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PREVIOUS YEAR PAPER · 2024

OLYMPIAD · STAGE I

NSEC

National Standard Examination in Chemistry

2024

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 2024, paper code 31.
Solutions and notes: Zigyan. This booklet is not an IAPT publication.

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AIR 168	AIR 811
	99.95 percentile



Sulokya Bibhuty

3 YEARS CLASSROOM

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

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Given in the question paper

Useful constants

Charge of electron, $e = 1.602 \times 10^{-19} C$
Mass of electron, $m_e = 9.1 \times 10^{-31} kg$
Planck's constant, $h = 6.63 \times 10^{-34} J\ s$
Speed of light, $c = 3.0 \times 10^{8} ms^{-1}$
Avogadro constant, $N_A = 6.022 \times 10^{23} mol^{-1}$
Faraday constant $F = 96500\ C\ mol^{-1}$
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. A closed vessel with rigid walls contains 1.0 mol of component M (vapour pressure p_M^*): 0.9 mol liquid and 0.1 mol vapor. 0.1 mol of component N (vapour pressure p_N^*) is added slowly to maintain equilibrium conditions. Assume M and N form an ideal solution. The total pressure at the end of the addition will:

(A) decrease if $p_M^* < p_N^*$

(B) decrease irrespective of relation between p_M^* and p_N^*

(C) increase if $p_M^* < p_N^*$

(D) increase irrespective of relation between p_M^* and p_N^*

2. A scuba diver accidentally surfaces from a depth of 100 feet in water (pressure = 4 atm). The solubility of nitrogen from air (78% N_2 in air) in water in standard conditions is 15 mg L^{-1} at 37 °C. The volume of N_2 gas released into the bloodstream of the diver from each litre of blood is:

(Assume blood to behave similarly as water)

(A) 14 mL (B) 41 mL (C) 55 mL (D) 12 mL

3. A 35 degree drop in temperature from 25 °C causes a 8.2-fold decrease in the rate of a first order reaction. If the half-life of the reaction is 3.2 h, what will be the half-life at a temperature of –10°C?

(A) 12.8 h (B) 19.8 h (C) 26.2 h (D) 23.4 min

4. An ideal-gas reaction equilibrium is represented as A + B ⇌ C + D. Considering, the fact that all components are ideal and that only A and B are present initially, which of the following options is **ALWAYS true** at equilibrium? 'N' is the number of moles of the species.

(A) $N_C = N_A$ (B) $N_C + N_D = N_A + N_B$

(C) $N_C = N_D$ (D) $N_A = N_B$

5. Which of the following statements is **correct**?

(A) The addition of neon to a gas-phase reaction mixture at equilibrium at constant T and constant V does not alter the equilibrium.

(B) For a reversible reaction in a closed system with constant T and constant P if $\left(\frac{\partial G}{\partial \xi}\right)_{T,P} > 0$, the reaction proceeds in the reverse direction. Here 'ξ' is the extent of the reaction.

(C) Complete dissociation of a weak electrolyte takes place in the limit of infinite dilution in aqueous solution.

(D) The standard state of a species is always a pure substance.

6. Consider the following statements about the given mechanism:

$$A + B \rightarrow C + D$$
$$2C \rightarrow F$$
$$F + B \rightarrow 2A + G$$

(i) The overall reaction is **3B → 2D + G**

(ii) A is a catalyst and B is a reactant.

(iii) C and F are intermediates.

(iv) D and G are products

The correct set of statements is

(A) (i) and (ii) only
(B) (iii) and (iv) only
(C) (ii), (iii) and (iv) only
(D) All (i), (ii), (iii) and (iv)

7. For one mole of a van der Waal gas with b = 0, the plot of PV versus 1/V at 298 K gives an intercept of 24.4 L atm K mol^{-1} and slope of – 2.5 L^2 atm mol^{-2}. The value of the van der Waal constant a is

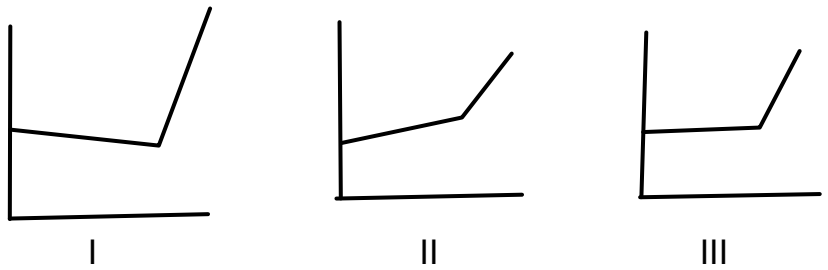
(A) 12.5 L^2 atm mol^{-2}
(B) 5.0 L^2 atm mol^{-2}
(C) 4.5 L^2 atm mol^{-2}
(D) 2.5 L^2 atm mol^{-2}

8. The following three plots show the variation of conductance with mL of titrant added for three titrations of aqueous solutions of Na_2SO_4, $(NH_4)_2SO_4$, $BaCl_2$

Given: Molar ionic conductivities in S cm^2 mol^{-1} are

Ba^{2+}	Cl^-	Na^+	SO_4^{2-}	NH_4^+
127.3	**76.4**	**50.1**	**160**	**73.6**

Titration	Analyte	Titrant
A	$BaCl_2$	$(NH_4)_2SO_4$
B	Na_2SO_4	$BaCl_2$
C	$BaCl_2$	Na_2SO_4



Assign the plots to the respective titrations

(A) I-A, II–B, III-C (B) I-B, II–C, III-A (C) I-C, II–A, III-B (D) I-B, II–A, III-C

9. 150 g of liquid water at 20°C is mixed with 40 g of ice at 0°C in a coffee cup calorimeter. The final temperature (in °C) reached will be (assuming no heat loss or gain by the surroundings)

Latent heat of ice = 334.72 J/g

Specific heat of water = 4.2 J/g °C

(A) 1.35 (B) -1.35 (C) 0 (D) 4

10. A chemical reaction, X (g) + Y(g) → Z (g) has following mechanism:

$$X_{(g)} + S_{(s)} \underset{k_2}{\overset{k_1}{\rightleftharpoons}} [X-S]\ (s)$$

$$[X-S]\ (s) + Y_{(g)} \underset{k_4}{\overset{k_3}{\rightleftharpoons}} Z_{(g)} + S\ (s)$$; [where (S) is solid catalyst]

The overall equilibrium constant for above reaction can be represented as

(A) $K = \frac{k1 \cdot k2}{k3 \cdot k4}$ (B) $K = \frac{k1 \cdot k3}{k2 \cdot k4}$

(C) $K = \frac{k4 \cdot k1}{k2 \cdot k3}$ (D) $K = \frac{k4 \cdot k2}{k3 \cdot k1}$

11. Given below is a galvanic cell

$Cu\ (s)\ |\ Cu^{2+}\ (aq.)\ (x\ M)\ ||\ Ag^{+}\ (aq.)\ (y\ M)|Ag\ (s)$

The possible condition for the galvanic cell to develop emf of 0.5 V is:

[Given: $E°_{Cu^{2+}/Cu} = 0.34V$ and $E°_{Ag^{+}/Ag} = 0.8V$]

(A) x = 0.015 and y = 0.3 (B) x = 0.05 and y = 0.25

(C) x = 0.04 and y = 0.2 (D) x = 0.011 and y = 0.5

12. If 5A current is passed for an hour through one dm^3 0.5 M aqueous solution of sodium acetate, then the amount of ethane produced will be:

(A) 2.79 g (B) 4.2 g (C) 1.39 g (D) 5.58 g

13. The results obtained when the finely divided metal powders of P, Q, R and S added to the aqueous solutions of different metal nitrates are given below:

Metal	Silver Nitrate	Lead Nitrate	Nickel Nitrate	Zinc Nitrate
P	√	√	√	x
Q	√	√	√	√
R	√	√	x	x
S	√	x	x	x

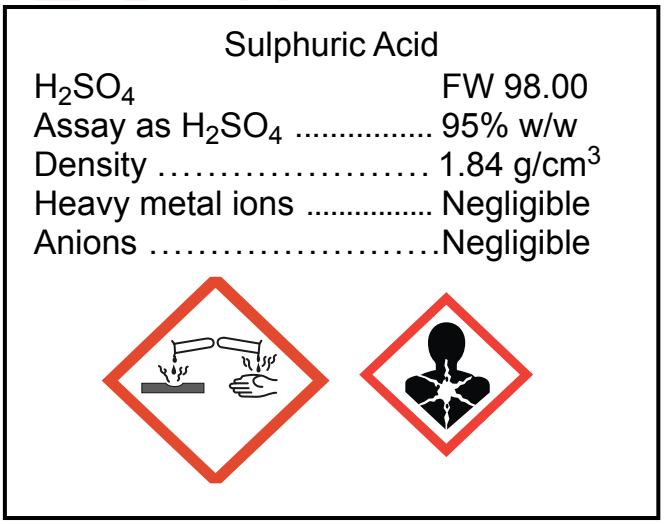
Displacement = √, No reaction = x

[Given: $E°_{Ag^{+}/Ag} = 0.80$ V, $E°_{Zn^{2+}/Zn} = -0.76$ V, $E°_{Ni^{2+}/Ni} = -0.25$ V, $E°_{Pb^{2+}/Pb} = -0.13$ V]

If these elements are to be arranged as per their positions in the electrochemical series, then which of the following will represent the above set of observations?

(A) P > Q > R > S (B) S > R > P > Q (C) Q > P > R > S (D) S > R > Q > P

14. The molarity of the commercially available concentrated sulphuric acid solution with label on the bottle is as shown below is:



(A) 19.38 M (B) 17.83 M (C) 20.77 M (D) 18.34 M

15. Oxide ions with ions of metals A and B together, form a crystal. The oxide ions get organized into a cubic closed packed (ccp) lattice. In the oxide lattice, the metal ion A occupy 25% of the octahedral voids and the metal ion B occupies 50% of the tetrahedral voids. Oxidation states of A and B respectively are:

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

16. Consider the statements

(i) Energy of the electron in the fourth orbit of He^+ ion is less than the energy of the electron in the fourth orbit of hydrogen atom.

(ii) Radius of the first orbit of He^+ ion is 0.529 Å.

(iii) In the Lyman series as the energy liberated during the transition increases then the distance between the spectral lines goes on decreasing.

(iv) If the radius of the 2nd orbit of Li^{2+} is x, the expected radius of the 3rd orbit of Be^{3+} is $\frac{9}{4}x$.

(v) In hydrogen atom, 3p and 3d orbitals are not degenerate orbitals.

The correct set of statements is

(A) (i) and (ii) (B) (i) and (iii)
(C) (ii), (iii) and (iv) (D) (i), (iii) and (v)

17. The mixture of $Al(OH)_3$ and $Fe(OH)_3$ can be separated by:

(i) leaching method

(ii) froth floatation method

(iii) gravity separation method

(iv) magnetic separation method

(A) (i) and (ii) only (B) (ii) and (iii) only
(C) (i) and (iv) only (D) (iii) and (iv) only

18. The anions giving white precipitate completely soluble in concentrated hydrochloric acid with barium chloride solution are:

(i) sulphite ; (ii) carbonate ; (iii) sulphate ; (iv) nitrate

(A) (i) and (ii) only (B) (ii) and (iii) only
(C) (i) and (iv) only (D) (i), (iii) and (iv) only

19. The substituted silanes which can produce dimeric and cyclic trimeric silicone polymers, respectively on hydrolysis are:

1. $RSiCl_3$
2. R_2SiCl_2
3. R_3SiCl

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

20. Identify the correct pair of species with the correct description.

(A) $CH_4 \rightarrow {}^{-}CH_3$ -change in both hybridization and shape

(B) $NH_3 \rightarrow NH_4^{+}$ - no change in shape and change in hybridization

(C) $BF_3 \rightarrow BF_4^{-}$ -change in both hybridization and shape

(D) $H_2O \rightarrow H_3O^{+}$ -no change in hybridization as well as shape

21. A student mixed three sodium salts accidentally. To identify these salts, some tests were performed and found that

i. When chromyl chloride test was performed, mixture of colored gases released and NaOH solution turned yellow and gave positive test.

ii. Brown ring test was positive but brown coloured gas was not intensified on adding copper turnings on heating the mixture with conc. H_2SO_4.

iii. Aqueous solution of the mixture was treated with $CHCl_3$ and chlorine water. From this chloroform layer $CHCl_3$ test was performed. A violet organic layer was first visible then on more addition of concentrated HNO_3, it changed to orange yellow. The observations indicate the presence of:

(A) chloride, bromide and iodide
(B) nitrate, bromide and iodide
(C) fluoride, nitrate and iodide
(D) chloride, nitrite and iodide

22. Total number of stereoisomers shown by the complex $[W(CO)_4\{P(OR)_3\}SR']$ (where R = $-C_6H_5$; R' = $-CH_3$)

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

23. **A**, **B** and **C** are three complexes of chromium (III) with empirical formula $H_{12}O_6Cl_3Cr$. All the three complexes have water and chloride ions as ligands. **W**hen subjected to heating at 200°C the mass of A was found to be constant, while that of B suffered a loss of 6.7%. When 2.66 g of C was treated with $AgNO_3$ it gave 1.43 g of AgCl. The complexes B and C are respectively:

1. $[Cr(H_2O)_6Cl_3]$
2. $[Cr(H_2O)_6]Cl_3$
3. $[Cr(H_2O)_5Cl]Cl_2.H_2O$
4. $[Cr(H_2O)_4Cl_2]Cl.2H_2O$
5. $[Cr(H_2O)_3Cl_3].3H_2O$

(A) 3, 4 (B) 3, 5 (C) 1, 2 (D) 2, 5

24. 126 g oxalic acid ($H_2C_2O_4.2\,H_2O$) under acidic conditions will be oxidized by:

i. $\frac{1}{3}$ mole of $K_2Cr_2O_7$

ii. $\frac{5}{2}$ mol $K_2Cr_2O_7$

iii. $\frac{1}{3}$ mol $KMnO_4$

iv. $\frac{5}{2}$ mol $KMnO_4$

(A) i and iii only (B) i and iv only (C) ii and iii only (D) ii and iv only

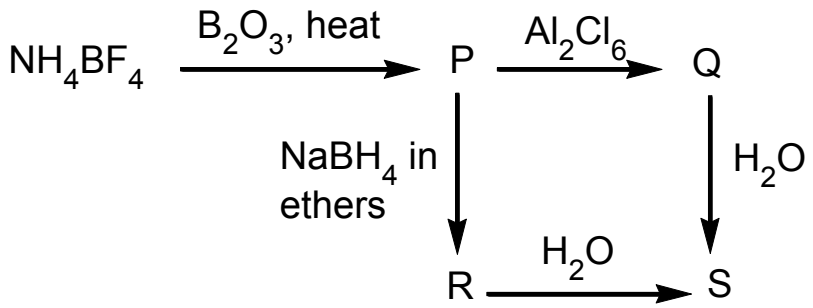
25. A carbonyl complex of Iridium (electronic configuration- [Xe] $4f^{14}\ 5d^7\ 6s^2$) with the formula $IrCl(CO)(PPh_3)_2$ is known as Vaska's complex. Which of the following ligand substitution/s will decrease the triple bond character of CO in Vaska's complex?

(A) Both PPh_3 by PMe_3
(B) Cl^- by CH_3^-
(C) Cl^- by PF_3
(D) Both PPh_3 by $P(CH_2Cl)_3$

26. A water sample is analysed and found to have concentration of Zn = 5.0 g m^{-3}, Fe = 0.5 µg mL^{-1}, Mn = 0.05 ppm and Cd = 0.005 ppb. The maximum prescribed concentration of metals in drinking water in mg dm^{-3} is Zn = 5.0, Fe = 0.2, Mn = 0.05 and Cd = 0.005. Identify the correct statement about the sample of water.

(A) The water sample is having excess of Zn than the maximum prescribed concentration.
(B) The water sample is having lower concentration of Mn and Cd than the maximum prescribed concentration.
(C) The water sample is potable (suitable for drinking).
(D) The concentration of Fe is 0.5ppm.

27. In the following reaction sequence, identify P, Q, R and S



(A) P = BF_3, Q = BCl_3, R = B_2H_6, S = $B(OH)_3$
(B) P = NH_4BO_2, Q = B_2Cl_4, R = $B(OH)_3$, S = $B(OH)_4^-$
(C) P = NH_4BO_2, Q = $B(OH)_3$, R = $NaBO_2$, S = $B(OH)_3$
(D) P = BF_3, Q = B_2Cl_4, R = $B(OH)_3$, S = $B(OH)_4^-$

28. The correct order of CFSE for the ions in the complexes having same ligands is:

(A) $V^{+2} < Mn^{+2} < Fe^{+2} < Co^{+2} < Ni^{+2}$
(B) $V^{+2} > Mn^{+2} = Fe^{+2} > Co^{+2} = Ni^{+2}$
(C) $Ni^{+2} < Co^{+2} < Fe^{+2} < Mn^{+2} < V^{+2}$
(D) $Mn^{+2} < V^{+2} < Co^{+2} < Fe^{+2} < Ni^{+2}$

29. Complexes with ..... geometry can exhibit different types of hybridization of central metal .

(A) square planar
(B) tetrahedral
(C) octahedral
(D) trigonal bipyramidal

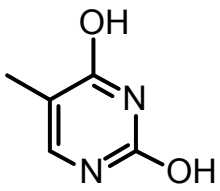
30. In the following given pairs, the one with an acidic oxide and a neutral oxide respectively is-

(A) NO, N_2O
(B) N_2O_5, NO
(C) N_2O, N_2O_5
(D) N_2O, NO

31. Out of the following substances, the one that forms a white solid, has a high melting point and dissociates in water to form a basic solution is-

(A) CO_2 (B) P_4O_{10} (C) Na_2O (D) Cl_2O_7

32. The form in which thymine, the base present in DNA, remains at pH ~ 10, is:

(A)


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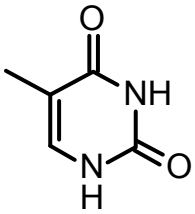
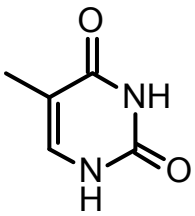
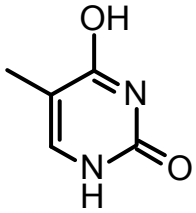


(C)


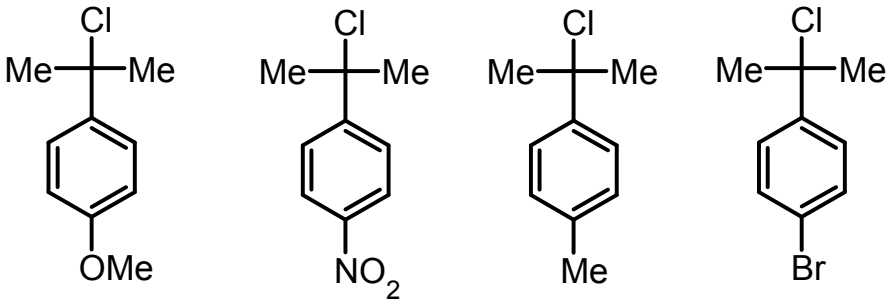
(D)


33. The compound not having a planar molecular configuration is:

(A) $H_2C = CH_2$ (B) $H_2C = CH - C \equiv CH$

(C) $H_2C = C = CHCl$ (D) $H_2C = C = C = CH_2$

34. For the following molecules, the correct order of reactivity towards S_N1 reaction is:



(I) (II) (III) (IV)

(A) (III) > (II) > (I) > (IV)
(B) (II) > (IV) > (III) > (I)
(C) (I) > (III) > (IV) > (II)
(D) (IV) > (II) > (III) > (I)

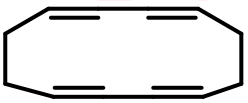
35. Relationship of X and Y is :

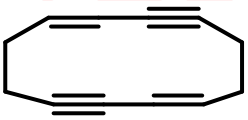


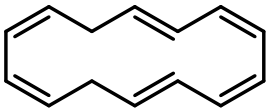
X Y

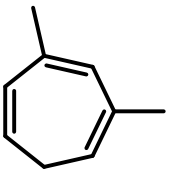
(A) same molecules
(B) enantiomers
(C) diastereoisomeres
(D) positional isomers

36. An unsaturated hydrocarbon "M" on oxidative ozonolysis gave a mixture of butanedioic acid and oxalic acid. The structure of the hydrocarbon "M" is:

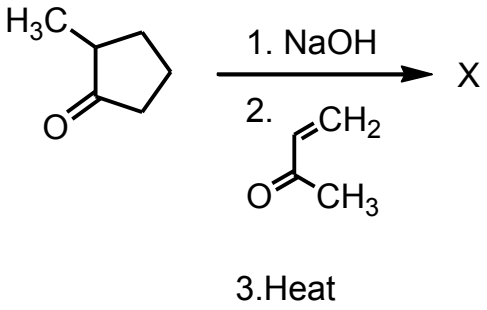
(A) 

(B) 

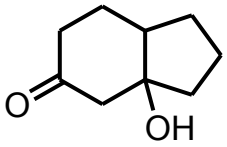
(C) 

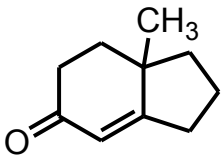
(D) 

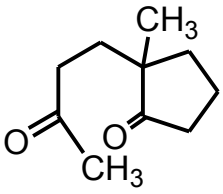
37. When 2-Methylcyclopentanone is treated with but-3-en-2-one under alkaline condition followed by heating gives the major product 'X'.

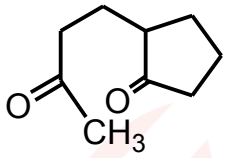


This 'X' is:

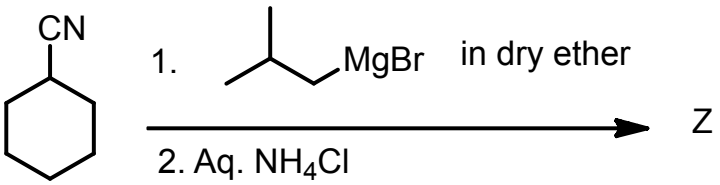
(A)


(B)


(C)


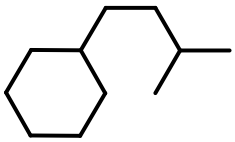
(D)


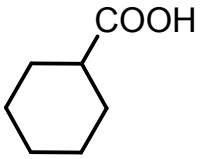
38. Consider the following chemical reaction

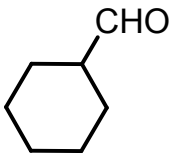


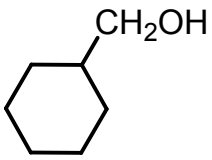
3. Hydrazine, KOH, heat

The major product 'Z' formed in the reaction is:

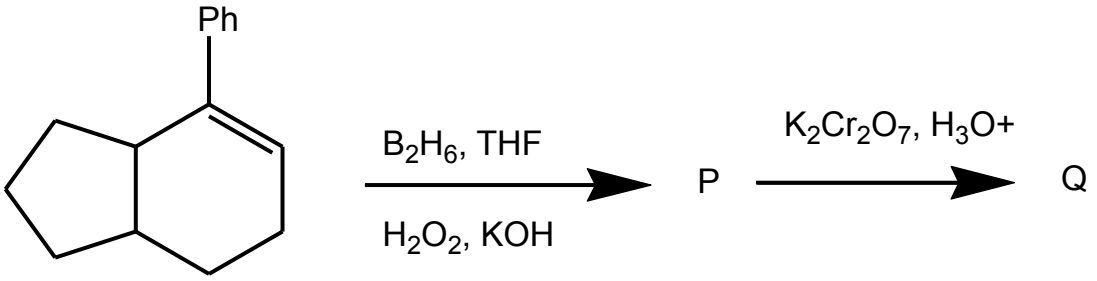
(A) 

(B) 

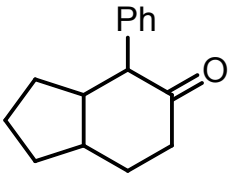
(C) 

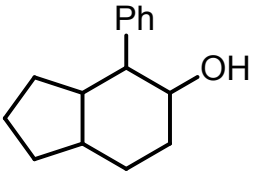
(D) 

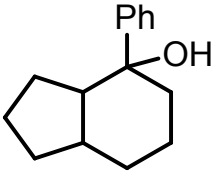
39. Consider the set of the following reactions

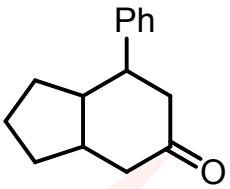


The final major product 'Q' is:

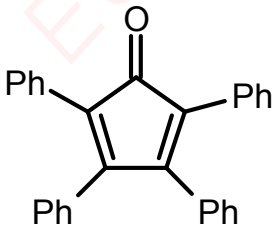
(A) 

(B) 

(C) 

(D) 

40. The following product 'P' given below is obtained by Aldol condensation of ...



product 'P'

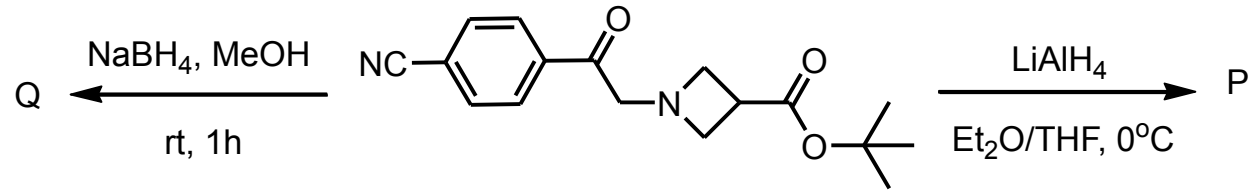
(A) 2 moles of dibenzyl ketone, $(PhCH_2)_2CO$

(B) 1 mole of dibenzyl ketone, $(PhCH_2)_2CO$ and 1 mole of acetone CH_3COCH_3

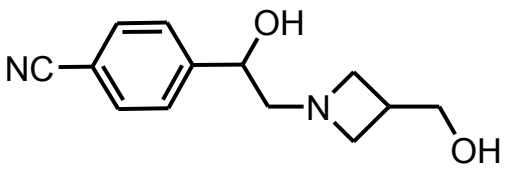
(C) 1 mole of dibenzyl ketone, $(PhCH_2)_2CO$ and 1 mole of benzil (PhCOCOPh)

(D) 2 moles of benzophenone, PhCOPh.

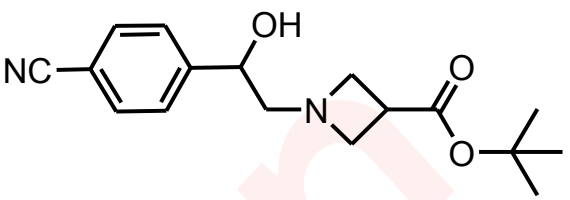
41. The structures of 'P' and 'Q' formed in the following reactions are :



(A)

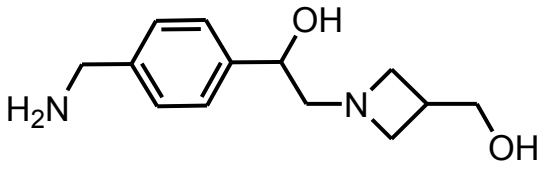


P

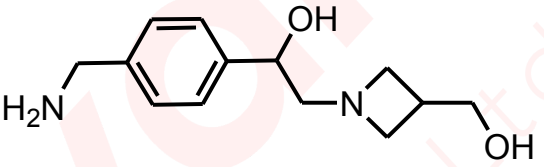


Q

(B)

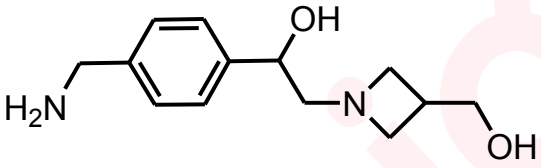


P

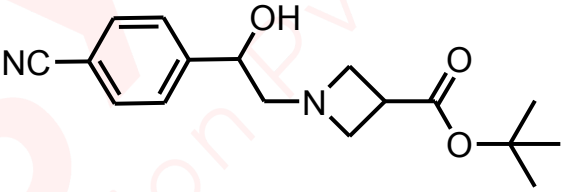


Q

(C)

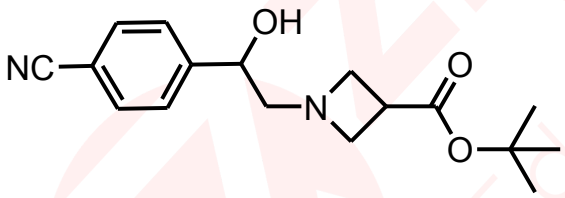


P

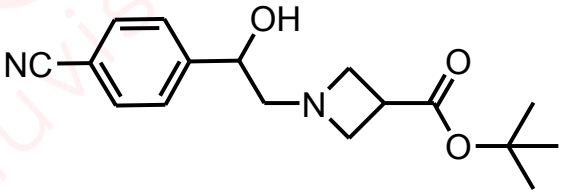


Q

(D)



P



Q

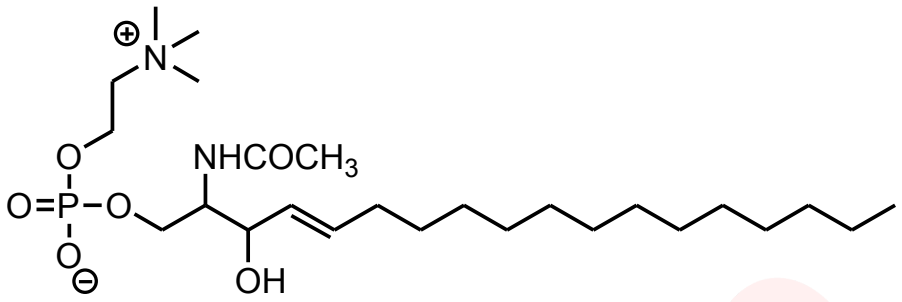
42. An amount of 0.45 g of an organic compound X containing C, H and N on combustion produces 1.1 g of CO_2 and 0.3 g of water. Empirical formula of X is:

(A) CH_2N_2 (B) C_2H_3N (C) C_3H_4N (D) C_2H_5N

43. Heptane-2,6-dione was treated with aqueous alkali and heated. The major product obtained is:

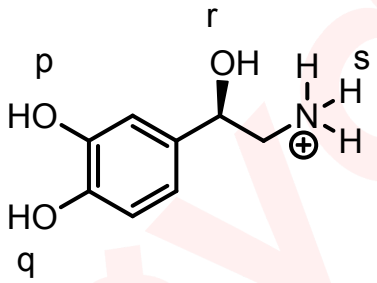
(A) 2, 3-dimethylcyclohex-1-ene-2-one
(B) 2, 3-dimethylcyclohex-1-ene-3-one
(C) 2, 3-dimethylcyclohex-2-ene-1-one
(D) 3-methylcyclohex-2-enone

44. The number of chiral carbon(s) in Sphingomyelin, an important constituent of a class of lipids with the following structure is:



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

45. In the following ion the strongest hydrogen bond donor site is:



(A) p (B) q (C) r (D) s

46. The double bond equivalents for the compounds with the following molecular formulae are respectively:

(i) $C_{13}H_9BrO$

(ii) C_3H_7N

(iii) $C_{10}H_7Cl$

(A) 1, 5, 6 (B) 5, 6, 1 (C) 9, 1, 7 (D) 7, 9, 1

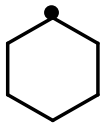
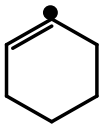
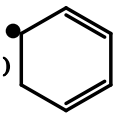
47. Match the following in which acetaldehyde is converted into different compounds (Column 1) using specific reagents (Column 2).

Column 1	Column 2
i. $CH_3CH{=}CHCHO$	1. EtMgI in dry ether, H_3O^+, acid dichromate
ii. CH_3COCl	2. Dilute NaOH/Heat
iii. CHI_3	3. Acid dichromate, PCl_5
iv. CH_3COEt	4. I_2, NaOH

(A) i - 1, ii - 3, iii - 4, iv - 2 (B) i - 4, ii - 3, iii - 2, iv - 1

(C) i - 2, ii - 4, iii - 1, iv - 3 (D) i - 2, ii - 3, iii - 4, iv - 1

48. The increasing order of stability of the following free radicals is:

(i)  (ii)  (iii)  (iv) 

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

PART A-2 · ONE OR MORE CORRECT OPTIONS

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

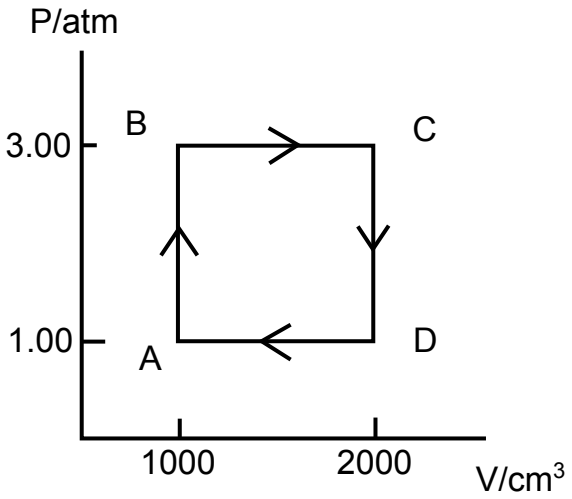
49. A 2 g piece of "dry ice" is dropped in a 5 L glass vessel containing air at 1 atm and 25 °C and the vessel is sealed. After some time, dry ice disappeared.

(Assume that the temperature is kept constant throughout.)

Identify the **correct** statement(s).

(A) Partial pressure of oxygen increases with respect to its initial value in air.
(B) Partial pressure of CO_2 increases with respect to its initial value in air.
(C) Total pressure of the vessel increases with respect to its initial value in air.
(D) Disappearance of dry ice is due to the evaporation process.

50. A thermo-dynamical process is represented by the cycle shown below in which 0.1 mol of a perfect gas undergoes the reversible cyclic process A → B → C → D → A



Given that $C_{v,m} = \frac{3}{2}R$ independent of temperature

All symbols have their usual meaning

Identify the correct statement(s)

(A) $T_B = 365.8$ K
(B) $q_{B\to C} = 760.5$ J
(C) $w_{B\to C} = -30$ J
(D) $\left(\frac{\partial U}{\partial V}\right)_T = 0$ for a perfect gas

51. Identify the correct statement(s) for the binary solutions

(A) The volume of a solution at T and P equals the sum of the volumes of its pure components at T and P.

(B) At constant T and P, the values of ΔG_{mix} and ΔS_{mix} are negative and positive respectively.

(C) Inter-molecular interactions are negligible in an ideal solution.

(D) The mixture of n-hexane and n-heptane form a nearly ideal solution.

52. The heat of combustion (kJ mol^{-1}) of ethane, propane and butane are −1560, −2220, −2878 respectively. When 100 g of each undergo complete combustion. Which of the following statement/s is/are correct?

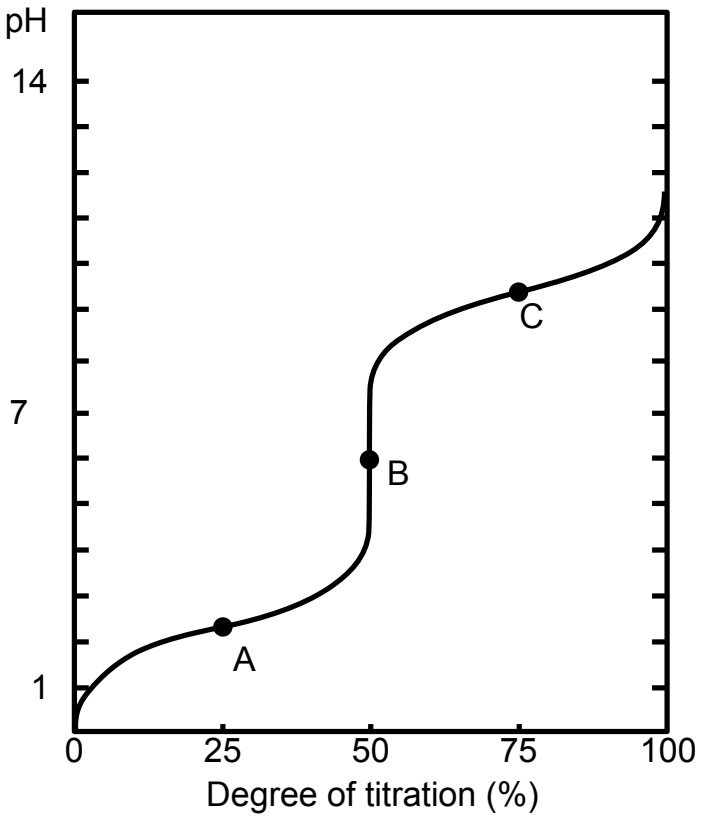
(A) The heat generated by combustion of propane will be maximum.

(B) The heat generated by combustion of butane will be minimum.

(C) At constant temperature and pressure, the work done during the combustion of ethane is minimum.

(D) At constant temperature and pressure, the work done during the combustion of butane is maximum.

53. pH titration curve of aqueous solution of simple aliphatic amino acid with general formula NH_2-CHR-COOH (where R = Alkyl group) against NaOH is represented below.



Identify the **correct** statement(s) pertaining to it:

(A) In aqueous solution, amino acid mainly exists as $^{+}NH_3$-CHR-COOH

(B) At point 'A', [$^{+}NH_3$-CHR-COOH] = [$^{+}NH_3$-CHR-COO^{-}]

(C) At point 'B' amino acid exists in zwitter ion form.

(D) At point 'C', [NH_2-CHR-COO^{-}] = [$^{+}NH_3$-CHR-COO^{-}]

54. An aqueous solution of $CuSO_4$(X) is treated with certain reagents. Identify the **incorrect** statement/s.

(A) Addition of NH_4OH to the aqueous solution of X develops green colour.

(B) X is treated with H_2S in acidic medium giving black precipitate soluble in hot aqueous KOH solution.

(C) X on treatment with KI in weakly acidic medium gives white precipitate of CuI_2 liberating I_2 gas.

(D) An aqueous solution of X when treated with $BaCl_2$ solution gives white precipitate.

55. Chlorine (Cl_2) gas can be prepared by the action of concentrated (or Conc.) H_2SO_4 on a mixture of sodium chloride (NaCl) and manganese dioxide (MnO_2). Identify the set(s) of correct reactions.

(A) $MnO_2 + H_2SO_4 \rightarrow MnSO_4 + H_2O + 1/2\ O_2$
$2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + Cl_2 + H_2$

(B) $2\ NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$
$MnO_2 + 2HCl + H_2SO_4 \rightarrow MnSO_4 + Cl_2 + H_2O$

(C) $4\ NaCl + 4\ H_2SO_4 \rightarrow 4\ NaHSO_4 + 4\ HCl$
$MnO_2 + 4\ HCl \rightarrow MnCl_2 + Cl_2 + 2\ H_2O$

(D) $MnO_2 + 2\ NaCl \rightarrow MnCl_2 + Na_2O + 1/2\ O_2$
$MnCl_2 + H_2SO_4 \rightarrow MnSO_4 + Cl_2 + H_2$

56. The 18-valence electron rule asserts that transition metal compounds are thermodynamically stable when they have a total of 18 valence electrons on the central metal, which include the metal's d electrons and the electrons provided by the ligands attached to the metal.

The 18-electron rule is obeyed by:

(A) $[Fe\ (CO)_5]$ (B) $[Mn\ (CO)_5]$ (C) $[Ni(CO)_4]$ (D) $[Cr\ (CO)_6]$

57. Identify the correct statement(s) from the following:

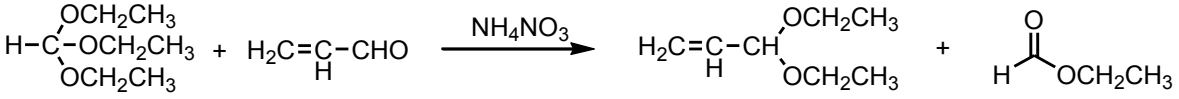
(A) The number bridging carbonyl groups in $Co_2(CO)_8$ is 2

(B) The number of lone pair (s) in $XeOF_4$ is zero

(C) B_5H_{10} is not an example of borane

(D) The number of bonding and lone pairs of electrons in XeF_2 are 2 and 6, respectively.

58. Consider the following reaction:



triethyl orthoformate acrylaldehyde ethyl formate

The correct statement(s) pertinent to the above mentioned reaction is/are:

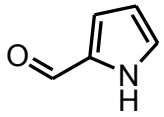
(A) It is an example of acetal exchange reaction.

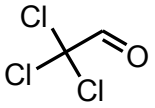
(B) It is an example of rearrangement reaction.

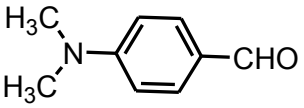
(C) Conventional reaction of acraldehyde and ethanol will produce better yield of the acetal.

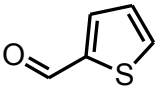
(D) Water produced in the reaction is taken out of the equilibrium by the hydrolysis of the orthoester.

59. Tendency to undergo Cannizaro reaction depends upon the electrophilic nature of the carbonyl group.


pyrrole-2-aldehyde


chloral


p-N,N-dimethylaminobenzaldehyde


thiophene-2-aldehyde

Identify the **incorrect** statement(s) from those listed below

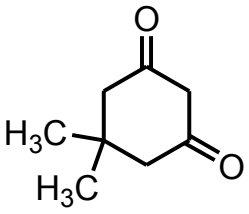
(A) Thiophene-2-aldehyde will undergo Cannizaro reaction.

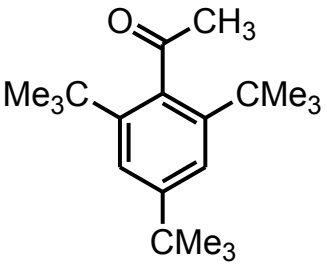
(B) Only chloral will not undergo Cannizaro reaction but others will follow.

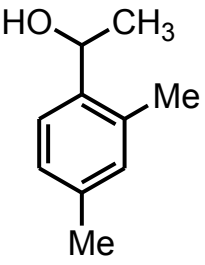
(C) pyrrole-2-aldehyde, chloral and *p*-*N,N*-dimethylaminobenzaldehyde will not follow Cannizaro reaction.

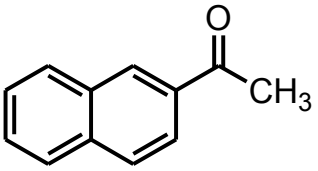
(D) All the four molecules will undergo Cannizaro reaction since no one contains any enolisable α - hydrogen atom.

60. In the haloform reaction, the trihalogenated intermediate ($-CO-CX_3$) formed is then subjected to a nucleophilic attack by the hydroxide ion (OH^-) at the carbonyl carbon (C=O) producing a tetrahedral intermediate, which eventually breaks down, expelling the $^-CX_3$ group and leading to the formation of a carboxylate anion.


P


Q


R


S

Identify the **correct** statement(s) regarding iodoform reaction:

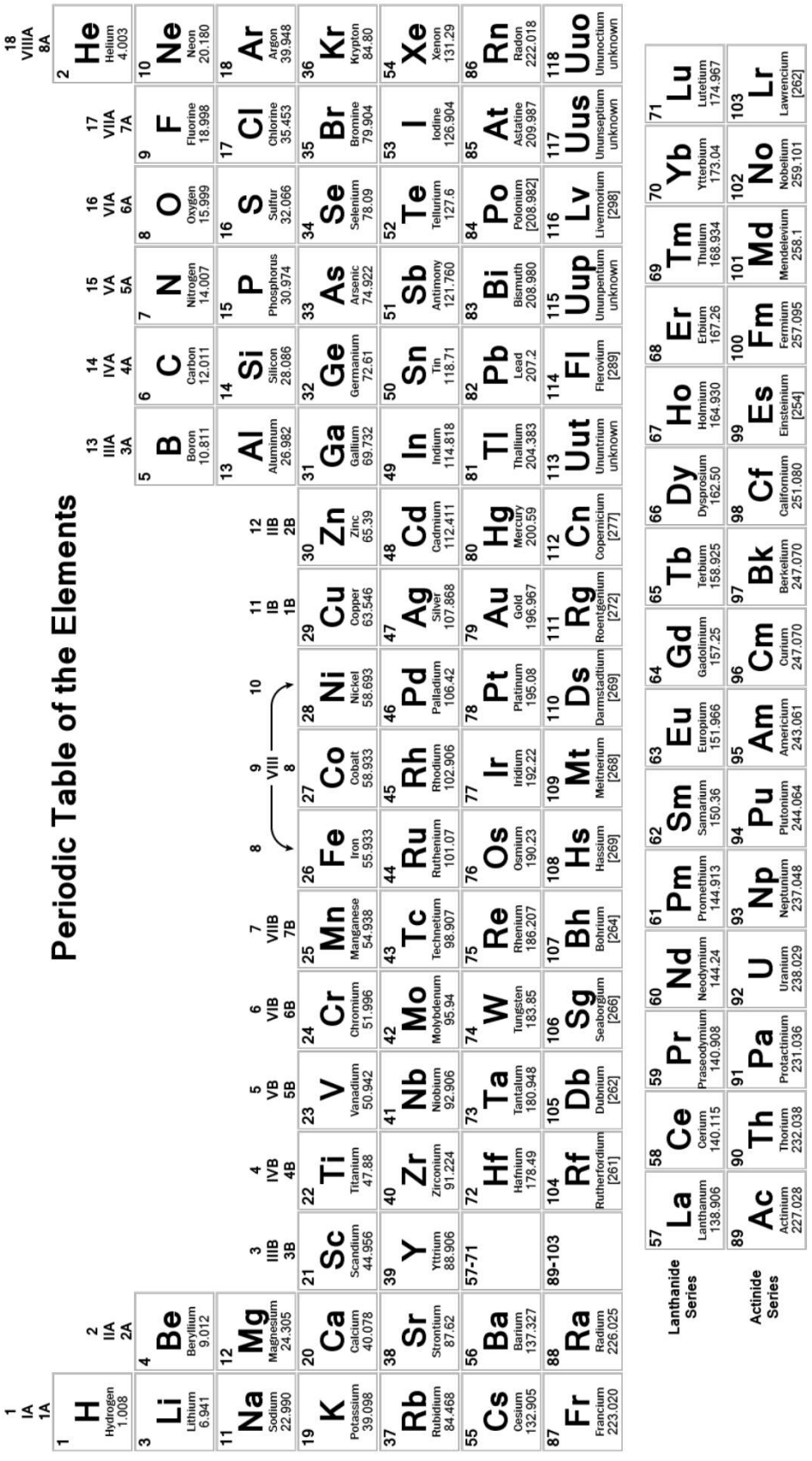
(A) 'Q', 'R' and 'S' will take part in iodoform reaction.

(B) 'P', 'R' and 'S' will take part in iodoform reaction.

(C) 'P' and 'Q' will not take part in iodoform reaction.

(D) 'Q' will not take part in iodoform reaction.

Given in the question paper



ANSWER KEY

NSEC 2024 · PAPER CODE 31

60
QUESTIONS · 216 MARKS

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

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

★ Answers as per Zigyan

- **Q5** — As per Zigyan: (B); IAPT key (A) or (B).
- **Q13** — As per Zigyan: (C); IAPT key (B).
- **Q21** — As per Zigyan: (A); IAPT key (D).
- **Q24** — As per Zigyan: no option is correct; IAPT key (B) or (D).
- **Q25** — As per Zigyan: (A); IAPT key (A).
- **Q28** — As per Zigyan: no option is correct; IAPT key (A).
- **Q32** — As per Zigyan: (B); IAPT key (A).
- **Q36** — As per Zigyan: (A); IAPT key (A).
- **Q52** — As per Zigyan: (B); IAPT key (B), (C), (D).
- **Q53** — As per Zigyan: (B), (C), (D); IAPT key (A), (B), (C), (D).
- **Q55** — As per Zigyan: (C); IAPT key (C).

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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.

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RESULTS · 2021 – 2026

Our toppers, year by year

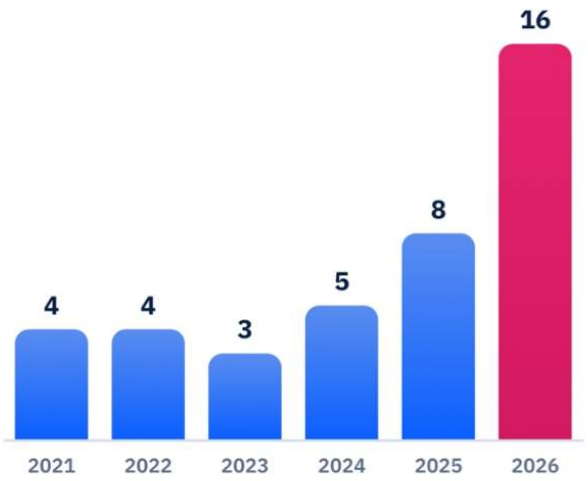
40
JEE Advanced selections in 6 years

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.

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