zigyan

PREVIOUS YEAR PAPER · 2022

OLYMPIAD · STAGE I

NSEC

National Standard Examination in Chemistry

2022

Question paper with official answer key

60	216	120 min	31
Questions	Maximum marks	Time	Paper code

Question paper and official answer key: Indian Association of Physics Teachers (IAPT), NSEC 2022, paper code 31.
Solutions and notes: Zigyan. This booklet is not an IAPT publication.

Prepare for the Olympiads with Zigyan

www.zigyan.com

zigyan

SCO No. 107, Sector 16, Faridabad, Haryana 121002
0129-4048800 · +91 92115 38800 · info@zigyan.com

zigyan

JEE 2026 RESULTS

OUR TOPPERS

When talent meets the right guidance.

Saksham Bishnoi and Sulokya Bibhuty - our JEE 2026 toppers from Zigyan, Sector 16 - with the programme they took and the rank they earned.



Rahul Kaushik Sir
Founder & Director, Zigyan Eduvision
23 years of teaching



Saksham Bishnoi

4 YEARS CLASSROOM

JEE ADVANCED 2026	JEE MAIN 2026
AIR 168	AIR 811
	99.95 percentile



Sulokya Bibhuty

3 YEARS CLASSROOM

JEE ADVANCED 2026	JEE MAIN 2026
AIR 1,315	AIR 1,095
	99.94 percentile

OLYMPIAD RESULTS

Above the Minimum Admissible Score - the national band for the subject

CHEMISTRY

- Sulokya Bibhuty — 3 Years Classroom
- Anay Gupta — 3 Years Classroom
- Akshat Khator — 3 Years Classroom
- Harshit Goyal — 4 Years Classroom
- Hardik Sharma — 3 Years Classroom
- Aarush Kumar — 1 Year Classroom

PHYSICS

- Sulokya Bibhuty — 3 Years Classroom
- Saksham Bishnoi — 4 Years Classroom

ASTRONOMY

- Sulokya Bibhuty — 3 Years Classroom

MATHEMATICS (IOQM)

- Priyanshi — 4 Years Classroom

Saksham Bishnoi qualified the Chemistry Olympiad twice and was selected for the Orientation-cum-Selection Camp at HBCSE, Mumbai.

16 selections	16 of 35	AIR 168
in JEE Advanced 2026	students of the batch selected	best JEE Advanced rank

Start where they started.

Register for ZEST - ₹200 · www.zigyan.com/scholarship/zest

+91 92115 38800
info@zigyan.com

Given in the question paper

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,	$R = 0.082\ L\ atm\ mol^{-1}\ K^{-1}$ $= 8.314\ J\ mol^{-1}\ K^{-1}$

PART A-1 · ONE CORRECT OPTION

Q. 1 – 48 · +3 for a correct answer, –1 for a wrong one

1. The results obtained by four students, each performing a set of four titrations with the same solution under identical conditions, are given below. If the expected titre 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

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

(A) Electric discharges 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 wavelengths lower than that of visible light

3. A closed 2.0 L container initially holds 3.0 mol of 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 behaviour throughout)

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

4. 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}

5. 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

6. The pH of the solution produced by complete consumption of 10 mL of 0.4 M NaOH to 'x' mL of 0.5M 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

7. 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) $H_2O < OH^- < SO_4^{2-} < HSO_4^- < H_3O^+$

8. 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

9. 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

10. 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

11. From the following data

$2CH_6N_2\ (\ell) + 5O_2\ (g) \rightarrow 2N_2\ (g) + 2CO_2\ (g) + 6H_2O\ (g)$ $(\Delta H^0_r = -2606\ kJ)$ and

$H_2O\ (\ell) \rightarrow H_2O\ (g)$ $(\Delta H^{\mathbf{0}}_{\mathbf{v}} = 44\ kJ\ mol^{-1})$

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

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

12. 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

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

14. 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

15. A sample of water from a water tank has a resistance of 100 Ω at 298 K, when placed in 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 $\Omega^{-1}m^2mol^{-1}$. The volume of water in the water tank is

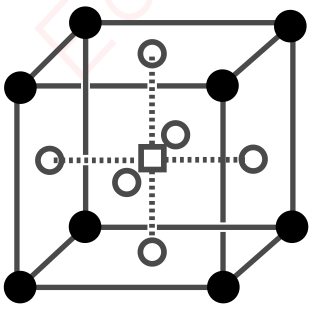
(A) 3.33×10^6 L (B) 3333.3 L (C) 363.5 L (D) 4.2×10^5L

16. Initial concentrations of the reactants 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

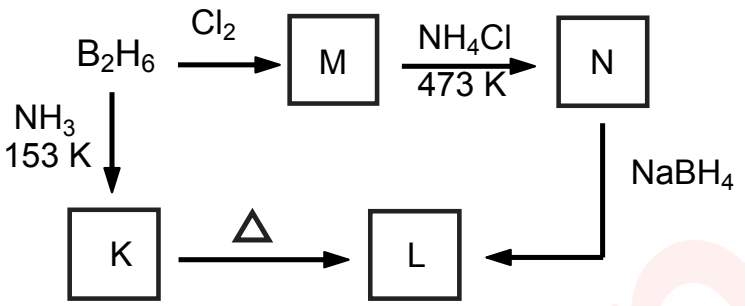
(A) dR/dt = k[P] (B) dR/dt = k[P]/[Q]
(C) dR/dt = k[Q] (D) −d[P]/dt = k[P]/[Q]

17. 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_8TiO_6

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



(A) **K** = BNH_6; **L** = (BN)x; **M** = B_2H_5Cl; **N** = $B_3N_3H_3Cl_3$

(B) **K** = $[B_2H_6.2NH_3]$; **L** = $B_3N_3H_6$; **M** = B_2H_5Cl; **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** = $B_3N_3H_3Cl_3$

19. 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 obtain compound Y and metallic gold. Identify X and Y.

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

$[X] + Zn \rightarrow [Y] + Au$ ..... (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 = $[Zn(CN)_4]^{4-}$

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

(A) Bisaquobisethylenediaminegold (III) trioxalatoaurate (III)

(B) Diaquobisethylenediamineaurate (III) trisoxalatogold (III)

(C) Bisaquodiethylenediamineaurate (III) trisoxalatogold (III)

(D) Diaquobisethylenediaminegold (III) trioxalatoaurate (III)

21. 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+}

22. 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 mass of Br_2)

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

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

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

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

(C) $[Ni(H_2O_6]^{2+} < [Ni(NH_3)_6]^{2+} < [Ni(NO_2)_6]^{4-}$

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

25. 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

26. Aqueous solutions 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

27. 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+}

28. 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

29. 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) $P_4O_{10} \times 0.44$

30. Given below are some 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

31. Hybridization of S in CH_3SH molecule is

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

32. 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 form organometallic compound

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

33. 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

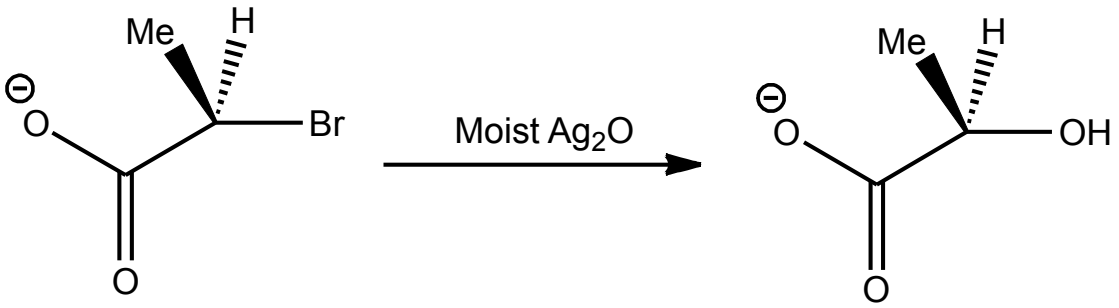
(A) the sample is completely racemized

(B) 25% of the sample is racemic

(C) 50% of the sample is racemic

(D) 6.76% of the sample is racemic

34. 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



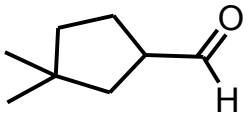
(A) Intramolecular S_N2 attack by $-COO^-$ to form an intermediate followed by the attack by HO^-via S_N2 pathway on the intermediate

(B) Intramolecular S_N2 attack by $-COO^-$ to form an intermediate followed by the attack by HO^- via S_N1 pathway on the intermediate

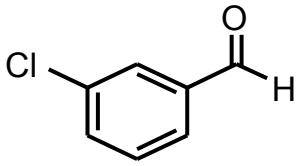
(C) HO^- attacks via S_N1 pathway on the reactant

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

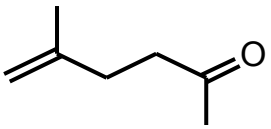
35. Which of the following compound is **NOT** named correctly according to the IUPAC nomenclature?

(A) 

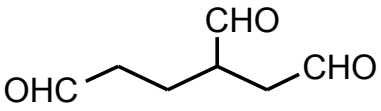
3,3 - Dimenthyl cyclopentanecar baldehyde

(B) 

3 - Chlorobenzaldehyde

(C) 

2 - Methy1-1-penten-4-one

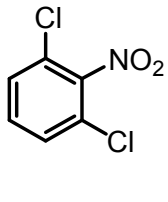
(D) 

Butane - 1,2,4-tricarbaldehyde

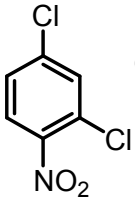
36. Which of the following compounds contains the maximum number of sp^2 hybridized carbon atoms?

(A) 1, 4-Cyclohexadiene
(B) 2, 5-dimethyl -2, 3, 4-hexatriene
(C) Benzaldehyde
(D) 1, 1-diallyl -3, 3-divinylcyclopentane

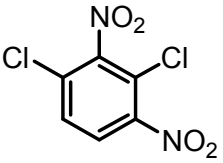
37. The number of products from the following, which cannot be formed on nitration of 1, 3-dichlorobenzene with a mixture of concentrated nitric acid and sulfuric acid is



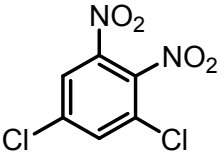
(i)



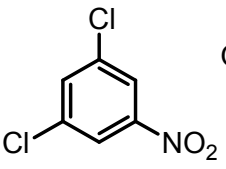
(ii)



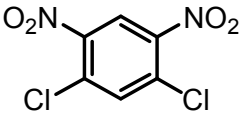
(iii)



(iv)



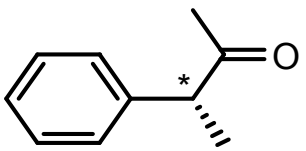
(v)



(vi)

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

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

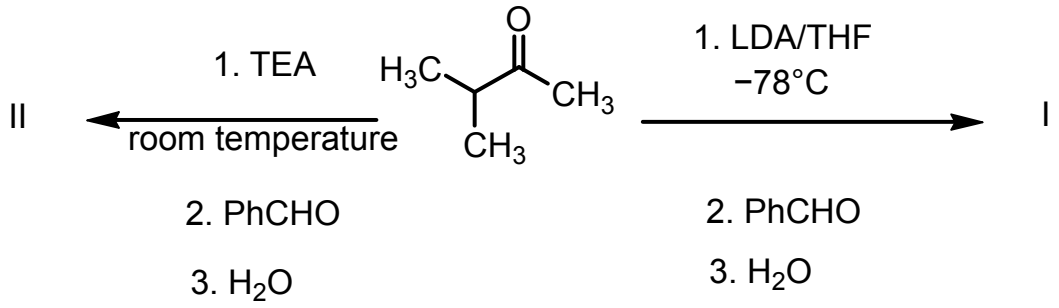


[X]

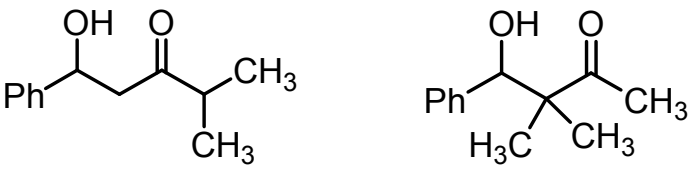
3-phenyl-2-butanone

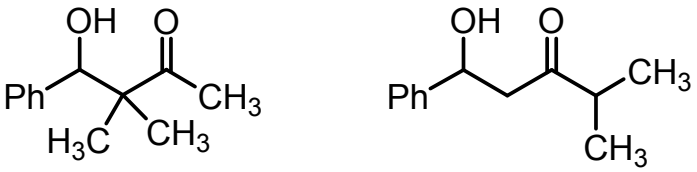
(A) diastereomeric mixture of alcohols
(B) optically pure alcohol
(C) racemic mixture of alcohols
(D) optically inactive alcohol

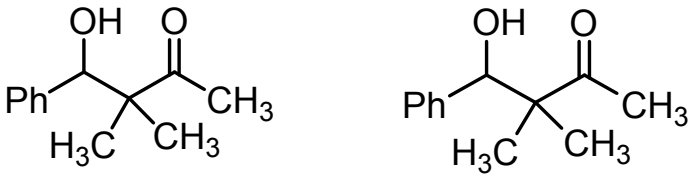
39. Aldehydes react with carbonyl compounds in the presence of bases by a mechanism similar to aldol condensation. Given below is the reaction of benzaldehyde with 3-methyl-2-butanone in the presence of lithium diisopropylamide (LDA), a strong bulky base and triethyl amine (TEA), a weak base. The correct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

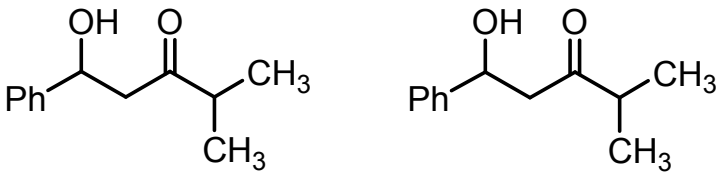


I **II**

(A) 

(B) 

(C) 

(D) 

40. 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 ether
(6) PBr_3	(7) H_3PO_2 (aqueous)	(8) HNO_3 (conc.) + H_2SO_4 (conc.) and heat	(9) Cu_2Br_2 + HBr	(10) $(CH_3CO)_2O$ + pyridine

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

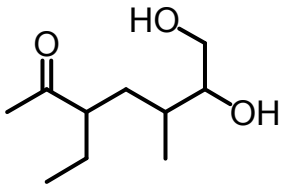
41. A chiral hydrocarbon (Molecular Formula C_6H_{12}) undergoes catalytic hydrogenation to yield an achiral product (Molecular Formula C_6H_{14}). The chiral hydrocarbon is

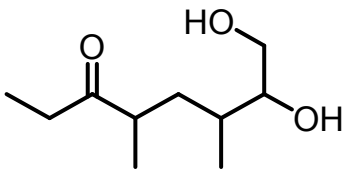
(A) *cis*-2-hexene
(B) 3-methyl-2-pentene
(C) 4-methyl-2-pentene
(D) 3-methyl-1-pentene

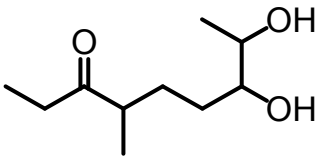
42. The structure of multistriatin, a pheromone of the elm bark beetle, is shown beside. The open chain ketodiol that on dehydrative cyclization gives multistriatin, bicyclic ketal (ignore stereo chemical aspects) is

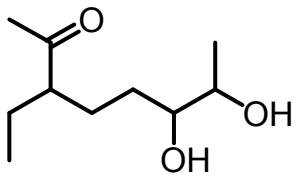


multistriatin

(A)


(B)


(C)


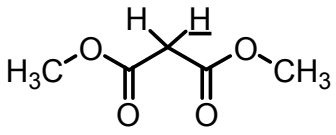
(D)


43. 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 mLof 0.1M NaOH solution was required. Molecular formula of the acid is

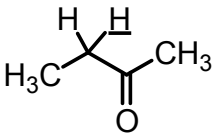
(A) $C_7H_6O_2$
(B) $C_6H_7O_2$
(C) $C_7H_7O_2$
(D) $C_6H_6O_2$

44. Acidity of acidic compounds depend on the stability of their conjugate bases. The correct order of acidity of the underlined H in the following compounds is

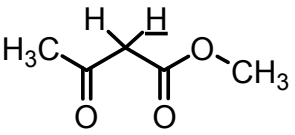
(Note: Assume that all the compounds exist in the keto form)



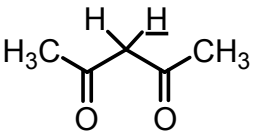
(i)



(ii)



(iii)



(iv)

(A) (ii) > (iii) > (iv) > (i)

(B) (iv) > (iii) > (i) > (ii)

(C) (iii) > (ii) > (iv) > (i)

(D) (i) > (iii) > (iv) > (ii)

45. 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 treatment suitable for purification of *para*-chloroacetanilide is

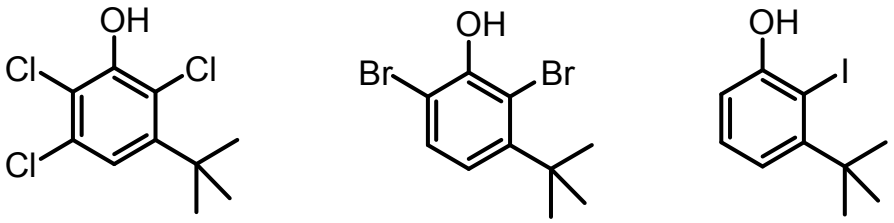
(A) treating the reaction mixture with methyl iodide

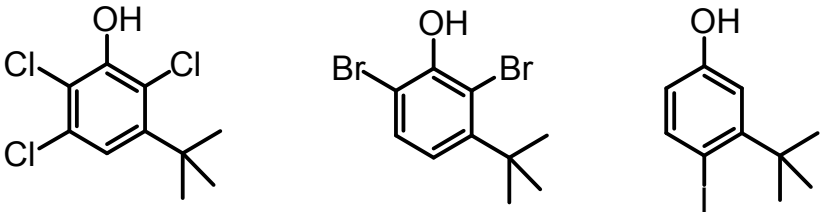
(B) washing an ether solution of the crude product with concentrated brine (aq. NaCl)

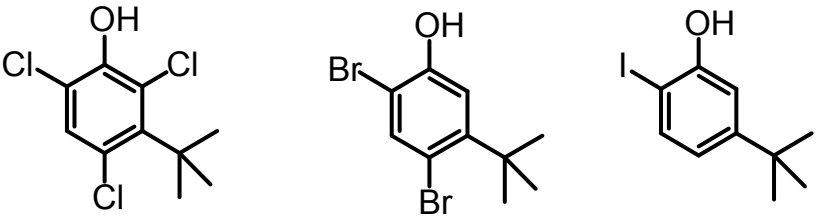
(C) washing an ether solution of the crude product with 5% cold aqueous sulfuric acid

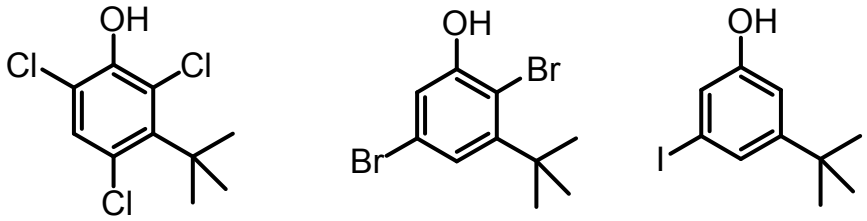
(D) washing an ether solution of the crude product with 5% aqueous sodium carbonate

46. 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) 

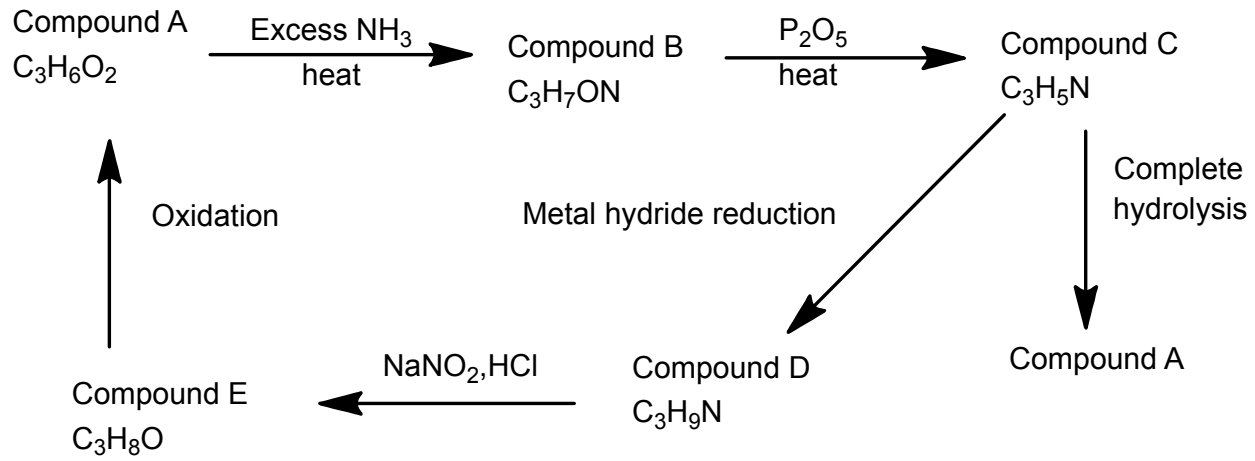
(B) 

(C) 

(D) 

47. Consider the following sequence of reactions:

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



(A) -COOH, -NC, $-CONH_2$, $-NH_2$, $-CH_2OH$

(B) -COOH, -CN, $-CONH_2$, $-NH_2$, $-CH_2OH$

(C) -COOH, $-CONH_2$, -CN, $-CH_2NH_2$, $-CH_2OH$

(D) $-CONH_2$, -COOR, -NC, -NHR, >CHOH

48. 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) 3 H_2 and Pt or Ni catalyst, (iv) HNO_2, 0°C, (v) KI solution

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

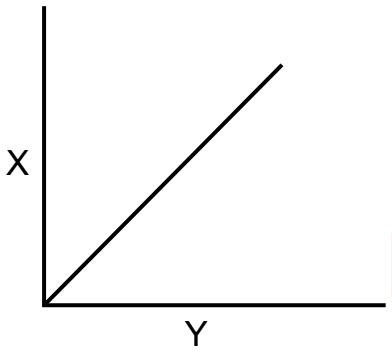
(C) (i) 3 H_2 and Pt or Ni catalyst, (ii) HNO_2, 0 °C, (iii) Cu_2Br_2 + HBr, (iv) $KMnO_4$ and heat, (v) KI solution

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

PART A-2 · ONE OR MORE CORRECT OPTIONS

Q. 49 – 60 · 6 marks only if all correct options are marked · no negative marking

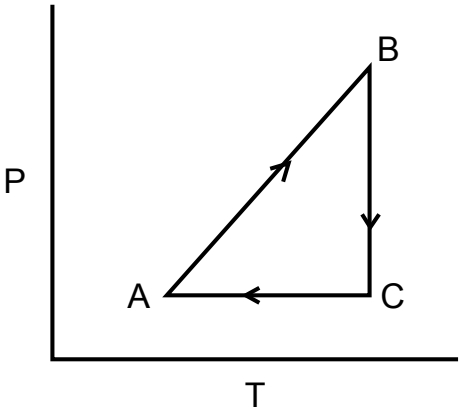
49. Following is a qualitative plot that can represent kinetic data obtained with a reactant R where $[R]_0$ and [R] represent the concentrations of R, at t = 0 and t = t respectively. 'Y' and 'X' are suitable parameters on the x- and y- axes.



The correct representation of the curve is

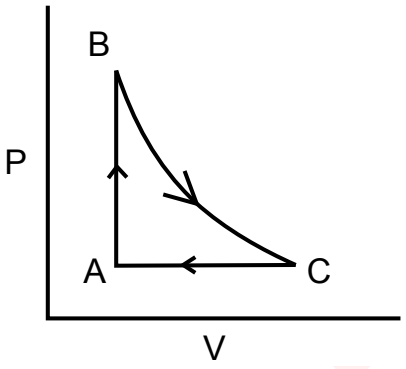
	X	Y	order	X	Y	order
(A)	$[R]_0 - [R]$	time	Zero	Rate	time	First
(B)	$[R]_0 - [R]$	time	Zero	Initial rate	$[R]_0$	First
(C)	Rate	[R]	Zero	$t_{1/2}$	[R]	First
(D)	$t_{1/2}$	[R]0	Zero	$\ln \{[R]_0 / [R]\}$	t	First

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

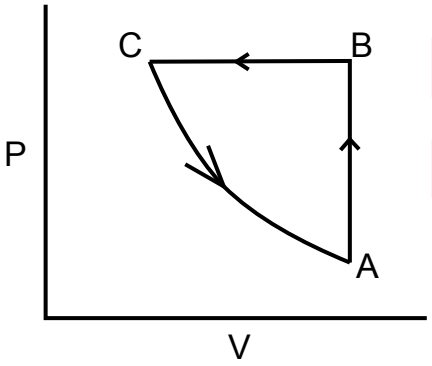


The equivalent representation/s of the same process is/are

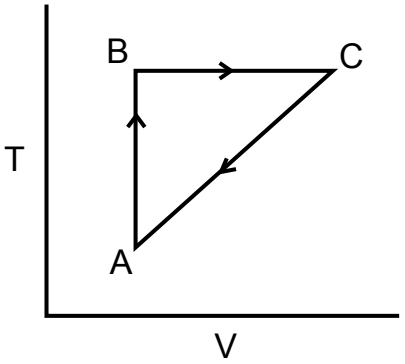
(A)



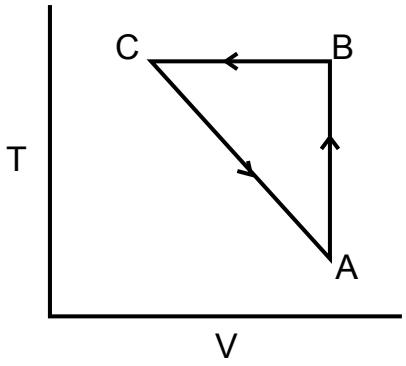
(B)



(C)



(D)



51. The correct statements among the following is /are

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

(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 25°C, BaF_2 will be precipitated (K_{sp} of $BaF_2 = 1.0 \times 10^{-6}$ at 25°C)

(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 $27s^4$

52. 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) If 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 adsorbate respectively, then $S = \left(\frac{m}{M}\right) AN_A$ (N_A-Avogadro's number)

(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

53. 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 Manganese

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

54. 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

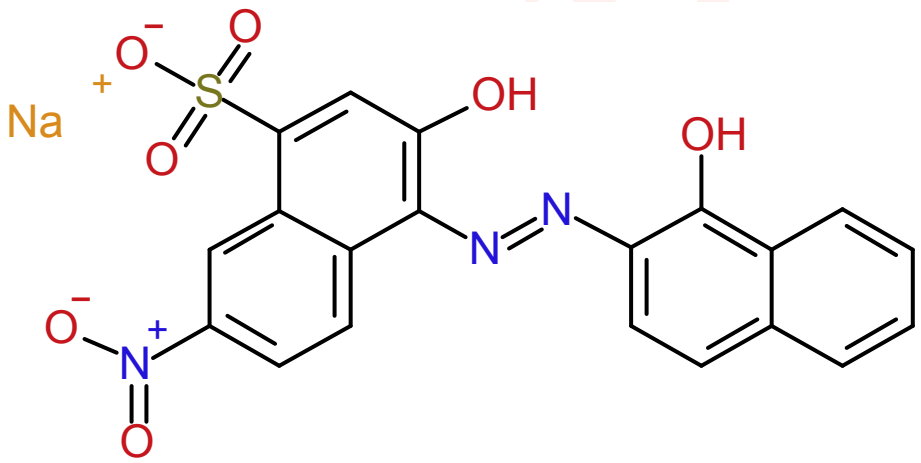
(B) Statements (ii) and (iii) are correct

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

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

55. Eriochrome 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



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

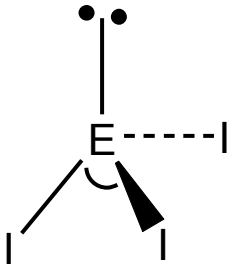
(A) On dissociation of EBT, Ca(II) binds at SO_3^- to form 1:2 complex

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

(C) EBT acts as a bidentate 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 tridentate ligand

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



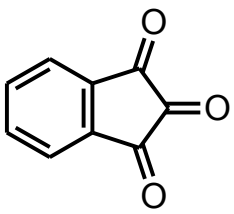
(A) These compounds are formed by mutual sharing of electrons and hence considered as covalent compounds

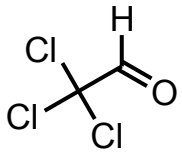
(B) PI_3 is most susceptible towards hydrolysis in water to give phosphorous acid

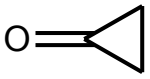
(C) SbI_3 has highest boiling point amongst all

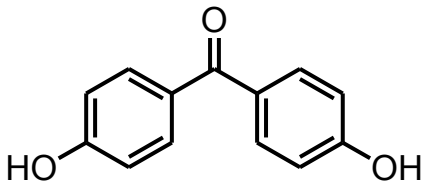
(D) In AsI_3, there is least repulsion between bond pair and lone pair and thus has the largest I-E-I angle

57. 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 corresponding hydrates (geminal diol). Among the following, the aldehyde/ketones which will have a greater percentage of the hydrate at equilibrium are

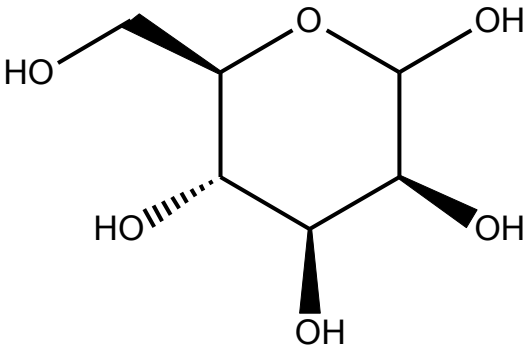
(A) 

(B) 

(C) 

(D) 

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



(X)

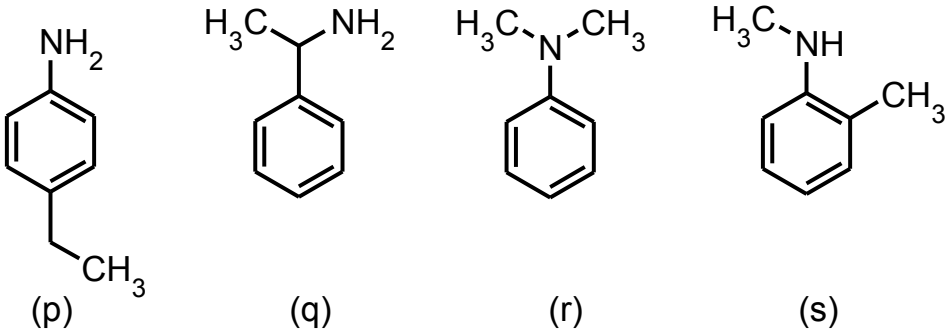
(A) It exists in two anomeric pyranose forms

(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

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



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

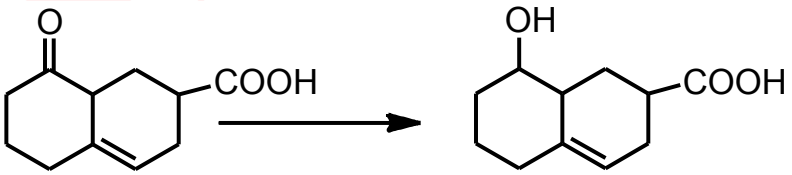
(A) (p) and (q) both will give unstable products respectively with $NaNO_2$ in HCl at 268 K

(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

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



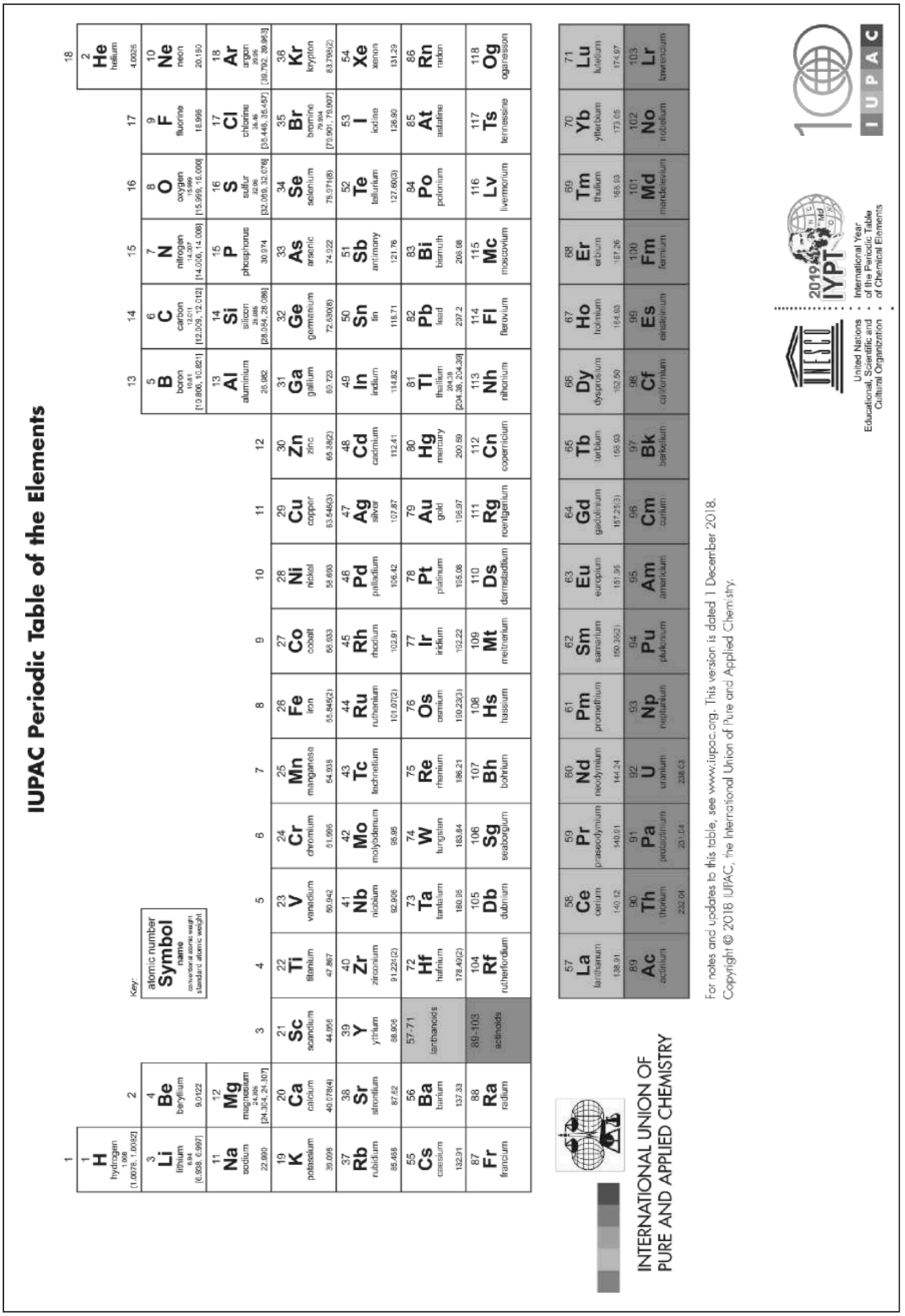
(A) $NaBH_4$ based reduction

(B) $LiAlH_4$ based reduction

(C) DIBAL-H based reduction

(D) B_2H_6 based reduction

Given in the question paper



ANSWER KEY

NSEC 2022 · PAPER CODE 31

60
QUESTIONS · 216 MARKS

IAPT final answer key for paper code 31. ★ marks an answer given as per Zigyan.

1	(D)	2	(C)	3	(B)	4	(D)	5	(C)
6	(C)	7	(A)	8	(B)	9	(D)	10	(B)
11	(B)	12	(C)	13	(C)	14	(D)★	15	(A)★
16	(A)★	17	(C)	18	(D)	19	(B)	20	(D)
21	(C)	22	(C)	23	(B)	24	(A)	25	(A)
26	(C)	27	(C)	28	(D)	29	(D)	30	(D)
31	(C)	32	(A)	33	(C)	34	(A)	35	(C)★
36	(D)	37	(C)	38	(B)	39	(A)	40	(D)
41	(D)	42	(B)	43	(A)	44	(B)	45	(C)
46	(C)	47	(C)	48	(D)	49	(B), (D)	50	(A), (C)
51	(A), (C)	52	(B), (D)	53	(A), (C), (D)	54	(A), (C)★	55	(C), (D)★
56	(A), (B)★	57	(A), (B), (C)	58	(A), (B), (C)	59	(A), (C)	60	(B), (C), (D)

★ Answers as per Zigyan

- **Q14** — As per Zigyan: (D); IAPT key (D).
- **Q15** — As per Zigyan: (A); IAPT key (A).
- **Q16** — As per Zigyan: (A); IAPT key (A).
- **Q35** — As per Zigyan: (C); IAPT key (C).
- **Q54** — As per Zigyan: (A), (C); IAPT key (A), (C).
- **Q55** — As per Zigyan: (C), (D); IAPT key (C), (D).
- **Q56** — As per Zigyan: (A), (B); IAPT key (A).

zigyan

OLYMPIADS · 2026

Olympiad results



TOP ACHIEVEMENT · CHEMISTRY

Qualified the Chemistry Olympiad twice, and selected for the HBCSE camp.

Saksham Bishnoi reached the national stage of the Chemistry Olympiad in two consecutive years and was selected for the Orientation-cum-Selection Camp at HBCSE, Mumbai. 4 Years Classroom - the same student who took AIR 168 in JEE Advanced 2026.

Qualified twice | HBCSE selection camp | Only student from Faridabad

Above MAS means above the **Minimum Admissible Score**: clearing it puts a student in the national band for their subject. It is a real threshold, not a participation marker.

CHEMISTRY · ABOVE MAS



Sulokya Bibhuty
Class XII
3 Years Classroom
Above MAS



Anay Gupta
Class XI
3 Years Classroom
Above MAS



Akshat Khator
Class XI
3 Years Classroom
Above MAS



Harshit Goyal
Class XII
4 Years Classroom
Above MAS



Hardik Sharma
Class XI
3 Years Classroom
Above MAS



Aarush Kumar
Class XII
1 Year Classroom
Above MAS

PHYSICS · ASTRONOMY · MATHEMATICS

PHYSICS



Sulokya Bibhuty
Class XII
3 Years Classroom
Above MAS

PHYSICS



Saksham Bishnoi
Class XII
4 Years Classroom
Above MAS

ASTRONOMY



Sulokya Bibhuty
Class XI
3 Years Classroom
Above MAS

MATHEMATICS · IOQM



Priyanshi
Class XI
4 Years Classroom
IOQM Qualifier

OLYMPIADS WE PREPARE STUDENTS FOR

NSEP	NSEC	NSEB	NSEA	IOQM	NSEJS
Physics	Chemistry	Biology	Astronomy	Mathematics	Class X and below

The olympiad pathway starts in Class 8.

NSEJS is open to Class 10 and below - the habit of staying with one hard problem is the one JEE Advanced rewards.

Zigyan Eduvision Pvt. Ltd. · SCO No. 107, Sector 16, Faridabad 121002
0129-4048800 · +91 92115 38800 · info@zigyan.com

zigyan

RESULTS · 2021 – 2026

Our toppers, year by year

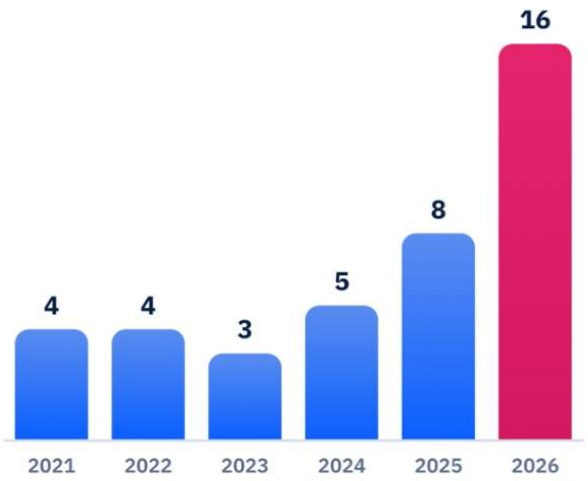
40
JEE Advanced selections in 6 years

AIR 168
best rank — Saksham Bishnoi, 2026

16 of 35
students selected, JEE Advanced 2026

14 of 35
above 98 percentile, JEE Main 2026

JEE ADVANCED SELECTIONS PER YEAR



BEST RANK EACH YEAR

YEAR	JEE ADVANCED	JEE MAIN
2026	**Saksham Bishnoi** AIR 168 · 4 Years Classroom	**Saksham Bishnoi** AIR 811 · 99.95 %ile
2025	**Chakshu** AIR 4,233 · 2 Years Classroom	**Chakshu** AIR 8,538 · 99.44 %ile
2024	**Harshit** AIR 777 · 2 Years Classroom	**Harshit** AIR 1,473 · 99.91 %ile
2023	**Aditya Jain** AIR 2,373 · 2 Years Classroom	**Aditya Jain** AIR 2,503 · 99.79 %ile
2022	**Rachit Sharma** AIR 698 · 1 Year Classroom	**Rachit Sharma** AIR 1,016 · 99.90 %ile
2021	**Sparsh Mittal** AIR 2,237 · 1 Year Classroom	**Sparsh Mittal** AIR 1,562

JEE ADVANCED 2026 — THIRTEEN NAMED SELECTIONS



Saksham Bishnoi
AIR 168
4 Years Classroom



Sulokya Bibhuty
AIR 1,315
3 Years Classroom



Aarush
AIR 2,699
1 Year Classroom



Manishka
AIR 2,869
4 Years Classroom



Oojit Kumar
AIR 5,765
4 Years Classroom



Harshit Goyal
AIR 6,407
4 Years Classroom



Pranab Sharma
AIR 6,750
3 Years Classroom



Aditya Dhar
AIR 15,183
3 Years Classroom



Arpit Anshuman
AIR 19,308
4 Years Classroom



Lokesh
AIR 22,857
3 Years Classroom



Arjun
AIR 24,674
3 Years Classroom



Sanyam Gulyani
AIR 25,123
1 Year Classroom



Saket
AIR 27,628
3 Years Classroom

Sixteen students of the 2026 batch were selected in JEE Advanced; the thirteen above are named with their All India Rank.

JEE MAIN 2026 — TOP SIX, WITH PERCENTILE



Saksham Bishnoi
AIR 811
99.95 %ile
4 Years Classroom



Sulokya Bibhuty
AIR 1,095
99.94 %ile
3 Years Classroom



Harshit Goyal
AIR 2,662
99.83 %ile
4 Years Classroom



Manishka
AIR 4,817
99.70 %ile
4 Years Classroom



Oojit Kumar
AIR 5,040
99.69 %ile
4 Years Classroom



Aarush
AIR 5,276
99.67 %ile
1 Year Classroom

14 of the 35 students in the 2026 batch scored above the 98th percentile in JEE Main.

Zigyan Eduvision Pvt. Ltd. · SCO No. 107, Sector 16, Faridabad 121002
0129-4048800 · +91 92115 38800 · info@zigyan.com