiting negative deviation from Raoult's law due to formation of Hydrogen bond between them. Force of attraction $A \xrightarrow{W} A, B \xrightarrow{W} B \rightarrow A \xrightarrow{S} B$

(ii) Write the unit of rate constant for zero order reaction. [1]

शून्यकोटि की अभिक्रिया के लिए वेग स्थिरांक की इकाई लिखिए।

Ans. (ii) For zero order reaction

$A \rightarrow \text{Product}$

Rate = $K [\text{Concentration}]^0$

$K = \text{Rate of reaction} = \frac{\text{mol}}{\text{Lit} \cdot \text{sec}}$

$= \text{Mole Lit}^{-1} \text{sec}^{-1}$

(iii) Write the name of metal elements present in brass. [1]

पीतल में उपस्थित धातु तत्वों के नाम लिखिए।

Ans. (iii) Element present in brass Cu + Zn

(iv) Define co-ordination Polyhedron. [1]

समन्वय बहुफलक को परिभाषित कीजिए

Ans. (iv) The spatial arrangement of the ligand atoms which are directly bonded to the central atom/ion called coordination polyhedron.

(v) Write IUPAC name of $K_3[Al(C_2O_4)_3]$ [1]

$K_3[Al(C_2O_4)_3]$ का IUPAC नाम लिखिए

Ans. (v) Potassium trioxalatoaluminate(III)

(vi) Write the type of isomerism exhibited by $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$. [1]

$[Co(NH_3)_6][Cr(CN)_6]$ तथा $[Cr(NH_3)_6][Co(CN)_6]$ द्वारा प्रदर्शित समावयवता का प्रकार लिखिए।

Ans. (vi) Coordination isomerism

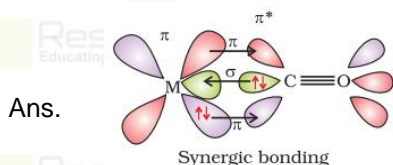
(vii) Write the type of hybridization of orbitals for nitrogen present in amine. [1]

ऐमीन में उपस्थित नाइट्रोजन के लिए कक्षकों के संकरण का प्रकार लिखिए।

Ans. (vii) sp^3

(viii) Draw the synergic bonding present in carbonyl complex. [1]

कार्बोनिल संकुल में उपस्थित सहक्रियाशीलता आबंधन को चित्रित कीजिए।



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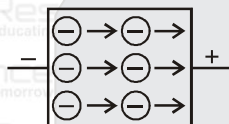
SECTION-B

Short answer type questions :

लघूत्तरात्मक प्रश्न

4. Explain n-type semi-conductor [1.5]
n-प्रकार के अर्धचालक को समझाइए।

Ans. When silicon is doped with some group-15 element, the some of the positions in the lattice are substituted by atoms of groups-15 elements have five valence electrons. After forming the four covalent bonds with silicon (or any other group-14 element such as germanium). One excess electron is left on them. Since this electron is not involved in bonding it becomes delocalized and contribute to electrical conduction. Silicon doped with group 15 element behaves as a n-type semiconductor.



n-type semiconductor

5. Compare paramagnetism and diamagnetism. [1.5]
अनुचुंबकत्व तथा प्रतिचुंबकत्व की तुलना कीजिए।

Ans. Paramagnetic: *When substances which are attracted by the external magnetic field are called paramagnetic substances and the phenomenon is called as paramagnetic.* Atoms ion or molecules containing unpaired electron show this property, eg. O_2 Cu^{2+} , Fe^{3+} etc. these substances lost their magnetism in the absence of magnetic field.

Diamagnetic materials: *Those materials which are repelled by magnetic field are called diamagnetic materials* e.g. Cu^+ , TiO_2 , $NaCl$ and C_6H_6 . They do not have unpaired electrons.

6. Calculate the molarity of 250 mL solution by dissolving 5g NaOH in water. [1.5]
5g NaOH को जल में घोलकर बनाए गए 250 mL विलयन की मोलरता की गणना कीजिए।

Ans. Molarity (M) of solution = $\frac{n}{V_{ml}} \times 1000$

$$\text{No. of moles of solute (n)} = \frac{\text{givenmass}}{\text{Molamass}} = \frac{5}{40}$$

Volume of solution (V_{ml}) = 250 ml

$$M = \frac{5}{40} \times \frac{1000}{250}$$

$$= 0.5 \text{ M}$$

7. 1.25 g protein is present in 300 mL aqueous solution of a protein. The osmotic pressure of such a solution at 300 K is found to be 2.50×10^{-3} bar. Calculate the molar mass of protein ($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$) [1.5]

एक प्रोटीन के 300 mL जलीय विलयन में 1.25 g प्रोटीन उपस्थित है। 300 K पर इस विलयन का परासरण दाब 2.50×10^{-3} bar पाया गया। प्रोटीन के मोलर द्रव्यमान की गणना कीजिए। ($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

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Ans. $\pi = CRT$ $\pi =$ Osmotic pressure
 $C =$ Concentration (molarity)
 $R =$ Solution constant
 $T =$ Temperature

$$\pi = \frac{\text{given mass}}{\text{MM}} \times \frac{1000}{V_{ml}} \times R \times T$$

$$2.50 \times 10^{-3} = \frac{1.25}{\text{MM}} \times \frac{1000}{300} \times 0.0821 \times 300$$

$$M = \frac{1.25 \times 10^3 \times 0.083 \times 300}{300 \times 2.50 \times 10^{-3}}$$

$$\text{MM} = 41500 \text{ gm/mol}$$

8. What do you understand by lanthanoid contraction ? [1.5]
 लैन्थेनॉयड आकुंचन से आप क्या समझते हैं ?

Ans. Lanthanoid contraction → due to the poor shielding of one 4f electron by another is less than one d electron by another with the increase in nuclear charge along the series of lanthanides size of Ln decreases from La – Lu. Which is called lanthanide contraction.

9. Calculate the 'spin only' magnetic moment for $M_{(aq)}^{2+}$ ($Z = 25$). [1.5]

$M_{(aq)}^{2+}$ ($Z = 25$) के लिए प्रचक्रण मात्र चुंबकीय आघूर्ण की गणना कीजिए।

Ans. M_{aq}^{2+} $z = 25 \rightarrow |\text{Ar}| 3d^5 4s^2$

$M^{2+} \rightarrow |\text{Ar}| 3d^5$

$n = 5$ (unpaired e^-)

$$\mu = \sqrt{n(n+2)} \text{ B.M}$$

$$\mu = \sqrt{5(5+2)}$$

$$\mu = \sqrt{35} \text{ B.M}$$

10. Explain Tollen's test used for distinguishing propanal and propanone. [1.5]

प्रोपेनैल तथा प्रोपेनोन में विभेद करने के लिए प्रयुक्त टॉलेन परीक्षण को समझाइए।

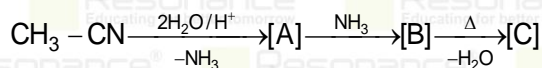
Ans. Distinguishing between propanal and propanone Tollen's test → $\text{CH}_3\text{-CH}_2\text{-CHO}$ (propanal) give positive test with T.R. and form silver mirror.



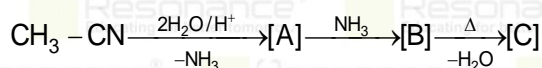
Silver
mirror



11. Write chemical formula of [A],[B] and [C] in above reaction sequence. [1.5]



उपरोक्त अभिक्रिया अनुक्रम में [A],[B] तथा [C] के रासायनिक सूत्र लिखिए।



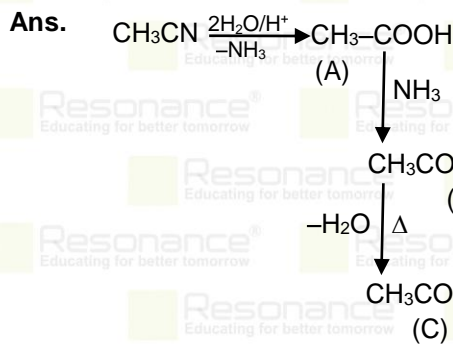
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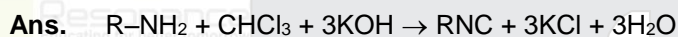
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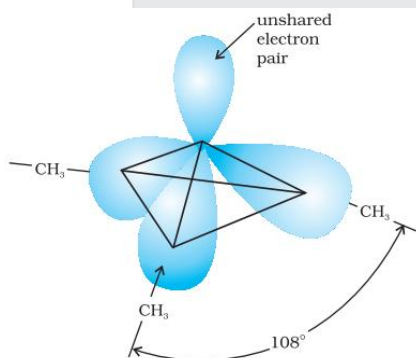
12. Explain the isocyanide test for primary amines. [1.5]

प्राथमिक ऐमीनों के लिए आइसोसायनाइड परीक्षण को समझाइए।



13. Draw pyramidal shape of trimethylamine. [1.5]

ट्राइमेथिलऐमीन की पिरेमिडी आकृति को चित्रित कीजिए।



Ans.

14. Explain denaturation of protein. [1.5]

प्रोटीन के विकृतिकरण को समझाइए।

Ans. When protein in native form is subjected to a physical change like temperature or pH, the H-bonds are disturbed. As a result globules get unfold and helices get uncoiled therefore proteins loses its activity. During denaturation 2° and 3° structures get destroyed but 1° structure remain the same.

Ex: Coagulation of egg while on boiling and curdling of milk caused by bacteria present in milk.

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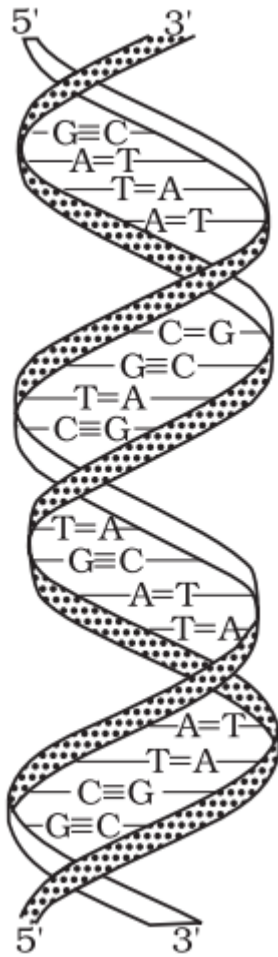
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15. Draw the double stand helix structure of DNA.

[1.5]

DNA की द्विकुंडली संरचना को चित्रित कीजिए।

Ans.



SECTION-C

Long answer type questions :

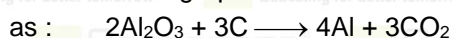
दीर्घउत्तरात्मक प्रश्न

16. Describe Hall-Heroult process for extraction of aluminium and draw the electrolytic cell used in the process. [3]

ऐलुमिनियम के निष्कर्षण के लिए हॉल-हेरोल्ट प्रक्रम का वर्णन कीजिए तथा प्रक्रम में प्रयुक्त वैद्युतअपघटनी सेल को चित्रित कीजिए।

Ans. Electrolytic reduction (Hall-Heroult process) :

The purified Al_2O_3 is mixed with Na_3AlF_6 (cryolite) or CaF_2 (fluorspar) which lowers the melting point of the mixture and brings conductivity. The fused matrix is electrolysed. Steel cathode and graphite anode are used. The graphite anode is useful here for reduction to the metal. The overall reaction may be taken as :



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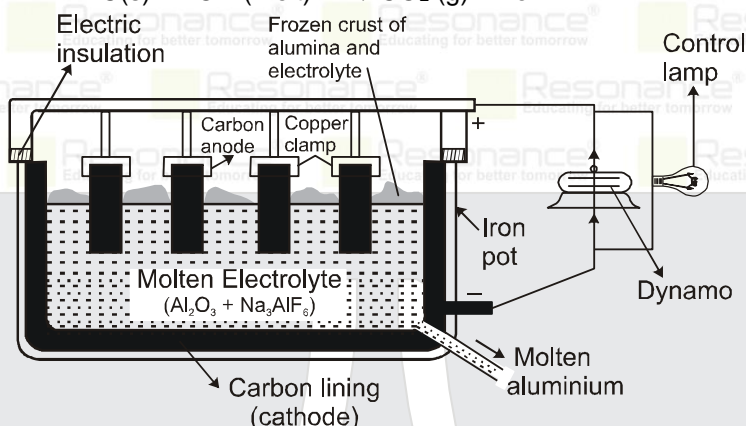
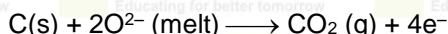
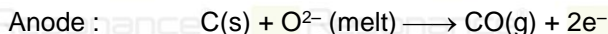
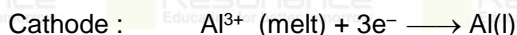
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The electrolysis of the molten mass is carried out in an electrolytic cell using carbon electrodes. The oxygen liberated at anode reacts with the carbon of anode producing CO and CO₂. This way for each kg of aluminium produced, about 0.5 kg of carbon anode is burnt away. The electrolytic reactions are :



OR/अथवा

Describe the zone refining process for purification of metals and draw its diagram.

धातुओं के शोधन के लिए मंडल परिष्करण प्रक्रम का वर्णन कीजिए तथा इसका चित्र बनाइए।

Ans. Zone refining method (Fractional crystallisation method) :

This process is used when metals are required in very high purity, for specific application. For example pure Si and Ge are used in semiconductors and hence are purified by this method. Zone refining method is based on the principle that an impure molten metal on gradual cooling will deposit crystals of the pure metal, while the impurities will be left in the remaining part of the molten metal.

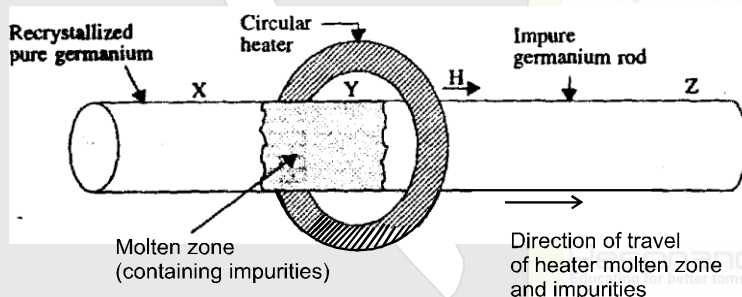


Fig. Zone refining of germanium metal

Germanium metal, which is used in semiconductor devices, is refined (purified) by the zone refining method. The impure germanium metal to be refined is taken in the form of a rod. A circular heater H is fitted around this rod and this heater is slowly moved along the length of the rod. When the heater is at the extreme left end of the impure germanium rod, it melts a narrow zone (narrow region) of the germanium rod at that place. Now, when the heater moves on a little to the right side, then the molten metal at the previous position cools down and crystallizes to give pure metal at region X of the rod. The impurities, which were initially present in region X of germanium rod, now pass on to the region Y in the adjacent molten zone. Now, as the heater is shifted more and more to the right side on the germanium rod, the impurities also keep on shifting to the right side in the newer and newer molten zones. Ultimately, the impurities reach the extreme right end Z of the germanium rod. This end Z of the germanium rod containing all the impurities is then discarded. The remaining rod is now of highly pure germanium metal. In addition to germanium, silicon and gallium used as semiconductors are also refined by the zone refining method.

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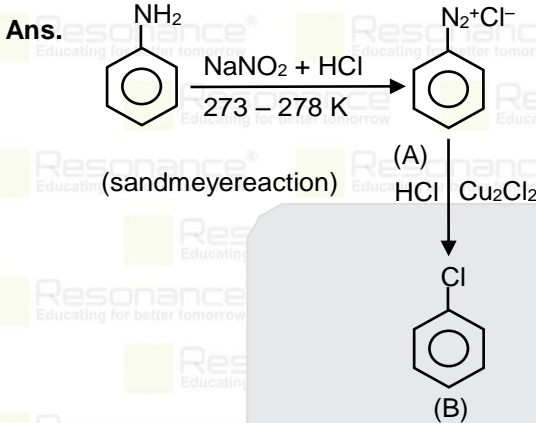
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17. Compound [A] is obtained on reacting aniline with $(\text{NaNO}_2 + \text{HCl})$ at 273-278 K. Compound [B] is obtained on mixing cuprous chloride in [A]. Write names of [A] & [B] and equations of chemical reactions involved.

[3]

ऐनिलीन को 273-278 K पर $(\text{NaNO}_2 + \text{HCl})$ के साथ अभिकृत करवाने पर यौगिक [A] बनता है। [A] में क्युप्रस क्लोराइड को मिलाने पर यौगिक [B] बनता है। [A] तथा [B] के नाम एवं निहित रासायनिक अभिक्रियाओं के समीकरण लिखिए।

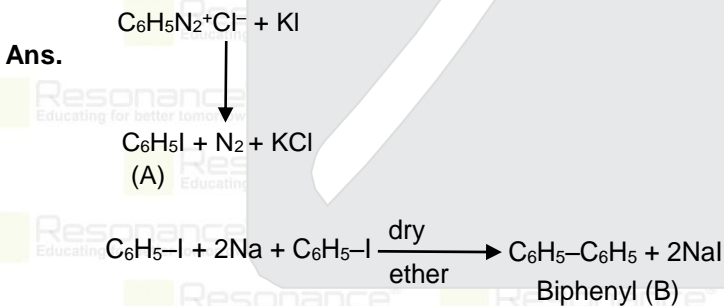


OR/अथवा

Compound [A] is obtained on mixing benzene diazonium chloride with KI solution compound [B] is obtained on reacting sodium with [A] in presence of dry ethane. Write names of [A] & [B] and equation of chemical reaction involved.

[3]

बेन्जीन डायैज़ोनियम क्लोराइड को KI विलयन के साथ मिलाने पर यौगिक [A] बनता है। [A] को शुष्क ईथर की उपस्थिति में सोडियम के साथ अभिक्रिया करवाने पर यौगिक [B] बनता है। [A] व [B] के नाम तथा निहित रासायनिक अभिक्रियाओं के समीकरण लिखिए।



18. Give reason [3]

- Carbon – Oxygen (C-O) bond length present in phenol is less than methanol.
 - C-O-C bond angle present in ether is more than tetrahedral angle.
 - Boiling point of isomeric alcohols is lowered on increase in branching.
- कारण दीजिए

- फीनॉल में उपस्थित कार्बन-ऑक्सीजन (C-O) आबंध लंबाई मेथेनॉल से कम होती है।
- ईथर में उपस्थित C-O-C आबंध कोण चतुष्फलकीय कोण से अधिक होता है।
- समावयवी ऐल्कोहॉलों में शाखन के बढ़ने पर क्वथनांक कम हो जाता है।

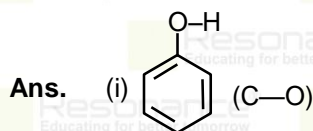
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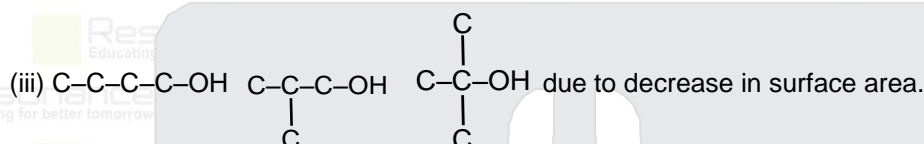
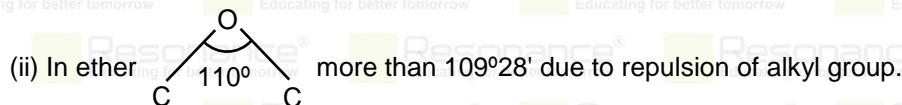
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Phenol

In phenol (C—O) bond length is less than methanol due to resonance. In phenol C—O bond length is partially double bonded.



OR/अथवा

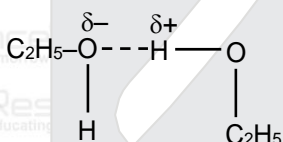
Give reason

- (i) Boiling point of ethanol is more than methoxymethane.
 (ii) Ethanol is easily dissolved in water.
 (iii) Phenol is strong acid as compared to alcohol.

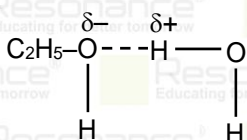
कारण दीजिए

- (i) एथेनॉल का क्वथनांक मेथॉक्सीमेथेन से अधिक होता है।
 (ii) एथेनॉल आसानी से जल में विलेय हो जाता है।
 (iii) फीनॉल, ऐल्कोहॉल की तुलना में प्रबल अम्ल होता है।

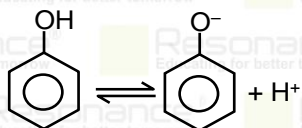
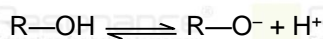
Ans. (i) Due to intermolecular—H—bonding boiling point of ethanol is more than methoxymethane.



(ii) Ethanol form intermolecular—H—bond with water.



(iii) Phenol is more acidic than alcohol because phenoxide ion is resonance stabilized. Whereas alkoxide ion is not stabilized.



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SECTION-D

Easy type questions :

निबंधात्मक प्रश्न

19. (i) Define order of reaction [1 + 1 + 2 = 4]
 (ii) Explain the effect of concentration of reaction on rate constant.
 (iii) The rate constant of a first order reaction at 500K and 600 K are 0.03 s^{-1} and 0.06 s^{-1} respectively, then calculate the activation energy.
 [R = $8.314 \text{ JK}^{-1} \text{ mol}^{-1}$, $\log 2 = 0.3010$]
 (i) अभिक्रिया की कोटि को परिभाषित कीजिए।
 (ii) वेग स्थिरांक पर अभिक्रिया की सांद्रता के प्रभाव को समझाइए।
 (iii) एक प्रथम कोटि की अभिक्रिया के लिए 500K तथा 600 K पर वेग स्थिरांक क्रमशः 0.03 s^{-1} तथा 0.06 s^{-1} हो, तो सक्रियण उर्जा की गणना कीजिए।

$$[R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}, \log 2 = 0.3010]$$

- Ans.** (i) The sum of powers of the concentration of the reactants in the rate law expression is called the order of that chemical reaction.
 (ii) There is no effect of concentration of reaction on rate constant. Rate constant depend on temperature and catalyst.

$$(iii) \log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\log \frac{0.06}{0.03} = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{500} - \frac{1}{600} \right]$$

$$\log 2 = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{500} - \frac{1}{600} \right]$$

$$0.3010 = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{500} - \frac{1}{600} \right]$$

$$E_a = 17283.42 \text{ J}$$

OR/अथवा

- (i) Define molecularity of reaction. [1 + 1 + 2 = 4]
 (ii) Explain the effect of presence of catalyst on rate of reaction.
 (iii) The initial concentration of reactant in a first order reaction was $10 \times 10^{-2} \text{ molL}^{-1}$ and at 300K that was reduced to $0.5 \times 10^{-2} \text{ molL}^{-1}$ after 30 minutes. Calculation the rate constant of the reaction at 300 K [log2 = 0.3010]
 (i) अभिक्रिया की आवश्यकता को परिभाषित करो।
 (ii) अभिक्रिया के वेग पर उत्प्रेरक की उपस्थिति के प्रभाव को समझाइए।
 (iii) 300K पर एक प्रथम कोटि की अभिक्रिया में अभिकारक की प्रारम्भिक सांद्रता $10 \times 10^{-2} \text{ molL}^{-1}$ थी, जो 30 मिनट पश्चात् घटकर $0.5 \times 10^{-2} \text{ molL}^{-1}$ रह गई। 300K पर अभिक्रिया के वेग स्थिरांक की गणना कीजिए [log2 = 0.3010]

- Ans.** (i) The number of reacting species (atoms, ions or molecules) taking part in an elementary reaction, which must collide simultaneously in order to bring about a chemical reaction is called molecularity of a reaction.

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(ii) Effect of Catalyst :

Presence of positive catalyst lower down the activation energy hence increases the rate of reaction.

Presence of negative catalyst increases activation energy hence decreases the rate of reaction.

(iii) For 1st order reaction

$$kt = 2.303 \log \left[\frac{R_0}{R} \right] \quad t = \text{time} = 30 \text{ min}$$

$$k = \frac{2.303}{t} \log \left[\frac{R_0}{R} \right] \quad R_0 = \text{initial concentration}$$

R = concentration at time t

$$k = \frac{2.303}{30} \log \frac{1 \times 10^{-2}}{0.5 \times 10^{-2}}$$

$$k = \frac{2.303}{30} \times 0.3010$$

$$k = 0.0231 \text{ min}^{-1}$$

20. (i) Write IUPAC name of dicarboxylic acid used in formation of Nylon-6,6 [1 + 2 + 1 = 4]

(ii) Explain reason

(A) Acetic acid is weak acid as compared to formic acid

(B) Boiling point of carboxylic acids is more than aldehydes having comparable molecular masses.

(iii) Draw the orbital diagram of carbonyl group.

(i) नाइलोन-6,6 के निर्माण में प्रयुक्त डाइकार्बोक्सिलिक अम्ल का IUPAC नाम लिखिए।

(ii) कारण समझाइए

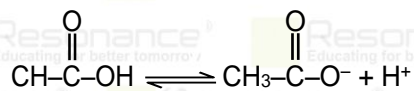
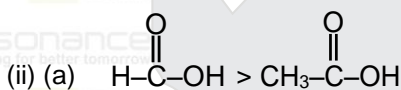
(A) ऐसीटिक अम्ल, फार्मिक अम्ल की तुलना में दुर्बल अम्ल होता है।

(B) कार्बोक्सिलिक अम्लों का क्वथनांक समतुल्य आणविक द्रव्यमानों वाले एल्डिहाइडों से अधिक होता है।

(iii) कार्बोनिल समूह के कक्षीय आरेख को चित्रित कीजिए।

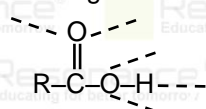
Ans. (i) Adipic acid \rightarrow $\text{COOH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{COOH}$

IUPAC name \rightarrow Hexanedioic acid



+I effect of CH_3 group \downarrow stability of anion.

(b) Boiling point of carboxylic acid is greater than aldehydes due to presence of intermolecular-H-bonding.



(not form H-bond)

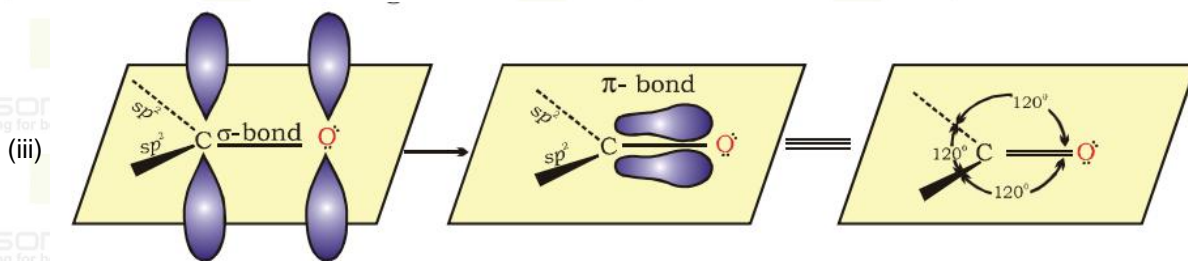
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OR/अथवा

(i) Write the name of ester used as food preservative. [1 + 2 + 1 = 4]

(ii) Explain the following terms :

(A) Rosenmund reduction

(B) Cannizzaro reaction

(iii) Draw the tetrahedral intermediate formed by nucleophilic attack on carbonyl carbon in nucleophilic addition reaction.

(i) खाद्य परिरक्षक के रूप में प्रयुक्त एस्टर का नाम लिखिए।

(ii) निम्नलिखित पदों को समझाइए।

(A) रोजेनमुंड अपचयन

(B) कैनिजारों अभिक्रिया

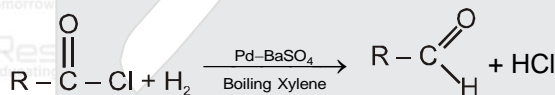
(iii) नाभिकरागी योगज अभिक्रिया में कार्बोनिल कार्बन पर नाभिकरागी आक्रमण से बने चतुष्फलकीय मध्यवर्ती को चित्रित कीजिए।

Ans. (i) Sodium benzoate (C_6H_5COONa)

(ii)

(a) Rosenmund's reduction :

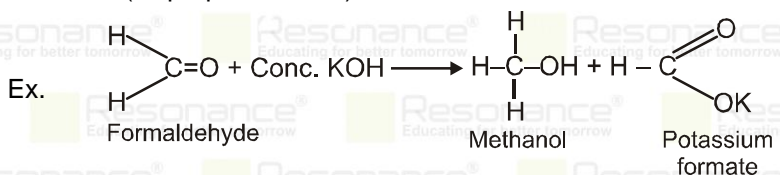
Here acid chlorides are reduced to aldehyde with H_2 in boiling xylene using palladium as a catalyst supported on barium sulphate.



Note : (i) Pd Catalyst is poisoned by $BaSO_4$ to check further reduction of aldehyde to alcohol.

(ii) Formaldehyde cannot be obtained by this method because $HCOCl$ is unstable at common temperature.

(b) Cannizzaro reaction : Aldehydes which do not have an α -hydrogen atom, undergo self oxidation and reduction (disproportionation) reaction on treatment with a concentrated alkali.



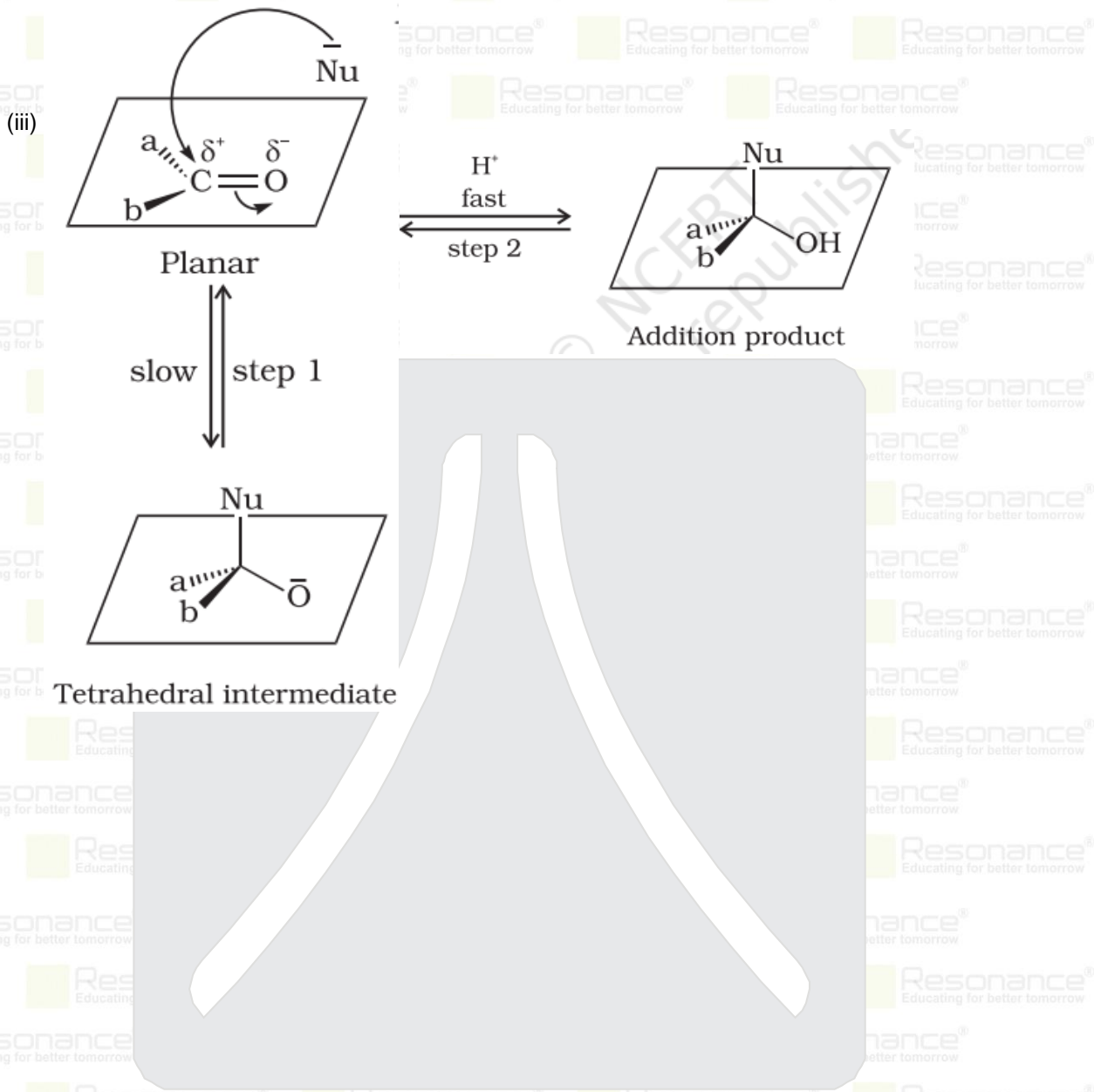
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