Resonance®
Educating for better tomorrow

NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC) 2022

Organized by

INDIAN ASSOCIATION OF PHYSICS TEACHERS (IAPT)

QUESTIONS, ANSWERS & SOLUTIONS

Saturday, November 27, 2022 | Time: 11:30 AM to 1:30 PM | Max. Marks : 216

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | **FAX No. :** +91-022-39167222

To Know more : sms **RESO** at **56677** | **Website :** www.resonance.ac.in | **E-mail :** contact@resonance.ac.in | **CIN :** U80302RJ2007PLC024029

Toll Free : 1800 258 5555 **7340010333** facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

INSTRUCTIONS

Write the question paper code mentioned above on YOUR OMR Answer Sheet (in the space provided), otherwise your Answer Sheet will NOT be evaluated. Note that the same Question Paper Code appears on each page of the question paper.

Instructions to Candidates:

1. Use of mobile phone, smart watch, and iPad during examination is STRICTLY **PROHIBITED**.
2. In addition to this question paper, you are given OMR Answer Sheet along with candidate's copy.
3. On the OMR sheet, make all the entries carefully in the space provided **ONLY** in **BLOCK CAPITALS** as well as by properly darkening the appropriate bubbles.
   Incomplete/ incorrect/ carelessly filled information may disqualify your candidature.
4. On the OMR Answer Sheet, use only **BLUE or BLACK BALL POINT PEN** for making entries and filling the bubbles.
5. Your **Ten-digit roll number and date of birth** entered on the OMR Answer Sheet shall remain your login credentials means login id and password respectively for accessing your performance / result in Indian **NSEC 2022.**
6. Question paper has two parts. In part A1 (Q. No.1 to 48) each question has four alternatives, out of which only one is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

In part A2 (Q. No. 49 to 60) each question has four alternatives out of which any number of alternative(s) (1, 2, 3 or 4) may be correct. You have to choose all correct alternative(s) and fill the appropriate bubble(s), as shown

7. For **Part A1**, each correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer. In **Part A2**, you get 6 marks if all the correct alternatives are marked. No negative marks in this part.
8. Rough work should be done only in the space provided. There are 16 printed pages in this paper.
9. Use of **non-programmable scientific** calculator is allowed.
10. No candidate should leave the examination hall before the completion of the examination.
11. After submitting answer paper, take away the question paper & Candidate's copy of OMR Sheet for your reference.

Please DO NOT make any mark other than filling the appropriate bubbles properly in the space provided on the OMR answer sheet.

OMR answer sheets are evaluated using machine, hence CHANGE OF ENTRY IS NOT ALLOWED. Scratching or overwriting may result in a wrong score.

DO NOT WRITE ON THE BACK SIDE OF THE OMR ANSWER SHEET.

Instructions to Candidates (Continued) :

You may read the following instructions after submitting the answer sheet.

12. Comments/Inquiries/Grievances regarding this question paper, if any, can be shared on the Inquiry/Grievance column on www.iaptexam.in **on the specified format till December 3, 2022**.

13. The answers/solutions to this question paper will be available on the website: www.iapt.org.in.**by December 2, 2022.**

14. CERTIFICATES and AWARDS:

Following certificates are awarded by IAPT/ACT to students, successful in the NATIONAL STANDARD EXAMINATION IN Chemistry - 2022.

(i) "CENTRETOP10 %" To be downloaded from iapt.org.in after 15.01.23

(ii) "STATETOP1 %" Will be dispatched to the examinee

(iii) "NATIONALTOP1 %" Will be dispatched to the examinee

(iv) "GOLD MEDAL& MERITCERTIFICATE" to all students who attend OCSC-2023 at HBCSE Mumbai

Certificate for centre toppers shall be uploaded on Iapt.org.in

15. List of students (with centre number and roll number only) having score above MAS will be displayed on the website: www.iapt.org.in by **December 25, 2022. See the Minimum Admissible score clause** on the Student's brochure on the web.

16. List of Students eligible to appear for Indian National Chemistry Olympiad (INChO - 2023) shall be displayed on www.iapt.org.in by December 30, 2022.

Constants you may need....

Charge of electron,	$e = 1.602 \times 10^{-19} C$	Speed of light,	$c = 3.0 \times 10^{8}\ ms^{-1}$
Mass of electron,	$m_e = 9.1 \times 10^{-31} kg$	Avogadro constant,	$N_A = 6.022 \times 10^{23}\ mol^{-1}$
Planck's constant,	$h = 6.63\ 10^{-34}\ Js$	Faraday	$F = 96500\ C\ mol^{-1}$
		Molar gas constant,	$R = 0.082\ L\ atm\ mol^{-1}\ K^{-1}$
			$= 8.314\ J\ mol^{-1}\ K^{-1}$

INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC) 2022

Question Paper Code: 34

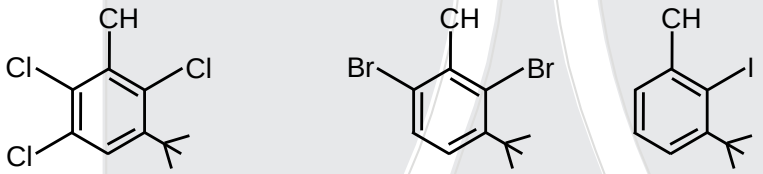
Time : 120 Minute **Max. Marks: 216**

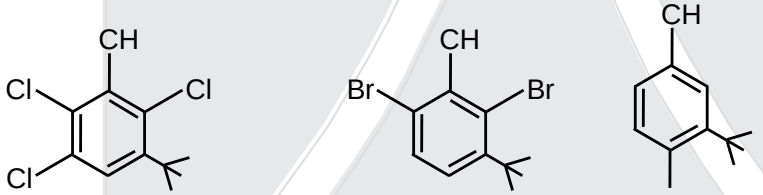
Attempt All Sixty Questions

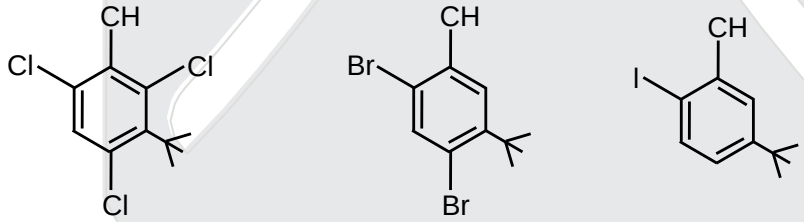
PART-A1

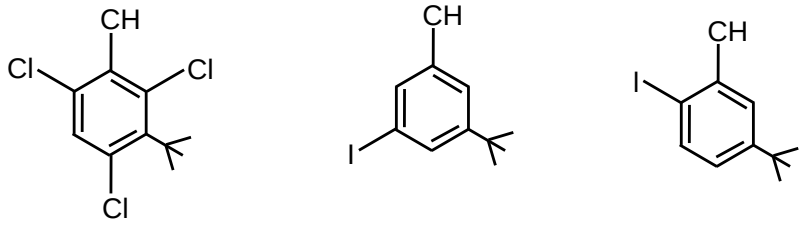
ONLY ONE OUT OF FOUR OPTIONS IS CORRECT. BUBBLE THE CORRECT OPTION.

1. 3-tert-butylphenol when reacted separately with excess chlorine, bromine and iodine gave trichloro, di-bromo and mono-iodo derivatives of 3-tert-butylphenol respectively. The correct structures of the respective halogen derivatives are

(A) 

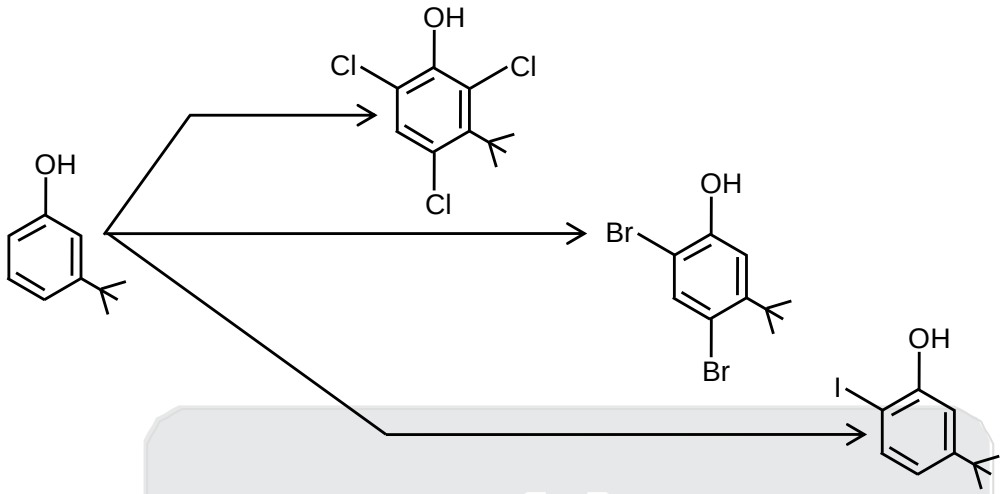
(B) 

(C) 

(D) 

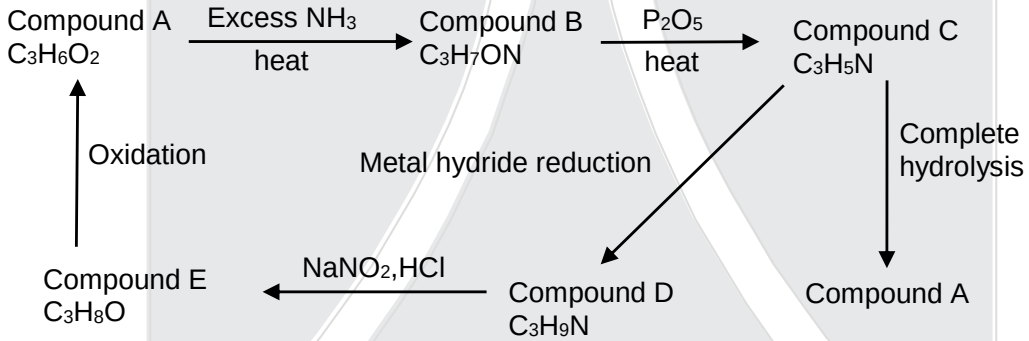
Ans. (C)

Sol.



2. Consider the following sequence of reactions:

The functional groups undergoing change in the conversion of A of E respectively are

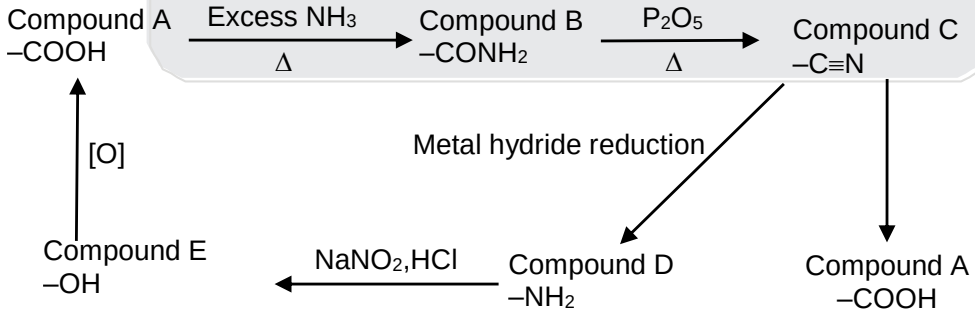


(A) –COOH, –NC, $–CONH_2$, $–NH_2$, $–CH_2OH$ (B) –COOH, –CN, –CONH, $–NH_2$, $–CH_2OH$

(C) –COOH, $–CONH_2$, –CN, $–CH_2NH$, $–CH_2OH$ (D) $–CONH_2$, –COOR, –NC, –NHR, > CHOH

Ans. (C)

Sol.



3. The correct sequence of reagents which would convert-p-Nitrotoluene to p-Iodobenzoic acid is

(A) (i) Br_2 + $FeBr_2$, (ii), Mg in ether, then CO_2, (iii) $3H_2$ and Pt or catalyst, (iv) HNO_2, 0ºC, (v) KI solution

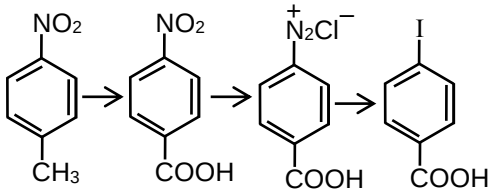
(B) (i) Br_2 in CCl_4 and heat, (ii) NaI in acetone, (iii) $3H_2$ and Pt or Ni catalyst, (iv) HNO_2, 0ºC, (v) H_3PO_2

(C) (i) 3 H_2 and Pt or Ni catalyst, (ii) HNO, 0ºC, (iii) Cu_2Br_2 + HBr, (iv) $KMnO_4$ and heat, (v) KI solution

(D) (i) $KMnO_4$ and heat, (ii) 3 H_2 and Pt or Ni catalyst, (iii) HNO_2, 0ºC, (iv) KI solution

Ans. (D)

Sol.



4. The results obtained by four students, each performing a set of four titrations with the same solution under identical condition are given below. If the expected titre value value is 20.0 mL, the set of data (mL) with good accuracy and poor precision is

(A) 19.9, 20.0, 20.1, 19.9 (B) 18.1, 18.2, 18.0, 18.1

(C) 17.9, 18.1, 21.5, 21.0 (D) 20.0, 19.8, 19.4, 20.2

Ans. **(D)**

Sol. **Good accuracy** ⇒ How close a given set of measurement are to their ture value.

Good precision ⇒ How close the measurements are to each other or it is description of random error a measure of statistical variability.

5. The statement that is NOT correct about atomic spectra is

(A) Electric discharge through gases produce line spectra

(B) Each element in the gaseous state has a unique line spectrum

(C) The number of lines in the spectrum is same as the number of electrons in the atom

(D) Atoms can emit photons with wavelength lower than that of visible light

Ans. **(C)**

Sol. Number of lines in spectrum depends on energy level in which electron are present.

6. A closed 2.0 L container initially holds 3.0 mol or $O_2(g)$ and 2.0 mol of $N_2(g)$ at room temperature T. If the pressure remains constant when 1.0 mol of $O_2(g)$ is added, the final temperature of the system is- (Assume ideal gas behavior throughout)

(A) (3/5)T (B) (5/6)T (C) 2T (D) (6/5)T

Ans. **(B)**

Sol. V = 2L

O_2 = 3 mol

N_2 = 2 mol

P = constant

1 mol O_2 added

Final temp. = ?

V = constant

$n_1T_1 = n_2T_2$

$5 \times T = 6 \times T_2$

$T_2 = \frac{5}{6}T$

7. The equilibrium constant (K_C) for trimerization of phenyl acetylene to triphenyl benzene is 3.0 at 310 K. If at equilibrium, 0.9 mol dm^{-3} of triphenyl benzene is present, concentration of phenyl acetylene at equilibrium is:

(A) 1/3 mol dm^{-3} (B) 3.0 mol dm^{-3} (C) 1.732 mol dm^{-3} (D) 0.67 mol dm^{-3}

Ans. **(D)**

Sol. $3A \rightleftharpoons A_3 \qquad K = 3 = \frac{[A_3]}{[A]^3} = \frac{0.9}{[A]^3}$

$[A]^3 = \frac{3}{10}$

$[A] = [\text{Phenyl acetylene}]_{eq} = 0.67 \text{ mol/dm}^3$

8. At 298 K, the standard free energies of formation of cis- and trans-1,2-dichloroethene are 41.549 kJ and 33.235 kJ respectively. The most appropriate mol ratio of trans- and cis-isomers at equilibrium at 298 K is

(A) 10 : 3 (B) 3 : 10 (C) 28 : 1 (D) 1.28

Ans. (C)

Sol. At 298 K

ΔG_F^0 (cis 1,2-dichlorobenzene) = 41.589 kJ

ΔG_F^0 (trans 1,2-dichlorobenzene) = 33.235 kJ

cis 1,2-dichlorobenzene $\rightleftharpoons$ trans 1,2-dichlorobenzene

$\Delta G^0_{reaction} = \Delta G_F^0$ (trans-form) – ΔG_F^0 (cis-form)

= 33.235 – 41.549

= –8.314 kJ = –8314 J

$\Delta G^0_{reaction} = -2.303\ RT \log K_{eq} = -8314$

$\log K_{eq} = \left(\frac{8314}{2.303 \times 8.314 \times 298}\right) = 1.457$

$K_{eq} = 28$

$K_{eq} = \frac{[trans]}{[cis]} = \left(\frac{28}{1}\right)$

9. The pH of the solution produced by complete consumption of 10 mL of 0.4 M NaOH to 'x' mL of 0.5 M CH_3COOH was found to be 4.57. The value of 'x' (mL) is (Given-K_a of $CH_3COOH = 1.8 \times 10^{-5}$).

(A) 12.0 (B) 10.4 (C) 19.8 (D) 6.5

Ans. (C)

Sol. NaOH solution CH_3COOH solution

10 ml, 0.4 M NaOH 'X' ml 0.5 M CH_3COOH

$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

(0.5 × X) 0.4 × 10 – –

(0.5 X – 4)

This act as acidic buffer solution

$$pH = pKa + \log \frac{[CH_3COONa]}{[CH_3COOH]}$$

$$4.57 = 4.74 + \log\left(\frac{4}{n_{CH_3COOH}}\right)$$

$$\log\left\{\frac{n_{CH_3COOH}}{4}\right\} = 0.17$$

$$\log(n_{CH_3COOH}) = (\log 4 + 0.17)$$

$$\log(n_{CH_3COOH}) = 0.60 + 0.17 = 0.77$$

$$n_{CH_3COOH} = 5.9$$

$$(0.5x - 4) = 5.9$$

$$0.5x = 9.9$$

$$x = 19.8 \text{ ml}$$

10. The correct order of concentrations of the ions/molecules present in 1.0 L of 1.0 M $H_2SO_4(aq)$ solution is

(A) $OH^- < SO_4^{2-} < HSO_4^- < H_3O^+ < H_2O$ (B) $OH^- < HSO_4^- < SO_4^{2-} < H_3O^+ < H_2O$

(C) $H_2O < HSO_4^- < OH^- < SO_4^{2-} < H_3O^+$ (D) $H_2O < OH^- < SO_4^{2-} < HSO_4^- < H_3O^+$

Ans. (A)

Sol. $H_2SO_4 \Rightarrow$ 1M, 1Lit

H_2SO_4	$\longrightarrow$	$H^+ + HSO_4^-$	$k_a, = \infty$
1M		-	-
0		1M	1M
HSO_4^-	$\longrightarrow$	$H^+ + SO_4^{2-}$	
1M		1	–
(1-x)		(1+x)	x

So $[H_2O] > [H_3O^+] > [HSO_4^-] > [SO_4^{2-}] > [OH^-]$

$[H_2O] \approx 55.5$

11. The pOH of the solution obtained by mixing 30 mL of a strong monobasic acid of pH 3.0 and 70 mL of a strong monoacidic base of pH 12.0 at 298 K is

(A) 3.17 (B) 2.17 (C) 5.17 (D) 0.17

Ans. (B)

Sol. 30 ml of monobasic acid (strong), (pH = 3) + 70 ml of strong monoacidic base, (pH = 12 or pOH = 2)

$V_1 = 30$ $N_1 = [H^+] = 10^{-3}$ $V_2 = 70$ $N_2 = [OH^-] = 10^{-2}$

milieq. of $[H^+] = N_1V_1 = 10^{-3} \times 30$

milieq. of $[OH^-] = N_2V_2 = 10^{-2} \times 70$

$$[OH^-]_{resultant} = \frac{70x10^{-2} - 30x10^{-3}}{70+30}$$

$$[OH^-] = \frac{0.7 - 0.03}{100} = 0.67 \times 10^{-2}\ M$$

pOH = 2 – log.67 = 2.17

12. If refractive index, density, pressure, volume, heat capacity and surface tension are represented respectively as η, ρ, P, V, Q and γ, the set that contains only intensive properties is

(A) η, ρ, γ, Q (B) ρ, P, Q, γ (C) V, Q, η, ρ (D) η, ρ, P, γ

Ans. (D)

Sol. Intensive properties = refractive Index, density, pressure, surface tension $\Rightarrow \eta, \rho, P, \gamma$

13. Heat of reaction and heat of formation will be the same in

I. $1/2\ N_2(g) + O_2(g) \rightarrow NO_2(g)$

II. $Xe(g) + 2F_2(g) \rightarrow XeF_4(g)$

III. $N_2(g) + O_3(g) \rightarrow N_2O_3(g)$

IV. $C(diamond) + O_2(g) \rightarrow CO_2(g)$

(A) Only I (B) Only I and II (C) Only I, II and III (D) Only II, III and IV

Ans. (B)

Sol. Heat of reaction = Heat of formation, represent only in :

(I) $\frac{1}{2}N_2 + O_2 \rightarrow NO_2$

(II) $Xe + 2F_2 \rightarrow XeF_4$

Only I & II

14. From the following data :

$2CH_6N_2(\ell) + 5O_2(g) \rightarrow 2N_2(g) + 2CO_2(g) + 6H_2O(g)$ $(\Delta H^\circ_r = -2606\ kJ)$

and $H_2O(\ell) \rightarrow H_2O(g)$ $(\Delta H^\circ_v = 44\ kJ\ mol^{-1})$

Heat of combustion of CH_6N_2 at 298 K can be calculated as

(A) –1567 kJ mol^{-1} (B) –1435 kJ mol^{-1} (C) –1171 kJ mol^{-1} (D) –2342 kJ mol^{-1}

Ans. (B)

Sol. $2CH_6N_2(\ell) + 5O_2(g) \rightarrow 2N_2(g) + 2CO_2(g) + 6H_2O(g)$ $(\Delta H^\circ_r = -2606\ kJ)$ …….. (i)

$H_2O(\ell) \rightarrow H_2O(g)$ $(\Delta H^\circ_v = 44\ kJ\ mol^{-1})$ …….. (ii)

Heat of combination of CH_6N_2 at 298K

$CH_6N_2(\ell) + \frac{5}{2}O_2(g) \rightarrow N_2(g) + CO_2(g) + 3H_2O(\ell)$ $\Delta H_C = ?$ …….. (iii)

Eq. (iii) = $\frac{1}{2}$ eq. (i) – 3 × eq. (ii)

$= \frac{-2606}{2} - 3 \times 44$

$= -1303 - 132 = -1435\ kJ/mol$

15. When 100 g each of the salts NaCl, $MgSO_4$, $Ca(NO_3)_2$, K_2CO_3, were dissolved separately in 1.0 kg of water, the solution with the highest boiling point will be of

(A) $Ca(NO_3)_2$ (B) $MgSO_4$ (C) NaCl (D) K_2CO_3

Ans. (C)

Sol.

Compound	i	Molar mass	Moles(n) for 100 g of each	n × i
NaCl	2	58.5	$\frac{100}{58.5}$	$\frac{100}{58.5} \times 2 = 3.4$
$MgSO_4$	2	120	$\frac{100}{120}$	$\frac{100}{120} \times 2 = 1.6$
$Ca(NO_3)_2$	3	164	$\frac{100}{164}$	$\frac{100}{164} \times 3 = 1.8$
K_2CO_3	3	138	$\frac{100}{138}$	$\frac{100}{138} \times 3 = 2.17$

Order of mole = $NaCl > MgSO_4 > K_2CO_3 > Ca(NO_3)_2$

Order of n × i = $NaCl > K_2CO_3 > Ca(NO_3)_2 > MgSO_4$

$\Delta T_b = K_b \frac{n \times i}{w} \times 1000$

$n \times i \uparrow$, $\Delta T_b \uparrow$, $BP \uparrow$

16. When the pH of the system is increased by 2.0 units, maximum decrease in half cell potential for the reaction will be observed in

(A) $V^{2+}(aq) \rightarrow V^{3+}(aq) + e^-$ (B) $VO_3^- + 2H^+ \rightarrow VO_2^+ + H_2O$

(C) $VO^{2+} + 2H^+ + e^- \rightarrow V^{3+}(aq) + H_2O$ (D) $VO^{2+} + H_2O \rightarrow VO_2^+ + 2H^+ + e^-$

Ans. (C)

Sol. pH increased by 2 unit maximum decreases in potential

pH↑, $[H^+]$ decreases

$VO^{+2} + 2H^+ + e^- \rightarrow V^{+2} + H_2O$

$$Q = \frac{[V^{+2}]}{[VO^{+2}][H^+]^2}$$

Q increases, E decreases in only option (C).

17. The reaction that takes place during charging of the lead storage cell is given below

$$2PbSO_4(s) + 2H_2O(\ell) \rightarrow Pb(s) + PbO(s) + 2H_2SO_4(aq)$$

If a current of 10.0 A is passed for 1.50 h for charging, the amount of $PbSO_4$ reacted is

(A) 25.0 g (B) 56.0 g (C) 120.5 g (D) 170.0 g

Ans. (D)

Sol. i = 10A

t = 1.5 hr

= 1.5 x 60 x 60 sec

$2PbSO_4(s) + 2H_2O(\ell) \rightarrow Pb(s) + PbO(s) + 2H_2SO_4(aq.)$ n=2

q = i x t

= 15 x 60 x 60 C

= 0.56 F = 0.56 mole of electron

If 1 mole of electron is produced, 1 mol $PbSO_4$ will be consume

so, n $PbSO_4$ = 0.56 mole

wt. $PbSO_4$ = 0.56 × 304 = 170 gm

18. A sample of water from a water tank has a resistance of 100 Ω at 298 K, when placed a conductivity cell of cell constant 0.2 m^{-1}. On dissolving 58.5 g of NaCl in the water tank, a sample of this solution gave a resistance of 40 Ω. The molar conductivity of NaCl at this concentration is 10 $\Omega^{-1} m^2 mol^{-1}$. The volume of water in the water tank is

(A) 3.33×10^6 L (B) 3333.3 L (C) 363.5 L (D) 4.2×10^5 L

Ans. (A)

Sol. R=100Ω

Cell constant $\left(\frac{\ell}{a}\right) = 0.2\ \Omega^{-1}$

$M_{NaCl} = \frac{58.5}{58.5 \times V_{lit}}$

$K_{H_2O} = \left(\frac{\ell}{a}\right) \times \frac{1}{R} = 0.2 \times \frac{1}{100} = 2x10^{-3}\ \Omega^{-1}\ m^{-1}$

$(\lambda_M)_{NaCl} = \frac{K_{NaCl} \times 1000}{M} \{K_{Nacl} = K_{sol.} - K_{H_2O}\}$

$K_{sol.} = \left(\frac{\ell}{a}\right) \times \frac{1}{R} = 0.2 \times \frac{1}{40} = 5x10^{-3}\ \Omega^{-1}$

$(\lambda_M)_{NaCl} = \frac{K_{NaCl} \times 10^{-3}}{M}$

$10 = \frac{(5-2) \times 10^{-3} \times 10^{-3}}{M}$

$M = 3 \times 10^{-7}\ \frac{mole}{Lit}$

$\frac{1}{V_{Lit}} = 3 \times 10^{-4}$

$V_{Lit} = \frac{10^7}{3} = \frac{10 \times 10^6}{3} = 3.33 \times 10^6$ Lit

19. Initial concentration of the reactions and the corresponding half-lives for the reaction P + Q → R are given below. The rate law for the reaction is

Entry	$[P_0]$ (mol $dm^{-3} \times 10^{-6}$)	$[Q_0]$ (mol $dm^{-3} \times 10^{-6}$)	$t_{1/2}$(s)
1	500	10	30
2	500	20	60
3	10	500	60
4	20	500	60

(A) dR/dt = k[P] (B) dR/dt = k[P]/[Q] (C) dR/dt = k[Q] (D) –d[P]/dt = k[P]/[Q]

Ans. (A)

Sol. $t_{1/2} \propto (C_o)^{1-n}$

when Q_0 is double $t_{1/2}$ is doubled $\frac{60}{30} = \left(\frac{20}{10}\right)^{1-n}$

$2^1 = (2)^{1-n}$

1 = n = 1

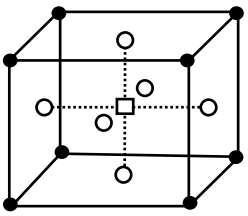
n = 0

Zero order with respect to Q_0.

When P_0 is doubled, half life is unchanged so it is first order reaction with respect to P_0.

So $\left(\frac{dR}{dt}\right) = K\ [P]^1$

20. The unit cell structure of a mineral perovskite crystallizes in cubic unit cell wherein calcium (filled circles) and oxide (hollow circles) constitute a cubic close packing (ccp) arrangement and titanium ion (hollow square) occupies an interstitial hole as shown below. (Charges are omitted for simplicity). The empirical formula of this compound is



(A) Ca_2TiO_3 (B) Ca_4TiO_6 (C) $CaTiO_3$ (D) Ca_4TiO_6

Ans. (C)

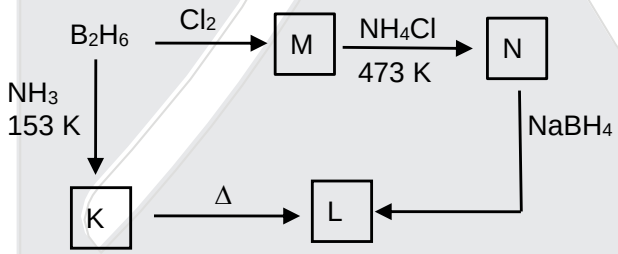
Sol. In CCP: Ca^{+2} at corner $\Rightarrow 8 \times \frac{1}{8} = 1$

O^{-2} at face center $= 6 \times \frac{1}{2} = 3$

Ti^{+4} at body center $= 1 \times 1 = 1$

So, formula is $CaTiO_3$.

21. Study the sequence of reactions of diborane (B_2H_6) given below and identify the products K, L and N. (The shown reagents are taken in excess).



(A) K = BNH_6; L = (BN)x; M = B_2H_3Cl; N = $B_3N_3H_3Cl_3$

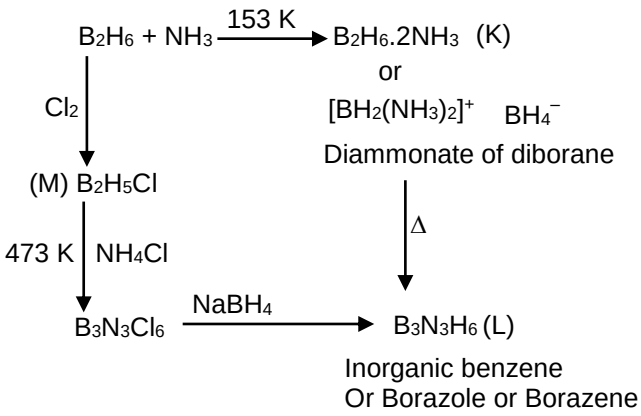
(B) K = [$B_2H_6.2NH_3$]; L = $B_3N_3H_6$); M = B_2H_3Cl; N = $B_3N_3Cl_6$

(C) K = BNH_6; L = (BN)x; M = BCl_3; N = $B_3N_3Cl_6$

(D) K = [$B_2H_6.2NH_3$]; L = $B_3N_3H_6$; M = BCl_3; N = $B_3N_3H_3Cl_3$

Ans. (B)

Sol.



22. During extraction of gold, the gold ore is treated with aqueous KCN solution as shown by the equations (not balanced) below to get compound X which is further reduced by Zn to obtains compound Y and metallic gold. Identify X and Y.

Gold ore + CN^- + H_2O + O_2 → [X] + OH^- ..... (i)

[X] + Zn → [Y] + Au ..... (ii)

(A) X = $[Au(CN)_2]^-$, Y = $[Zn(CN)_2]^{2-}$ (B) X = $[Au(CN)_2]^-$, Y = $[Zn(CN)_4]^{2-}$

(C) X = $[Au(CN)_4]^{3-}$, Y = $[Zn(CN)_4]^{2-}$ (D) X = $[Au(CN)_2]^-$, Y = $[Zn(CN)_4]^{4-}$

Ans. (B)

Sol. Gold ore + CN^- + H_2O + $O_2 \longrightarrow [Au(CN)_2]^- \xrightarrow{Zn} Au + [Zn(CN)_4]^{-2}$

23. The correct IUPAC name for the complex $[Au(en)_2(H_2O)_2]$ $[Au(ox)_3]$ is (en = ethylenediamine a ox = oxalate)

(A) Bisaquobisethylenediaminegold (III) trioxalatoaurate (III)

(B) Diaquobisethylenediamineaurate (III) trisoxalatogold (III)

(C) Bisaquodiathylenediamineaurate (III) trisoxalatogold (III)

(D) Diaquobisethylenediaminegold (III) trioxalatoaurate (III)

Ans. (D)

Sol. $[\overset{+3}{Au}(en)_2(H_2O)_2][\overset{+3}{Au}(ox)_3]$

Diaquobisdiethylenediaminegold(III) trioxalatoaurate(III)

24. Addition of dil. HCl to an aqueous solution of a mixture of two inorganic salts yielded white precipitate **E** and filtrate **F**. Precipitate **E** dissolved in hot water **F** in alkaline alizarin gives a positive red lake test. The cations present in the precipitate E and solution **F** respectively are

(A) Ag^+ ; Fe^{3+} (B) Hg^{2+} ; Ba^{2+} (C) Pb^{2+} ; Al^{3+} (D) Pb^{2+} ; Zn^{2+}

Ans. (C)

Sol. $Pb^{+2} \xrightarrow{HCl}$ $PbCl_2$ (White ppt soluble in hot water)

Al^{+3} given red lake test in alkaline alizarin

25. Br_2 disproportionates to Br^- and BrO_3^- in a hot alkaline solution as

$3Br_2 + 6OH^- \rightarrow 5Br^- + BrO_3^- + 3H_2O$

the equivalent weight of Br_2 is: (M = molar mas of Br_2)

(A) M/5 (B) M/6 (C) 3M/5 (D) 5M/3

Ans. (C)

Sol. $Br_2 \longrightarrow Br^-$

n factor = 2 = n_1

$Br_2 \longrightarrow BrO_3^-$

n factor = 10 = n_2

$$\frac{1}{n} = \frac{1}{2} + \frac{1}{10}$$

$$n = \frac{20}{12} = \frac{5}{3}$$

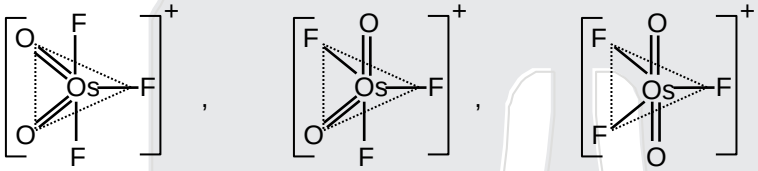
$$\text{Equivalent mass} = \frac{M}{\text{n factor}} = \frac{M}{5/3} = \frac{3M}{5}$$

26. The number of all the possible geometrical isomers for trigonal bipyramidal $OsO_2F_3^+$ cation is:

(A) 2 (B) 3 (C) 1 (D) 4

Ans. (B)

Sol. $OsO_2F_3^+ \Rightarrow$ It have trigonalbipyramidal structure



Possible Geometrical isomer = 3

27. The correct order for the wavelength of absorption in the following complex ions is

(A) $[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$ (B) $[Ni(NO_2)_6]^{4-} < [Ni(NH_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+}$

(C) $[Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+} < [Ni(NO_2)_6]^{4-}$ (D) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$

Ans. (A)

Sol. Ligand strength: $H_2O < NH_3 < NO_2^-$

As ligand strength increases, Δ increases, $\lambda_{ab.}$ decreases

so order of wave length of light absorbed is $H_2O > NH_3 > NO_2^-$

28. Mixing of an aqueous salt solution containing nitrate ion with ferrous ion followed by gentle addition of conc. sulphuric acid from the sides of the test tube, results in brown coloration at the interface is due to

(A) interaction of ferrous ion with nitric oxide

(B) interaction between the resulting nascent oxygen, ferrous ion and nitrate ion

(C) formation of ferrous ion and nitrogen dioxide

(D) complex formation between ferrous ion and nitrate ion

Ans. (A)

Sol. $NO_3^- + Fe^{+2} + H_2SO_4 \rightarrow [Fe(H_2O)_5NO^+]SO_4$

Brown ring test (Fe^{+2} + NO charge transfer)

Brown ring test : When a freshly prepared saturated solution of iron (II) sulphate is added to nitrate solution and then concentrated H_2SO_4 is added slowly from the side of the test tube, a **brown ring** is obtained at the junction of two layers.

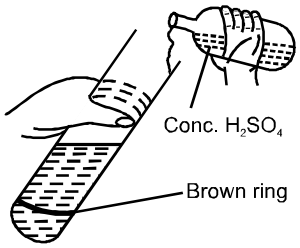


Figure : Brown ring test

$NaNO_3 + H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$

$6FeSO_4 + 2HNO_3 + 3H_2SO_4 \longrightarrow 3Fe_2(SO_4)_3 + 2NO + 4H_2O$

or $2NO_3^- + 4H_2SO_4 + 6Fe^{2+} \longrightarrow 6Fe^{3+} + 2NO \downarrow + 4SO_4^{2-} + 4H_2O.$

$Fe^{2+} + NO \uparrow + 5H_2O \longrightarrow$ **$[Fe^{I}(H_2O)_5\ NO^+]^{2+}$ (brown ring).**

29. Aqueous solution of hydrogen sulphide and sulphur dioxide when mixed together gives

(A) bisulphite ion and water (B) hydrogen and sulphurous acid

(C) sulphur and water (D) hydrogen peroxide and sulphur

Ans. (C)

Sol. $H_2S + SO_2 \rightarrow S + H_2O$

30. The ion with least coagulation value for arsenous sulphide sol is

(A) SO_4^{2-} (B) PO_4^{3-} (C) Al^{3+} (D) Ba^{2+}

Ans. (C)

Sol. $As_2S_3 \rightarrow$ Negative colloid for coagulation positive ion is required.

Al^{+3} has more charge so more coagulating power & less coagulation value.

31. The correct order of catenation property among the following is

(A) Pb > Si > Ge > Sn (B) Pb > Sn > Ge > Si (C) Si > Sn > Ge > Pb (D) Si > Ge > Sn > Pb

Ans. (D)

Sol. Order of catenation property : Si > Ge > Sn > Pb

32. An agriculturist wants to use different concentrations of phosphorus as a fertilizer using P_4O_{10}. The correct expression to calculate P from P_4O_{10} is

(A) $P_4O_{10} \times 2.29$ (B) $P \times 0.44$ (C) $P \times 2.29$ (D) $P_4O_{10} \times 0.44$

Ans. (D)

Sol. % of P in $P_4O_{10} = \left[\frac{4\times 31}{124+160}\right] 100 = 0.44$

so P from P_4O_{10} is = $0.44 \times P_4O_{10}$

33. Given below are same names of the compounds.

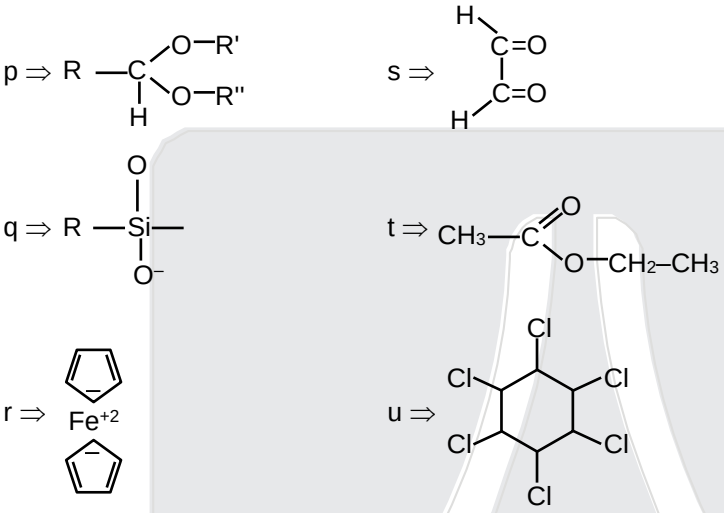
(p) Acetals ; (q) silicones ; (r) ferrocene ; (s) glyoxal, (t) ethyl acetate, (u) gammaxene

The set which is **NOT** having a double bond between an element and O(E=O where E is any element in the periodic table) as a functional group is

(A) p, s, u, t (B) p, q, r, s (C) q, r, s, t (D) p, q, r, u

Ans. (D)

Sol.

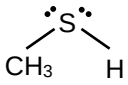


34. Hybridization of S in CH_3SH molecule is :

(A) dsp^3 (B) sp^2 (C) sp^3 (D) sp^3d

Ans. (C)

Sol. CH_3SH



According to Drago rule there is no hybridrsation of (S) in this compound but from given option suitable answer is sp^3.

35. Using different reaction conditions nickel reacts with (p) Cl^-, (q) CN^-, (r) CO and (s) small amount of Al. Choose **incorrect** statement.

(A) (p), (q) and (r) respectively can result in tetrahedral, octahedral and square planar geometries around nickel

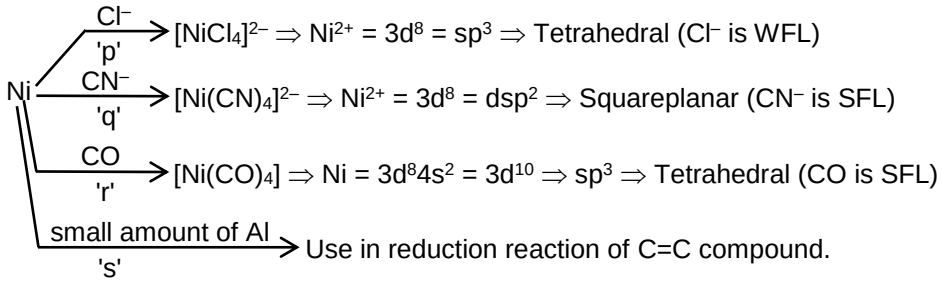
(B) Ligand (p) and (q) leads to homoleptic complex formation wherein final electronic configuration shows maximum multiplicity in case of (p)

(C) Ligand (r) reacts only in reducing medium to from organometallic compound

(D) In case of (s) formation of spongy product with large surface drive reduction of C=C compounds

Ans. (A)

Sol.



36. Optically pure 2-butanol has a specific rotation of +13.52 degrees. A synthesized and purified sample of 2-butanol has the observed specific rotation of +6.76 degrees. The correct statement based on this observation is

(A) the sample is completely racemized
(B) 25% of the sample is racemic
(C) 50% of the sample is racemic
(D) 6.76 of the sample is racemic

Ans. (C)

Sol. Specific rotation of pure 2-butanol = +13.52º

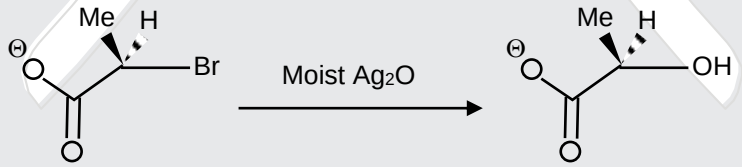
Observed rotation of pure sample = +6.76º.

Optical purity = $\frac{6.76}{13.52}$ = 50%

50% of the sample is pure (+) 2-butanol

50% of the sample is racemic.

37. Certain organic reactions proceed through formation of intermediates which are highly strained and reactive. Given the following reaction, the correct statement about the mechanism of the reaction is



(A) Intramolecular S_N2 attact by -COO^- to from an intermediate followed by the attact by HO^- via S_N2 pathway on the intermediate

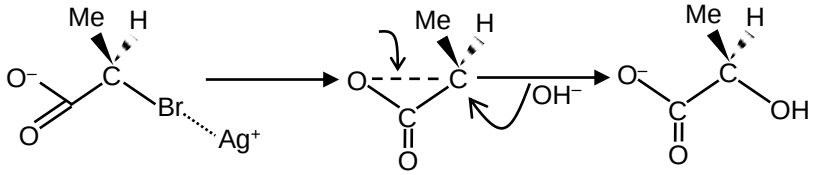
(B) Intramolecular S_N2 attack by -COO^- to from an intermediate followed by the attact by HO^- via S_NI pathway on the intermediate

(C) HO^- attacks via S_N1 pathway on the reactant

(D) HO^- attacks via S_N2 pathway on the reactant

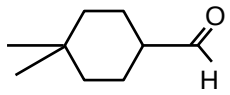
Ans. (A)

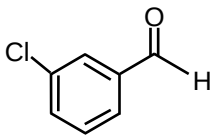
Sol.

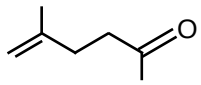


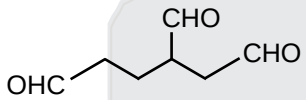
Here O^- of $–COO^-$ group is carried out intra molecular S_N2 attack due to neighboring group participation.

38. Which of the following compound is **NOT** named correctly according to the IUPAC nomenclature?

(A)  3,3-Dimenthylcyclopentanecarbaldehyde

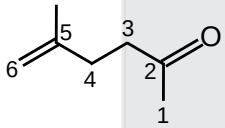
(B)  3-Chlorobenzaldehyde

(C)  3-Methyl-1-penten-4-one

(D)  Butane-1,2,4-tricarbaldehyde

Ans. (C)

Sol. Correct IUPAC Name is



5-Methylhex-5-en-2-one

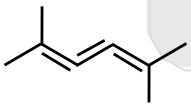
39. Which of the following compound contains the maximum number of sp^2 hybridized carbon atoms?

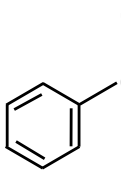
(A) 1, 4-Cyclohexadiene (B) 2, 5-dimethyl-2,3,4-hexatriene

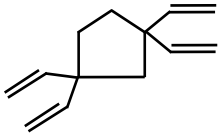
(C) Benzaldehyde (D) 1, 1-diallyl-3,3-divinylcyclopentane

Ans. (D)

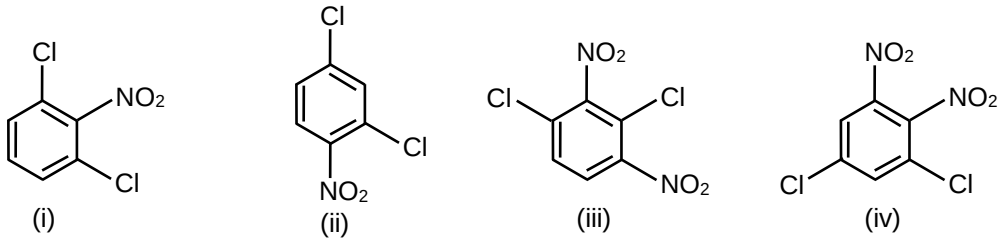
Sol.  = 4 sp^2 carbon.

 = 2 sp^2 carbon.

 = 7 sp^2 carbon.

 = 8 sp^2 carbon.

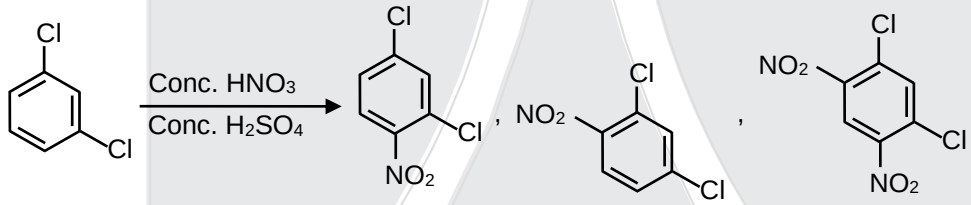
40. The number of products from the following, which cannot be formed on nitration of 1-3-dichlorobenzene with a mixture of concentrated nitric acid and sulfuric acid is



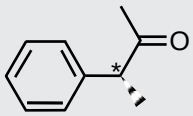
(A) Four (B) Three (C) Two (D) One

Ans. (A)

Sol.



41. Optically pure 3-phenyl-2butanone (X) with the following structure is treated with methyl magnesium iodide in anhydrous ether. The product formed after acidic hydrolysis is

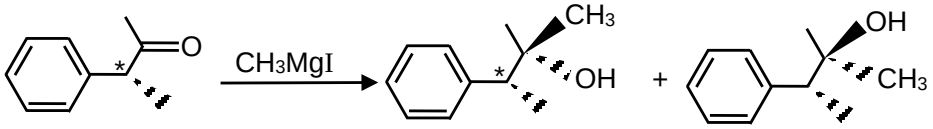


[X]
3-phenyl-2-butanone

(A) diastereomeric mixture of alcohols (B) optically pure alcohol
(C) racemic mixture of alcohols (D) optically inactive alcohol

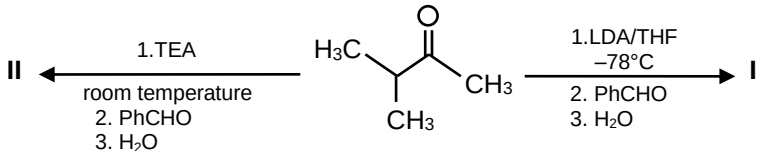
Ans. (B)

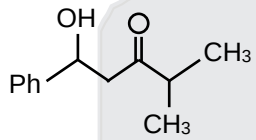
Sol.

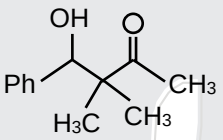


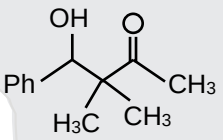
Optically pure
3-Phenyl-2-butanone
(x)

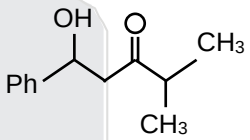
42. Aldehydes react with carbonyl compound in the presence of bases by a mechanism similar to aldol condensation. Given below is the reaction of benzaldehyde with 3-methyl-2-butanone in the presence of lithium diisopropylamide (LDA), a strong bulky base and triethyl amine (TEA), a weak base. The correct structures of the major products, I and II formed in the following reactions are respectively.

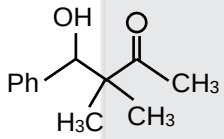


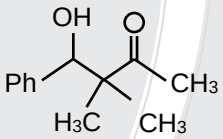
(A) 

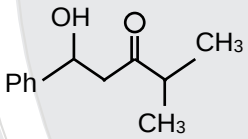


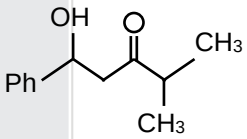
(B) 



(C) 

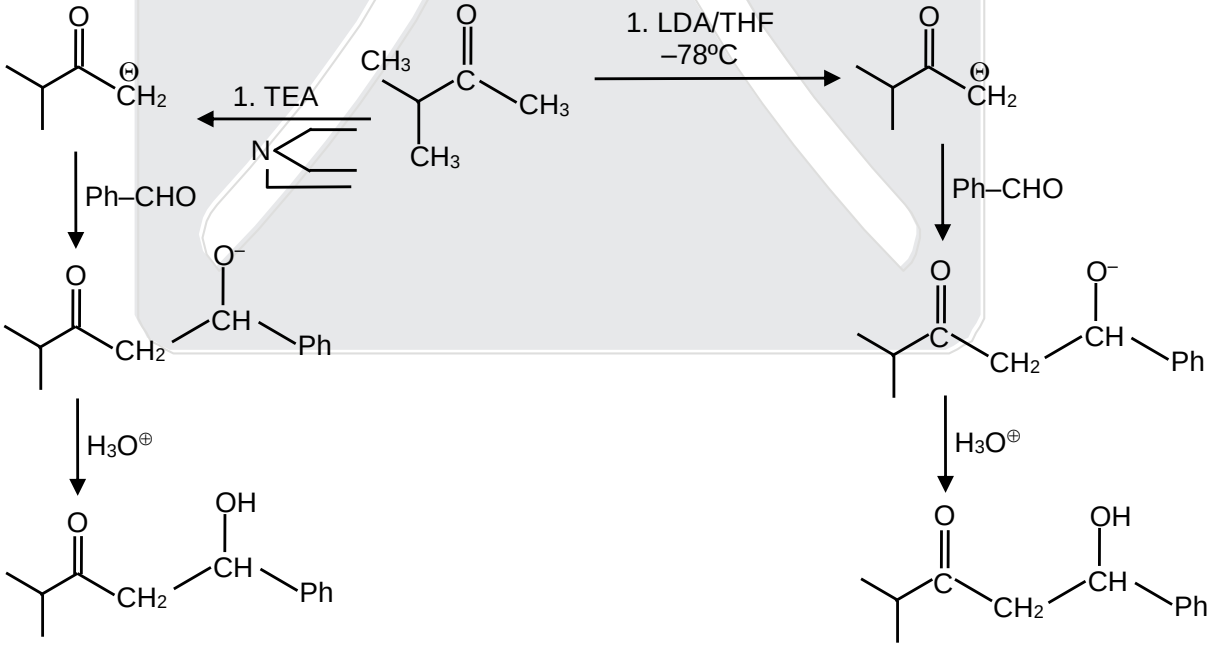


(D) 



Ans. (D)

Sol.



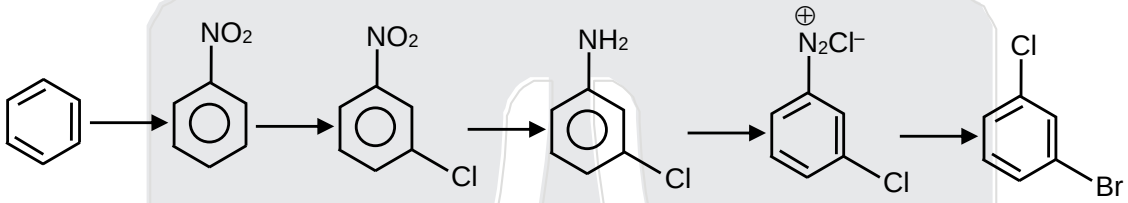
43. The correct order of the given reagents to convert benzene to m-Chlorobromobenzene is

(1) sulfuric acid (conc.) and heat	(2) Cl_2 + $FeCl_3$ and heat	(3) $NaNO_2$ + H_3O_+ 0°C	(4) H_2, Pt catalyst	(5) Mg in either
(6) PBr_3	(7) H_3PO_2(aq.)	(8) HNO_3 (conc.) + H_2SO_4 (conc.) and heat	(9) Cu_2Br_2 + HBr	(10) $(CH_3CO)_2O$ + pyridine

(A) 1, 2, 5, 6 and 7 (B) 2, 8, 4, 3 and 9 (C) 8, 4, 10, 2, 3 and 9 (D) 8, 2, 4, 3 and 9

Ans. (D)

Sol.



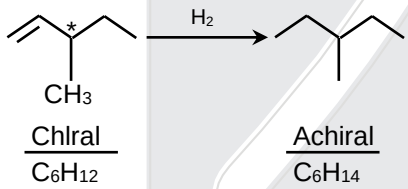
44. A chiral hydrocarbon (Molecular formula C_6H_{12}) undergoes catalytic hydrogenation to yield an achiral product (Molecular formula C_6H_{14}). The chiral hydrocarbon is :

(A) cis–2–hexane (B) 3–methyl–2–pentene

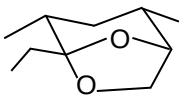
(C) 4–methyl–2–pentene (D) 3–methyl–1–pentene

Ans. (D)

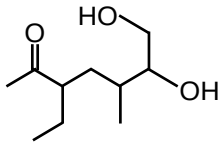
Sol.

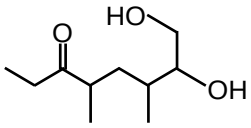


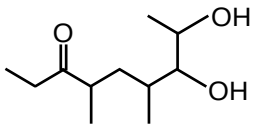
45. The structure of multistriatin, a pheromone of the elm bark beetle, is shown beside. The open chain ketodiol that on dehydriative cyclization gives multistriatin, bicyclic ketal (ignore stereo chemical aspects) is

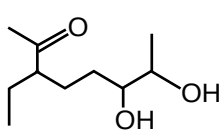


Multistriatin

(A) 

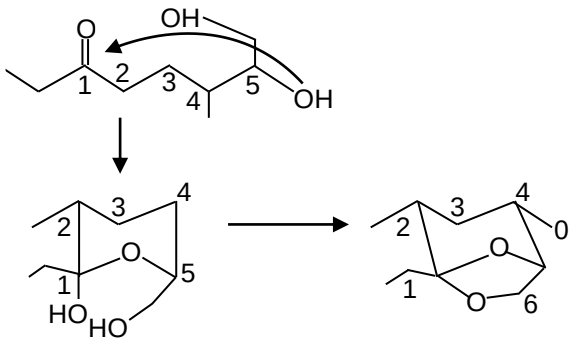
(B) 

(C) 

(D) 

Ans. (B)

Sol.



46. A monobasic acid (0.100 g) on complete combustion gave 0.252 g of CO_2 and 0.044 g of H_2O. For complete neutralization of 0.122 g of the acid, 10.0 mL of 0.1 M NaOH solution was required. Molecular formula of the acid is

(A) $C_7H_6O_2$ (B) $C_6H_7O_2$ (C) $C_7H_7O_2$ (D) $C_6H_6O_2$

Ans. (A)

Sol. $C_XH_YO_Z + O_2(g) \longrightarrow XCO_2 + \frac{Y}{2}H_2O$

0.100 gram 0.252 gram 0.44 gram

$$n_{CO_2} = \left[\frac{0.252}{44}\right] = 0.00573$$

$n_C = 0.00573 \Rightarrow W_C = 0.00573 \times 12 = 0.069$ gram

$$n_{H_2O} = \frac{0.044}{18} = 0.0024$$

$n_H = 2 \times 0.0024 = 0.0048$ & $W_H = 0.0048$ gram

so weight of oxygen = 0.0262 gram = 0.00163 mole

For neutrazation reaction

$RCOOH + NaOH \longrightarrow RCOONa + H_2O$

Mili eq. of acid = mili eq. of NaOH

$$\left(\frac{0.122}{M_{acid}}\right)10^3 = 0.1 \times 10$$

$M_{acid} = 122$

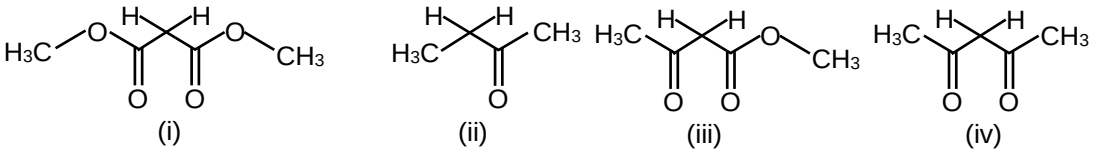
	Mole	Simple ratio	Simplest whole no. ratio
C	0.00573	3.5	7
H	0.0049	3	6
O	0.00163	1	2

Empirical formula = $C_7H_6O_2$

Empirical formula mass = 122

so molecular formula = $C_7H_6O_2$

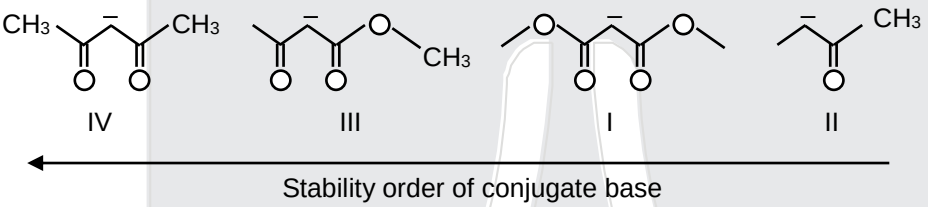
47. Acidity of acidic compounds depend on the stability of their conjugate bases. The correct order of acidity of the underlined H in the following compound is (**Note:** Assume that all the compounds exist in the keto form)



(A) (ii) > (iii) > (iv) > (i)
(B) (iv) > (iii) > (i) > (ii)
(C) (iii) > (ii) > (iv) > (i)
(D) (i) > (iii) > (iv) > (ii)

Ans. (B)

Sol.



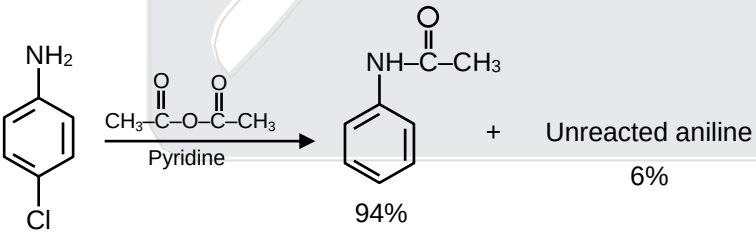
48. Reaction of para–Chloroaniline with acetic anhydride in pyridine gave a crude mixture of 94% of para–chloroacetanilide and 6% unreacted amine.

From the following, the best treatement suitable for purification of para–chloroacetanilide is

(A) treating the reaction mixture with methyl iodide
(B) washing an ether solution of the crude product with concentrated brine (aq. NaCl)
(C) washing an ether solution of the crude product with 5% cold aqueous sulfuric acid
(D) washing an ether solution of the crude product with 5% aqueous sodium carbonate

Ans. (C)

Sol.



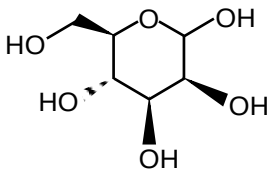
Unreacted aniline form anilinium ion in 5% cold aqueous sulfuric acid and it get dissolved.

PART-A2

ANY NUMBER OF OPTIONS 4, 3, 2 or 1 MAY BE CORRECT

MARKS WILL BE AWARDED ONLY IF ALL CORRECT OPTIONS ARE BUBBLED.

49. The correct statement/s about the pyranose form of a sugar (X) given below is/are :



(A) It exists in two anomoric pyranose forms

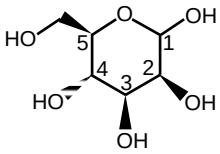
(B) It reacts with Tollens' reagent to give a silver mirror

(C) The penta–O–methyl derrvative of (X) is non reducing

(D) It resists reduction with aqueous sodium borohydride

Ans. (ABC)

Sol.

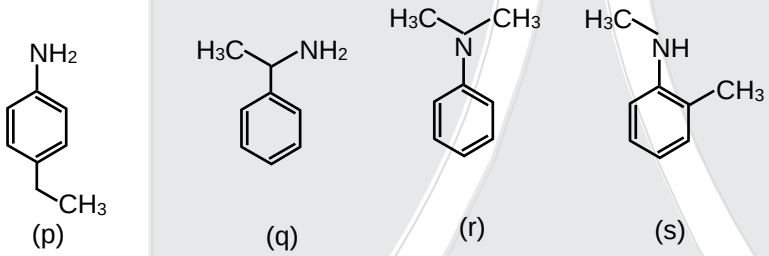


(i) C-1 is anomeric.

(ii) It has hemiacetal function group hence reducing sugar.

(iii) Its penta-O-methyl derivative is a glucocide. It has acetal linkage hence non reducing.

50. Given below are isomeric amines. The **incorrect** statement/s about them from the following is/are



(p) (q) (r) (s)

(A) (p) and (q) both will give unstable products respectively with $NaNO_2$ in HCl at 268 K

(B) Reaction of all amines with HCl is exothermic

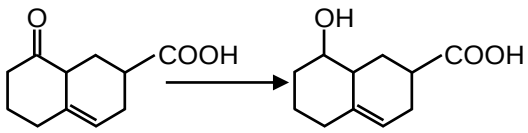
(C) Reaction of benzene sulphonyl chloride with (s) gives a solid product that is soluble in NaOH

(D) (q) has the highest basicity among these

Ans. (C)

Sol. (C) 2º amine gives solid product insoluble in NaOH.

51. Which one/s of the reduction techniques mentioned below is/are **NOT** suitable for the following



(A) $NaBH_4$ based reduction

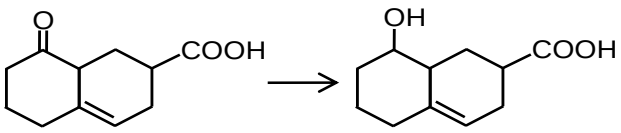
(B) $LiAlH_4$ based reduction

(C) DIBAL–H based reduction

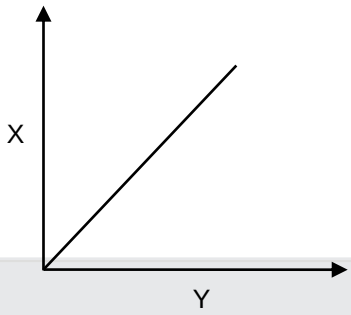
(D) B_2H_6 based reduction

Ans. (BD)

Sol.



52. Following is a qualitative plot that can represent kinetic data obtained with a reactant R where $[R]_0$ and [R] represent the concentrations of R, at t = 0 and t = t respectively. 'Y' and 'X' are suitable parameters on the x-and y-axes.



The correct representation of the curve is

	X	Y	order	X	Y	order
(A)	$[R]_0$–[R]	time	Zero	Rate	time	First
(B)	$[R]_0$–[R]	time	Zero	Initial rate	$[R]_0$	First
(C)	Rate	[R]	Zero	$t_{1/2}$	[R]	First
(D)	$t_{1/2}$	$[R]_0$	Zero	ln {$[R]_0$/[R]}	t	First

Ans. **(B,D)**

Sol. **(a)** $[R]_0 - [R] = kt$ (zero order)

But for first order $[R]_t = kC_t = kC_0e^{-kt}$ therefore decreases exponentially.

(b) $[R]_0 - [R] = kt$ (zero order)

$r_{initial} = k[R]_0$ (first order)

(c) For zero order rate does not depends on initial conc. (r = const).

For first order reaction $t_{½}$ does not depends upon initial conc. ($t_{½}$ = conc.)

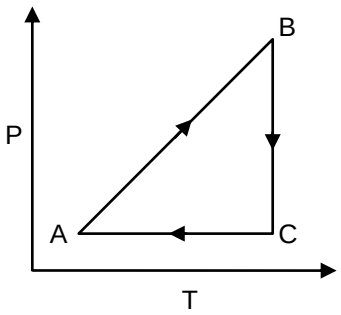
(d) $t_{½} = \dfrac{[R]_0}{2k}$ or $t_{½} \propto [R]_0$

Also for first order

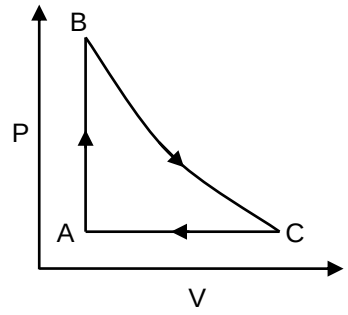
$$kt = \ln \frac{[R]_0}{[R]_t}$$

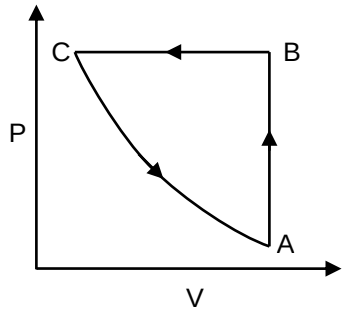
or $$\ln \frac{[R]_0}{[R]_t} \propto t$$

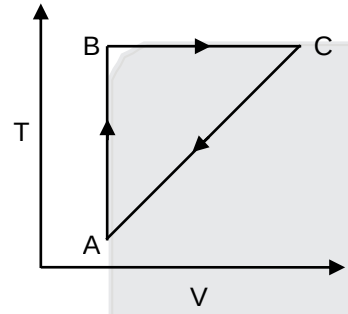
53. A given amount of an ideal gas undergoes the cyclic process ABCA as given below.

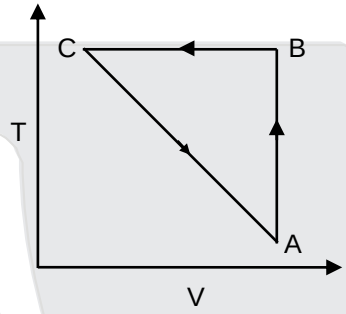


The equivalent representation/s of the same process is/are

(A)


(B)


(C)


(D)


Ans. (AC)

Sol. Graph Analysis

(I) For process AB

(i) Isochoric (V constant)

(ii) P ↑ T ↑

(II) For process BC

(i) Isothermal / expansion

(ii) P ↓ V ↑

(III) For process CA

(i) Isobaric

(ii) T ↓ V ↑

54. The correct statements among the following is/are

(A) When equal volumes of a solution containing Sr^{2+} (0.01 M) and another containing F^- (0.001 M) are mixed at 25ºC, SrF_2 will be precipitated (K_{sp} of SrF_2 = 8.0×10^{-10} at 25ºC) F^- (0.001 M) are mixed at 25ºC

(B) When equal volumes of a solution containing Ba^{2+} (1.0×10^{-4} M) and another containing F^- (1.0×10^{-2} M) are mixed at 25ºC, BaF_2 will be precipitated (K_{sp} of BaF_2 = 1.0×10^{-6} at 25ºC)

(C) The solubility product (K_{sp}) and the molar solubility (s) of $La(IO_3)_3$ are related as $K_{sp} = 27s^4$

(D) The solubility product and the molar solubility of $Ca_3(PO_4)_2$ are related as $27s^4$

Ans. (A & C)

Sol. (A) On mixing equal volume, new conc. will become half of the initial

$[Sr^{+2}] = \frac{0.01}{2}M = \frac{10^{-2}}{2}M$

$[F^-] = \frac{0.001}{2}M = \frac{10^{-3}}{2}M$

$IP_{SrF_2} = [Sr^{+2}][F^-]^2$

$= \frac{10^{-2}}{2} \times \left(\frac{10^{-3}}{2}\right)M$

$= \frac{1}{8} \times 10^{-8} = 1.25 \times 10^{-9} > k_{sp}$ of (SrF_2)

Therefore ppt. will occur

(B) Similarly $IP_{BaF_2} = \frac{10^{-4}}{2} \times \left(\frac{10^{-2}}{2}\right)^2$

$= \frac{1}{8} \times 10^{-8}$

$= 1.25 \times 10^{-9} < k_{sp}$ (BaF_2)

Therefore ppt. will not occur

(C) k_{sp} $La(IO_3)_3 = S\,(3S)^3 = 27S^4$

(D) k_{sp} $Ca_3(PO_4)_2 = (3S)^3\,(2S)^2 = 108S^5$

55. For the phenomenon of adsorption, the correct statement/s among the following is/are

(A) According to Freundlich model, mass of N_2 gas adsorbed per g of silica surface will increase with temperature of adsorption

(B) It S is the surface area of an adsorbent, and 'A' 'm' and 'M' are the cross–sectional area, mass adsorbed and molar mass of the adsorbed and molar mass of the adsorbate respectively, then $S = \left(\frac{m}{M}\right)AN_A$

(C) The number of gas molecules physisorbed on unit mass of an adsorbent will be the same for two different gases at the same temperature

(D) Adsorption of H_2 on Ni surface with E_a = 96 kJ mol^{-1} can be termed as chemisorption

Ans. (D)

Sol. (A) For Physical adsorption (Extent of adsorption) or $\frac{x}{m} \downarrow$ as T ↑

(B) It is not equal to the surface area, as 3D particles are getting adsorbed

(C) Extent of adsorption is different for different-different gases

(D) For chemical bond, bond energy > 42 kJ mol

56. When excess $KMnO_4$ is added to concentrated H_2SO_4, an oily green colored covalent compound Y is formed. Which of the following statements is/are true for the above reaction.

(A) Compound **Y** is formed by a dehydration reaction

(B) In compound **Y** Mn is octahedrally surrounded by oxygen atoms

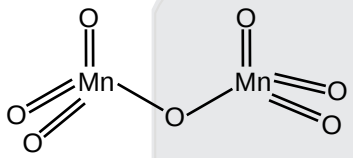
(C) **Y** is the highest oxide of Manganes

(D) Compound **Y** has Mn-O-Mn bridge

Ans. (ACD)

Sol. $KMnO_4 + H_2SO_4 \longrightarrow Mn_2O_7 + KHSO_4 + H_2O$

(conc.) [Y]



(7) Mn_2O_7

57. Read carefully all the three statements on defects in solids :

(i) In Frenkel defect, interstitial Ag^+ site is surrounded tetrahedrally by four Cl^- ions and four Ag^+ ions, where interstitial Ag^+ and Cl^- interaction is covalent

(ii) Addition of small amount of $SrCl_2$ in NaCl yields solid solution with a formula of $Na_{1-2x}Sr_xV_{Nax}Cl$, where V = valency

(iii) In general, Schottky defect increases the density of the substance

Choose the correct alternative(s).

(A) Statement (i) is correct

(B) Statement (ii) and (iii) are correct

(C) Statement (i) and (ii) are correct

(D) Statement (i) and (iii) are correct

Ans. (A)

Sol. (i) $\Rightarrow$ AgCl have rocksalt type structure & Ag^+ is actually present in octahedral void but due to Frenkel defect this defect this Ag^+ ion move in tetrahedral void. Where Ag^+ is surrounded tetrahedrally by four Cl^- ions and four Ag^+.

(ii) $\Rightarrow$ On dopping Sr^{2+} in NaCl one Sr^{2+} ion replace two Na^+ ion so one vacancy is created

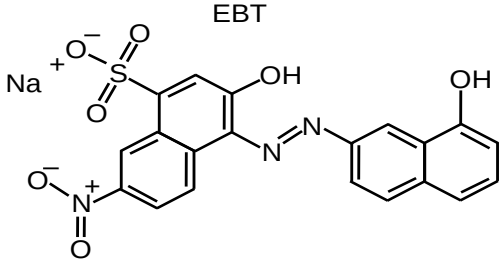
so Foramula $\Rightarrow$ $Na_{1-2a}Sr_aV_aCl$

(iii) $\Rightarrow$ Due to Schttoky defect density of solid decrease.

Note : In statement (ii) there is type error**. Ans. (A)**

58. Eeriochrome black T(EBT) is an indicator in titrimetric estimation of calcium at pH 10.0 giving pink colour to the solution. It has structure as shown below. Considering that the pH of solution is 10.0. Which statement(s) describe(s) the complexation of EBT with Ca(II) correctly.

EBT



pK_{a2} = 6.3, pK_{a3} = 11.5

(A) On dissociation of EBT, Ca(II) binds at SO_3 to form 1 : 2 complex

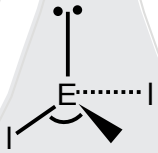
(B) Both sulphonate and nitro groups are involved in 1 : 1 complexation with Ca(II)

(C) EBT acts as a bidenate ligand to form a dianionic species, with deprotonation of one –OH, where Ca(II) binds to azide nitrogen and phenolic oxygen trans to $–NO_2$ group in 1 : 2 ratio.

(D) There is a mixture of complexes of Ca(II) with EBT acting as a bidentate and tridenate ligand.

Ans. (AD)

59. The correct statement(s) regarding three EI_3 molecules (where E=P, As or Sb) is/are :



(A) These compounds are formed by mutual sharing of electrons and hence considered as covalent compounds.

(B) PI_3 is most susceptible towards hydrolysis in water to give phosphorous acid

(C) SbI_3 has highest boiling point amongst all

(D) In AsI_3, there is least repulsion between bond pair and lone pair and thus has the largest I-E-I angle

Ans. (ABC)

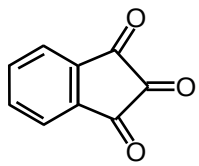
Sol. (A) These are covalent compound

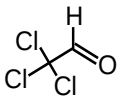
(B) $PI_3 + H_2O \longrightarrow H_3PO_3 + HI$

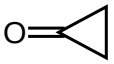
(C) Molar mass ↑, Vander waal's force ↑, B.P. ↑

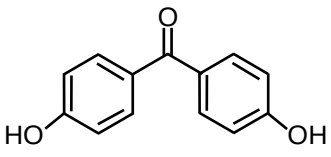
(D) Wrong statement

60. Aldehydes and ketones can react with water in the presence of an acid or base to yield an equilibrium mixture of the aldehyde/ketone and the corrects ponding hydrates (germinal diol). Among the following, the aldehyde/ketones which will have a greater percentage of the hydrate at equilibrium are

(A) 

(B) 

(C) 

(D) 

Ans. (ABC)

Resonance®
Educating for better tomorrow

SUCCESS AT
JEE (ADV.) / NEET (UG) 2022

RESONites ने फिर लहराया सफलता का परचम

STUDENTS FROM CLASSROOM PROGRAM (ONLINE / OFFLINE)

JEE (ADV.) 2022

AIR 6
KARTHIKEYA POLISETTY
Reso Roll No. 21925115
Course: i-VIJETA

AIR 8
DHEERAJ KURUKUNDA
Reso Roll No. 21925114
Course: i-VIJETA

NEET (UG) 2022

AIR 13
VRAJESH V. SHETTY
Reso Roll No. B20013403
Classroom Student (ResoBASE)

AIR 27
RISHIT AGARWAL
Reso Roll No. 21537750
Online Classroom Student

RRN: Reso Roll No.

8 ALL INDIA RANKS IN TOP-60

10 ALL INDIA RANKS IN TOP-1000

43.74% Selection Ratio in JEE (Advanced) 2022

86.92% Selection Ratio in NEET (UG) 2022

ADMISSION ANNOUNCEMENT
for Academic Session 2023-24

Target: JEE (Advanced) | JEE (Main)
NEET (UG) | PCCP (Class V to X)

Appear in Resonance National Entrance Test (ResoNET) & GET UPTO 100% SCHOLARSHIP

Enrol Now to get Early Fee Benefit

Scan QR to Apply Online

Resonance Eduventures Ltd.
Follow us at

Kota Study Centre & Registered Corporate Office:
CG Tower, A-46 & 52, IPIA, Near City Mall,
Jhalawar Road, Kota (Raj.) - 324005

0744-2777777, 2777700 | 83067 41444
Toll Free: 1800 258 5555 | **CIN:** U80302RJ2007PLC024029
e-mail: contact@resonance.ac.in | **visit:** www.resonance.ac.in