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PREVIOUS YEAR PAPER · 2025

OLYMPIAD · STAGE I

NSEC

National Standard Examination in Chemistry

2025

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 2025, paper code 31.
Solutions and notes: Zigyan. This booklet is not an IAPT publication.

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Saksham Bishnoi

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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

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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, $h = 6.63 \times 10^{-34}$ Js

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. Among Ca, V, Cr and Mn, the second Ionization Energy is the highest for

(A) V (B) Ca (C) Cr (D) Mn

2. Among the given compounds, the permanent dipole moment is exhibited by

(A) BF_3 (B) XeF_4 (C) SiF_4 (D) SF_4

3. Choose the correct statement

(A) XeO_4 and XeO_2F_2 have tetrahedral geometry with no lone pairs

(B) XeO_2F_2 is trigonal planar with two oxygen atoms in the trigonal plane

(C) XeO_4 has square planar geometry with no lone pair of electrons

(D) XeO_2F_2 is distorted tetrahedral and XeO_4 is square planar

4. $HClO_4$ is used in etching of liquid crystal displays whereas $H_2C_2O_4$ is present in vegetables like spinach which causes itching to throat. Consider the following statements for these compounds

(i) $HClO_4$ is a stronger acid than $H_2C_2O_4$

(ii) $HClO_4$ is a weaker acid than $H_2C_2O_4$

(iii) $H_2C_2O_4$ is reducing agent and $HClO_4$ is oxidizing agent

(iv) The conjugate base of $HClO_4$ is stronger than the conjugate base of $H_2C_2O_4$

The correct statements are

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

5. Compounds A, B, C and D are solid trihalides, all containing the same central atom. Compounds A, B, C are pale lilac (pale purple) in colour but compound D is dark green. Compound A is insoluble in water and alcohol but rest of the three are soluble in both the solvents.

The correct statement indicating the central atom and halides present in each of the compounds is

(A) Central atom is As, halides are F^-, Cl^-, Br^-, I^- respectively

(B) Central atom is Co, halides are F^-, Cl^-, Br^-, I^- respectively

(C) Central atom is Cr, halides are F^-, Cl^-, Br^-, I^- respectively

(D) Central atom is Nd, halides are F^-, Cl^-, Br^-, I^- respectively

6. You are given a set of oxides: SrO, MoO_3 and ZrO_2. All the three show different reactions with water. Two of these oxides react with water whereas the third one is insoluble in water at room temperature (25-30 ^{o} C). The statement that is correct about these oxides is

(A) MoO_3 is insoluble in water, SrO gives a basic solution and ZrO_2 gives an acidic solution in water.

(B) MoO_3 is insoluble in water, SrO gives an acidic solution and ZrO_2 gives a basic solution in water.

(C) ZrO_2 is insoluble in water, SrO gives a basic solution and MoO_3 gives an acidic solution in water.

(D) ZrO_2 is insoluble in water, MoO_3 gives a basic solution and SrO gives an acidic solution in water.

7. The complex that shows maximum number of isomers is (where gly = glycine, PEt_3= triethylphosphine)

(A) $[Pt(ox)(NH_3)_2]$ (B) $[Pd(PEt_3)_2BrCl]$

(C) $[Pd(gly)(ox)]$ (D) $[Pt(NH_3)(NO_2)(PEt_3)_2]^+$

8. The spin-only magnetic moment for $[Ni(H_2O)_6](ClO_4)_2$ should be

(A) 3.87 (B) 2.83 (C) 1.72 (D) 5.92

9. The correct order of Δ_o for the following given transition metal complexes is

(A) $Rh(CN)_6^{3-} > Rh(NH_3)_6^{3+} > RhCl_6^{3-}$ (B) $Rh(NH_3)_6^{3+} > RhCl_6^{3-} > Rh(CN)_6^{3-}$

(C) $RhCl_6^{3-} > Rh(CN)_6^{3-} > Rh(NH_3)_6^{3+}$ (D) $Rh(CN)_6^{3-} > RhCl_6^{3-} > Rh(NH_3)_6^{3+}$

10. The correct rank of bond order for O_2^+, O_2^-, CO and O_2^{2-} is

(A) 3, 1.5, 3, 1 (B) 2, 5, 1, 1 (C) 1.5, 2.5, 3, 2 (D) 2.5, 1.5, 3, 1

11. The correct basicity order in water for the following is

(A) $NMe_3 > NH_3 > NH_2NH_2 > NF_3$ (B) $NH_2OH > NH_3 > NF_3 > NMe_3$

(C) $NH_3 < NF_3 < NMe_3 < NH_2NH_2$ (D) $NMe_3 < NH_2OH < NH_3 < NF_3$

12. A 1.25 g Shelcal 500 tablet contains 1250 mg of $CaCO_3$. A student dissolved one tablet in water to make 1.0 L solution(X). 10.0 mL of solution(X) was titrated with 0.0198 M EDTA-MgEDTA mixture in the burette and found the $CaCO_3$ content matched the label claim. (Molar mass of $CaCO_3$ = 100.0 g/mol).

The correct option is

(A) The burette reading is 6.31 mL and molarity of Shelcal solution is 0.125 M

(B) The burette reading is 10.00 mL and molarity of Shelcal solution is 0.0125 M

(C) The burette reading is 6.31 mL and molarity of Shelcal solution is 0.0125 M

(D) The burette reading is 10.00 mL and molarity of Shelcal solution is 0.125 M

13. When 10 mL of 0.01 M HCl was added to a mixture of 0.5 M NH_3 and 0.5 M NH_4Cl, the pH of the resultant solution will be (pK_b of NH_3 is 4.75)

(A) 9.07 (B) 9.75 (C) 9.25 (D) 8.75

14. The correct order of CO triple bond character in the given metal carbonyl complexes is

(A) $[Fe(CO)_4]^{-2} > [Co(CO)_4]^{-1} > [Mn(CO)_6]^{+} > Ni(CO)_4$

(B) $Ni(CO)_4 > [Mn(CO)_6]^{+} > [Co(CO)_4]^{-1} > [Fe(CO)_4]^{-2}$

(C) $[Mn(CO)_6]^{+} > [Fe(CO)_4]^{-2} > [Co(CO)_4]^{-1} > Ni(CO)_4$

(D) $[Mn(CO)_6]^{+} > Ni(CO)_4 > [Co(CO)_4]^{-1} > [Fe(CO)_4]^{-2}$

15. Consider the following statements for the square planar complex $[Pt(en)(NCS)_2]$. Identify the correct statements

I. It is thermodynamically more stable than $[Pt(NH_3)_2(NCS)_2]$

II. It can exhibit stereoisomerism.

III. It can exhibit structural isomerism.

IV. It is not easily soluble in polar solvents.

The correct option is

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

16. Which of the following molecules is odd one out in its bonding properties?

(A) CO_3^{2-} (B) SO_3 (C) CH_4 (D) BF_3

17. Which one of the following reactions will give a product that has zero net dipole moment?

(A) Hex-3-yne with H_2-Pd/C

(B) Hex-3-yne with Na in liquid ammonia

(C) Hex-2-yne with H_2-Pd/C

(D) Hex-2-yne with Na in liquid ammonia

18. Which of the following statements is ***not*** correct regarding the aromatic electrophilic substitution reactions of aniline or its derivatives under standard laboratory conditions?

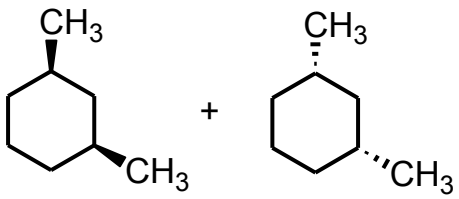
(A) A*niline*, when subjected to bromination with Br_2/H_2O, undergoes rapid tribromination to form 2,4,6-tribromoaniline as the major product.

(B) During direct nitration of aniline with a nitrating mixture, meta-substitution is observed predominantly due to protonation of the amino group under acidic conditions.

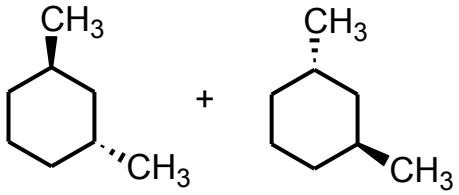
(C) The acetamido group (-$NHCOCH_3$), being less basic than -NH_2, shows stronger +M (mesomeric) effect and thus activates the ring more than the free amino group.

(D) Acetylation of aniline reduces its reactivity towards electrophilic substitution and facilitates controlled monosubstitution at ortho and para positions.

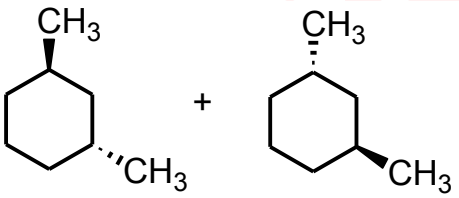
19. The optically active mixtures from the following is:

(A) 

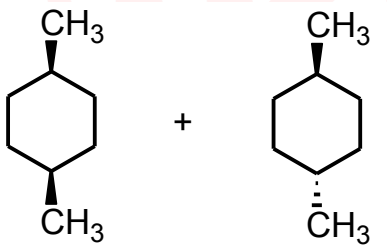
(75%) (25%)

(B) 

(50%) (50%)

(C) 

(75%) (25%)

(D) 

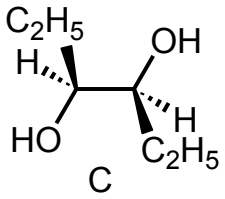
(75%) (25%)

20. Alkenes can be converted to *cis*-diols using OsO_4 + $NaHCO_3$ and *trans*-diols via the epoxide followed by acid hydrolysis.

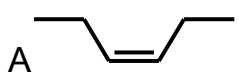
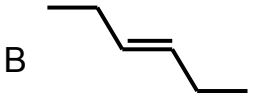
Compound **C** given below is formed from:

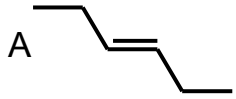
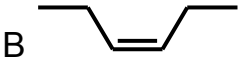
(i) alkene **A** by treatment with OsO_4 + $NaHCO_3$

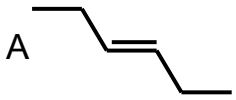
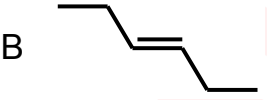
(ii) the epoxide of alkene **B** followed by acid hydrolysis.

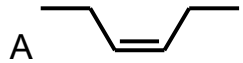


The structures of **A** and **B** are:

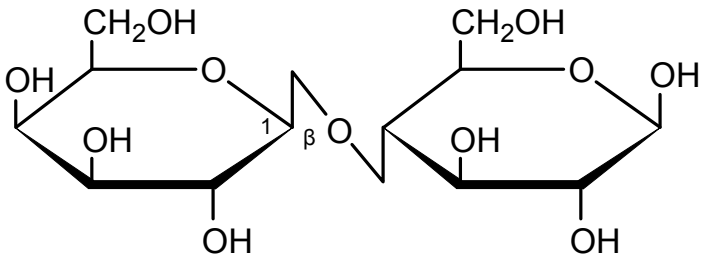
(A)  

(B)  

(C)  

(D)  

21. The disaccharide shown below undergoes enzymatic hydrolysis. The monosaccharide units formed upon complete hydrolysis of the disaccharide are

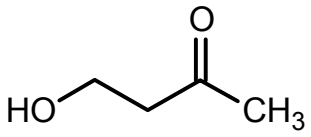


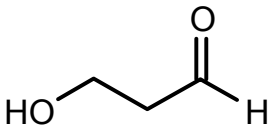
(A) Glucose and Glucose
(B) Glucose and Galactose
(C) Galactose and Fructose
(D) Galactose and Galactose

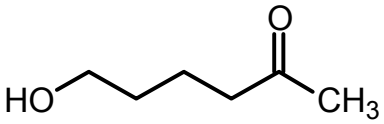
22. The correct order of the isoelectric points (pI) of Alanine (Ala), Arginine (Arg), and Glutamic acid (Glu) is:

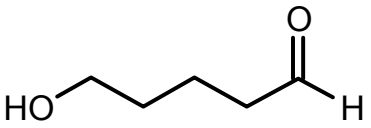
(A) Ala > Arg > Glu (B) Arg > Ala > Glu (C) Glu > Arg > Ala (D) Glu > Ala > Arg

23. Which of the following most readily forms a cyclic hemiacetal in the presence of an acid catalyst?

(A) 

(B) 

(C) 

(D) 

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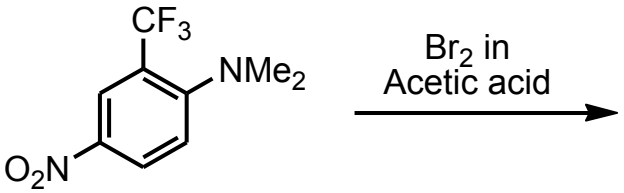
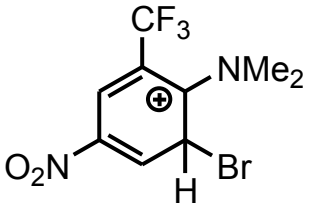
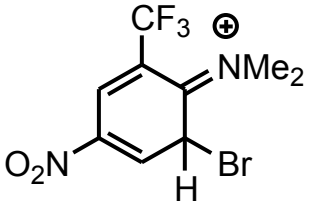
24. A medicinal chemist is exploring halogenated aromatic compounds as potential precursors for drug molecules. In one experiment, she attempts bromination of a substituted aromatic ring in the presence of acetic acid, a typical aromatic electrophilic substitution (AES) condition.

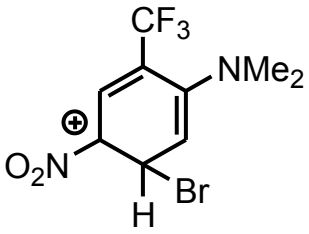


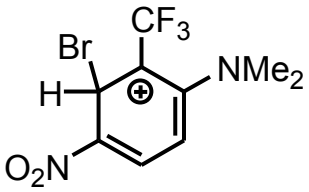
The chemist proposed an intermediate for the above reaction with the following resonance structures.

Which of the following structures contributes the most to the stability of the intermediate?

(A) 

(B) 

(C) 

(D) 

25. Which sequence of reagents, when used in the correct order, will convert benzene to *m*-nitro-n-propylbenzene?

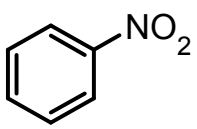
(A) (i) $CH_3COCl/AlCl_3$, (ii) HNO_3/H_2SO_4, (iii) Zn/Hg, HCl

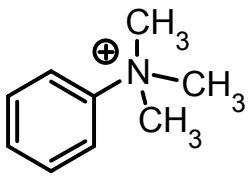
(B) (i) HNO_3/H_2SO_4, (ii) $CH_3CH_2CH_2Cl/AlCl_3$

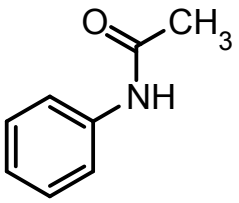
(C) (i) HNO_3/H_2SO_4, (ii) $CH_3CH_2COCl/AlCl_3$, (iii) $H_2NNH_2/NaOH$

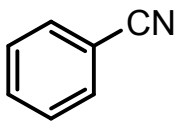
(D) (i) $CH_3CH_2COCl/AlCl_3$, (ii) HNO_3/H_2SO_4, (iii) $H_2NNH_2/NaOH$

26. Which of the following compounds predominantly gives the *para*-nitro product as the major isomer upon nitration using a nitrating mixture ($HNO_3 + H_2SO_4$)?

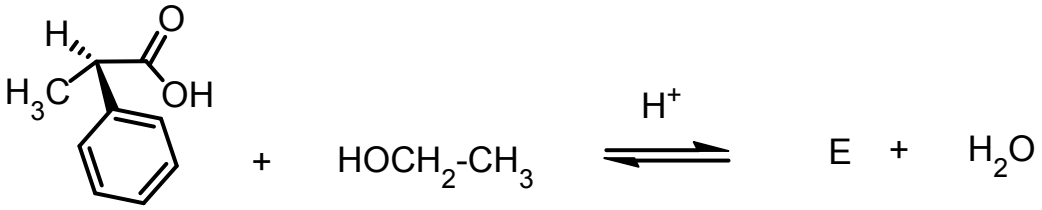
(A) 

(B) 

(C) 

(D) 

27. Product **E** formed in the following chemical reaction will



B

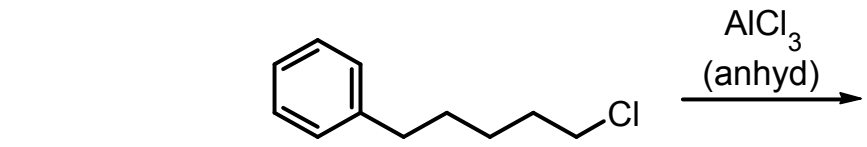
(A) have the same configuration as **B**

(B) have inverted configuration as compared to **B**

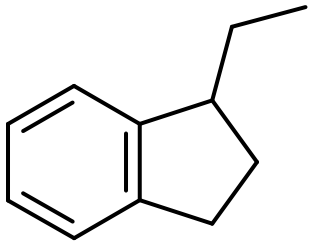
(C) be a racemic mixture

(D) be optically inactive

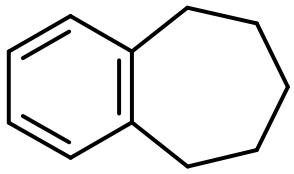
28. The most predominant product of the following reaction will be:



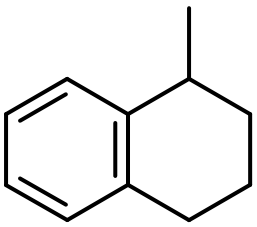
(A)



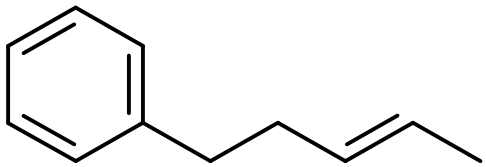
(B)



(C)

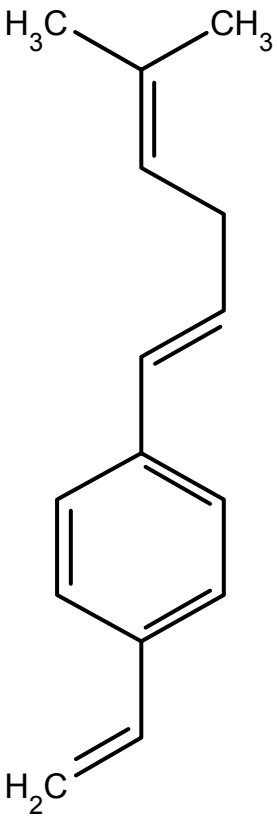


(D)

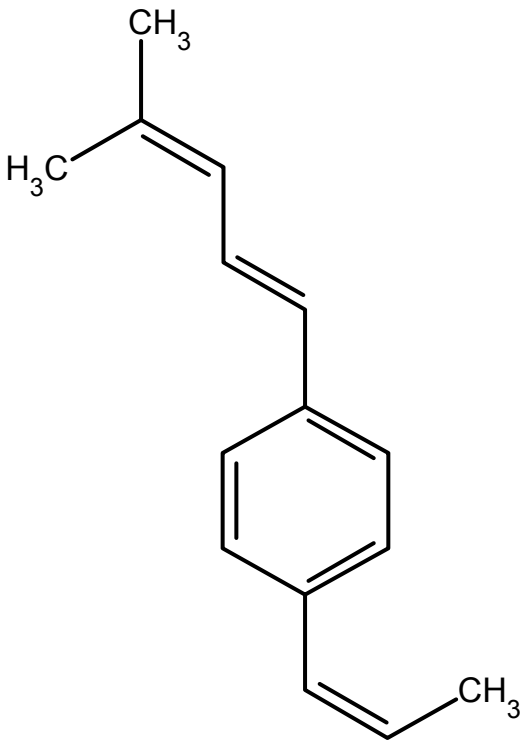


29. Which of the following molecules will react with ozone and hydrogen peroxide to form 1,4-benzene dicarboxylic acid, formic acid, oxalic acid and acetone?

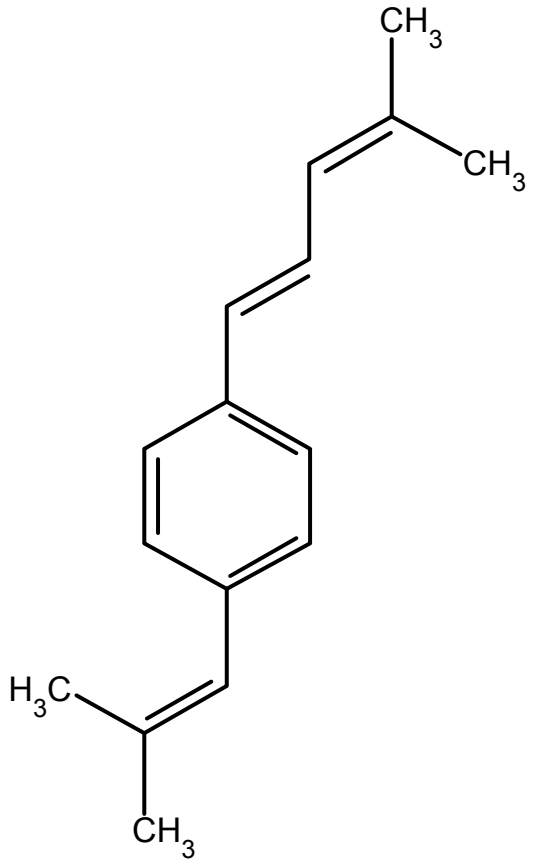
(A)



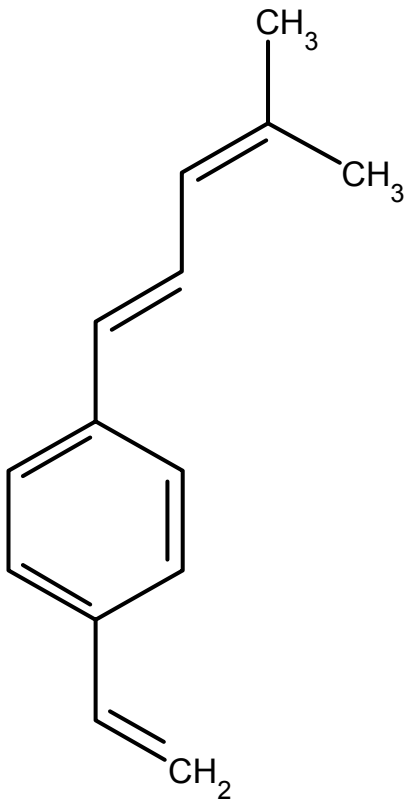
(B)



(C)



(D)



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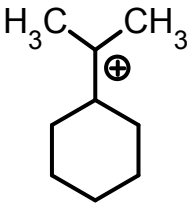
30. The correct numerical answers for the following is:

(i) The number of NOT-aromatic compounds from the following is

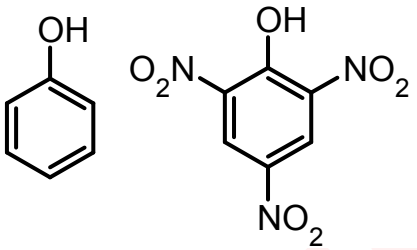


(ii) The number of α hydrogen atoms in the following structure is



(iii) The number of geometrical isomers possible in
$CH_3CH{=}CH{-}CH{=}CH_2$

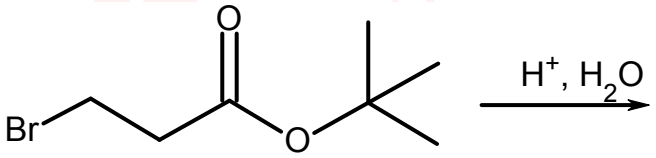
(iv) The number of compounds more acidic than CH_3COOH from:



CF_3COOH CH_3SO_3H C_2H_5OH

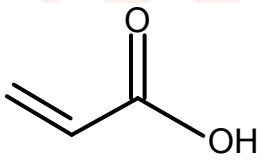
(A) (i) = 3 ; (ii) = 6; (iii) = 2; (iv) = 3
(B) (i) = 2 ; (ii) = 6; (iii) = 2; (iv) = 3
(C) (i) = 2 ; (ii) = 7; (iii) = 4; (iv) = 2
(D) (i) = 3 ; (ii) = 7; (iii) = 2; (iv) = 3

31. The following reaction is performed and multiple products are observed.

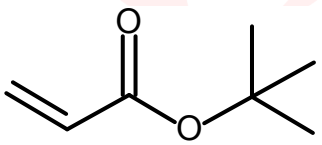


One of the products (X) can decolourize Br_2 water. The product (X) is

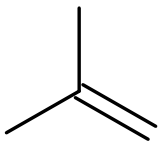
(A)



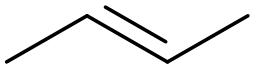
(B)



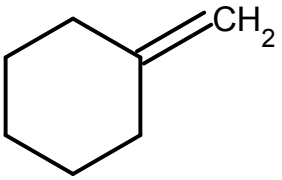
(C)



(D)



32. Compound **A** can be prepared from a suitable alkyl halide and appropriate reagent and conditions. The most appropriate combination of the requirements to give the highest yield is:

Compound A 

(A) 1-bromo-1-methylcyclohexane, CH_3O^-, CH_3OH

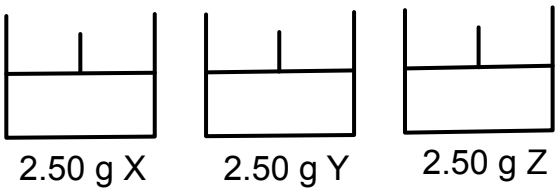
(B) 1-fluoro-1-methylcyclohexane, CH_3O^-, CH_3OH

(C) 1-bromo-1-methylcyclohexane, $(CH_3)_3CO^-$, $(CH_3)_3COH$

(D) 1-fluoro-1-methylcyclohexane, $(CH_3)_3CO^-$, $(CH_3)_3COH$

33. Consider three cylinders of capacity 2.24 L each fitted with piston. Each containing 2.50 g of an ideal gas (X, Y and Z) as specified below at 273 K. The pressure is not specified.

Given: Molar mass (in g mol^{-1}) as X = 40, Y = 80 and Z = 20.



The correct set of statement(s) is/are

(i) The number of molecules in each cylinder is the same.

(ii) The average velocity of the molecules in each cylinder is the same.

(iii) The pressure of gas Z is the highest.

(iv) If the pressure in each cylinder is adjusted to one atmosphere at constant temperature, the volume of the gas Z will increase and those of the other two will decrease.

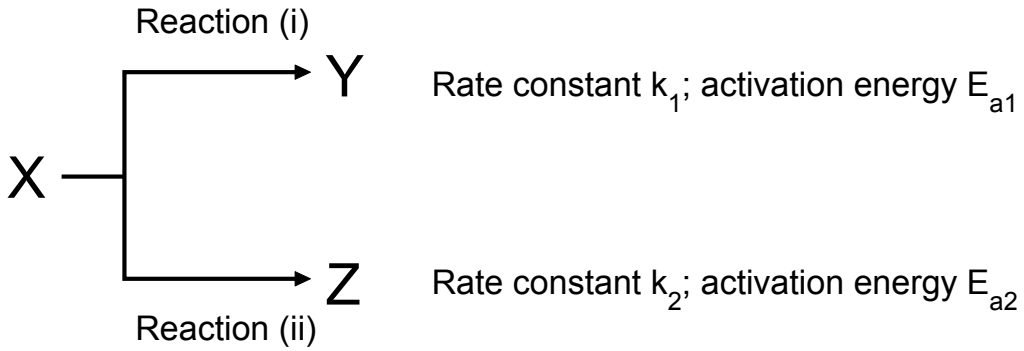
(A) (i) and (ii) are correct
(B) (i) and (iii) are correct
(C) (ii) and (iv) are correct
(D) (iii) and (iv) are correct

34. A sample(X) of MCl_2 was found to contain a small quantity of $M(OH)_2$ as an impurity, both of the compounds are soluble in water. In an experiment 30 g of the above sample (X) was dissolved in 60 mL of 0.4 M HCl to give solution (Y). 20 mL of 0.4 M NaOH was required to neutralise the excess HCl in solution(Y). The percentage of $M(OH)_2$ in sample(X) is:

Given: Molar mass of $M(OH)_2$ = 65 g mol^{-1}

(A) 1.7
(B) 3.5
(C) 0.17
(D) 0.35

35. Consider the following reactions (i) and (ii) occurring at 298 K, such that $E_{a2} = 3E_{a1}$ and the Arrhenius constant A has the same value for both the reactions. The relation between k_1 and k_2 is



(A) $k_1 = 3k_2e^{E_{a2}/RT}$ (B) $k_1 = k_2e^{2E_{a1}/RT}$

(C) $k_2 = k_1e^{2E_{a1}/RT}$ (D) $k_2 = k_1e^{3E_{a1}/RT}$

36. In the spacecrafts of NASA, the oxygen required for the astronauts is obtained from the following chemical reaction.

$$KClO_3(s) + Fe(s) \rightarrow O_2(g) + KCl(s) + FeO(s)$$

The requirement of O_2 per astronaut per day is 500 L as measured at 1 atm and 300 K. The minimum mass of $KClO_3$ (Molar mass of $KClO_3$ = 122.5 g mol^{-1}) needed for two astronauts to be in the spacecraft for ten days in a space mission is:

(A) 49.8 kg (B) 426 g (C) 213 g (D) 498.0 kg

37. When 15.0 g of steam at 373 K is passed in 250.0 g of H_2O (l) in closed container at 298 K at constant pressure of 1 bar, then the correct statement, if this is isolated system, will be:

(Assume that the final state is liquid water)

(A) Both the volume and entropy will increase.

(B) Both the volume and entropy will decrease.

(C) The volume will increase and the entropy will decrease.

(D) The volume will decrease and the entropy will increase.

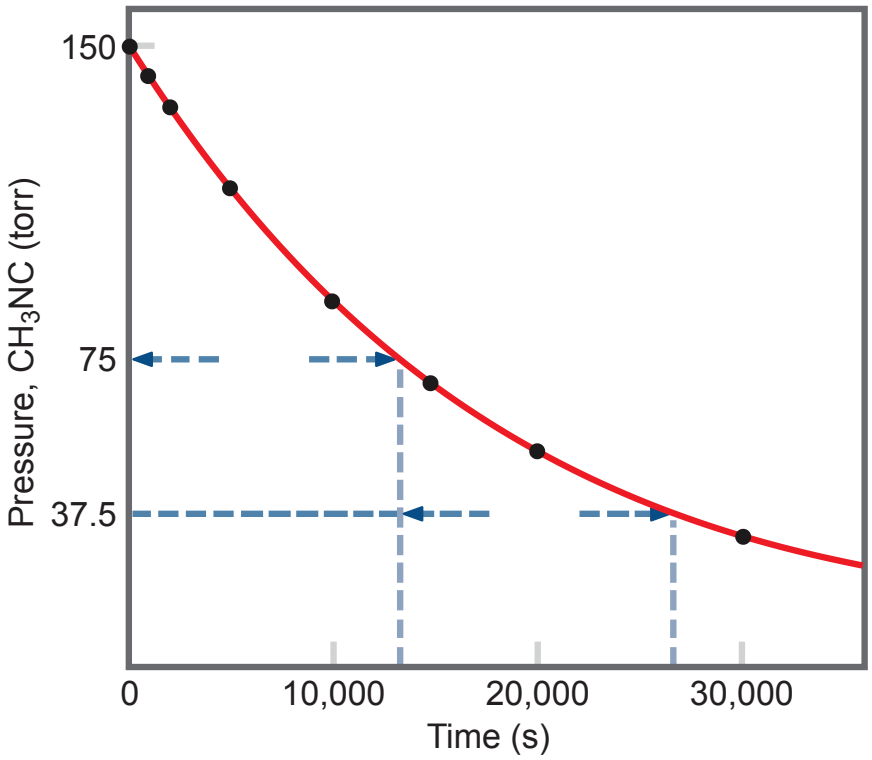
38. Consider the given equilibrium reaction at 473 K

$$Li_3N(s) + 2H_2(g) \rightleftharpoons LiNH_2(s) + 2\ LiH\ (s)\ \Delta H_{rxn}^{\circ} = -200\ kJ/mol$$

The number of moles of $H_2(g)$ present at equilibrium can be maximised by

	Temperature	Pressure
(A)	increasing	increasing
(B)	increasing	decreasing
(C)	decreasing	increasing
(D)	decreasing	decreasing

39. The following concentration vs time plot represents the conversion of $CH_3NC(g)$ to $CH_3CN(g)$. Which of the following statements (I to IV) is/are true?



I. The reaction is of zero order

II. Unit of rate constant of this reaction is s^{-1}

III. Unit of rate constant of the reaction is torr s^{-1}

IV. Unit of rate of the reaction is torr s^{-1}

(A) I only (B) I, II (C) III only (D) II, IV

40. Consider the chemical reaction A → C + D

The observations for kinetic study of the above unimolecular elementary reaction at 298 K are given in the table below:

Time (minute)	[A] (M)
0	0.35
10	0.035
t	0.00035

The value of time t (minute) is

(A) 20 (B) 30 (C) 40 (D) 35

41. Propanoic acid (PA) is an organic acid. At 298 K, the pH of a 50.0 mL sample of 0.20 M of it is 3.0. The pH of solution formed by mixing 25.0 mL 0.2 M sodium propanoate solution with 25.0 mL 0.1 M propanoic acid will be:

(A) 3.3 (B) 5.3 (C) 5.6 (D) 6.3

42. M is an alkaline earth metal. 1.0 M solution of MCl_2 is added dropwise to a solution that is 0.01 M each in fluoride, sulfite, and phosphate ions. The order of precipitation of corresponding salts is

Solid	**Ksp**
MSO_3	7×10^{-7}
MF_2	5×10^{-9}
$M_3(PO_4)_2$	1×10^{-25}

(A) $M_3(PO_4)_2$, MF_2, MSO_3 (B) $M_3(PO_4)_2$, MSO_3, MF_2

(C) MSO_3, MF_2, $M_3(PO_4)_2$ (D) MF_2, MSO_3, $M_3(PO_4)_2$

43. $CrCl_3.xNH_3$ can exist as an octahedral complex (P). 0.1 molal aqueous solution of this complex (P) shows a depression in freezing point of 0.558 °C. The molecular formula of the complex (P) is:

(Given K_f for water = 1.86 K Kg mol^{-1})

(Assuming 100% ionization of the complex)

(A) $[Cr(NH_3)_6]Cl_3$ (B) $[Cr(NH_3)_5Cl]Cl_2$

(C) $[Cr(NH_3)_4Cl_2]Cl$ (D) $[Cr(NH_3)_3Cl_3]$

44. Aspirin ($C_9H_8O_4$) is produced by the reaction between salicylic acid ($C_7H_6O_3$) and acetic anhydride ($C_4H_6O_3$) as per the reaction $C_7H_6O_3 + C_4H_6O_3 \rightarrow C_9H_8O_4 + C_2H_4O_2$

In the reaction of 155 g salicylic acid and 105 g acetic anhydride, assuming 80% conversion of the limiting reactant, the mass of aspirin formed is:

Given molar mass in g mol^{-1} salicylic acid = 138, acetic anhydride = 102 and aspirin = 180

(A) 148 g (B) 162 g (C) 202 g (D) 184 g

45. A voltaic cell is constructed as shown below

$Ni(s)|\ Ni^{2+}(aq)\ ||\ Ag^{+}(aq)\ |Ag(s)$

$E°_{Ni2+(aq)/Ni(s)} = -0.236$ V , $E°_{Ag+(aq)/Ag(s)} = 0.799$ V. The initial concentration of $Ag^{+}(aq)$ in the $Ag^{+}(aq)/Ag(s)$ half-cell is 0.005 M and the corresponding cell voltage is +0.95 V at 298 K. Identify the correct option from the following

(A) Initial $[Ni^{2+}](aq) = 0.019$ M; it will increase with time

(B) Initial $[Ni^{2+}](aq) = 0.120$ M; it will increase with time

(C) Initial $[Ni^{2+}](aq) = 0.019$ M; it will decrease with time

(D) Initial $[Ni^{2+}](aq) = 0.120$ M; it will decrease with time

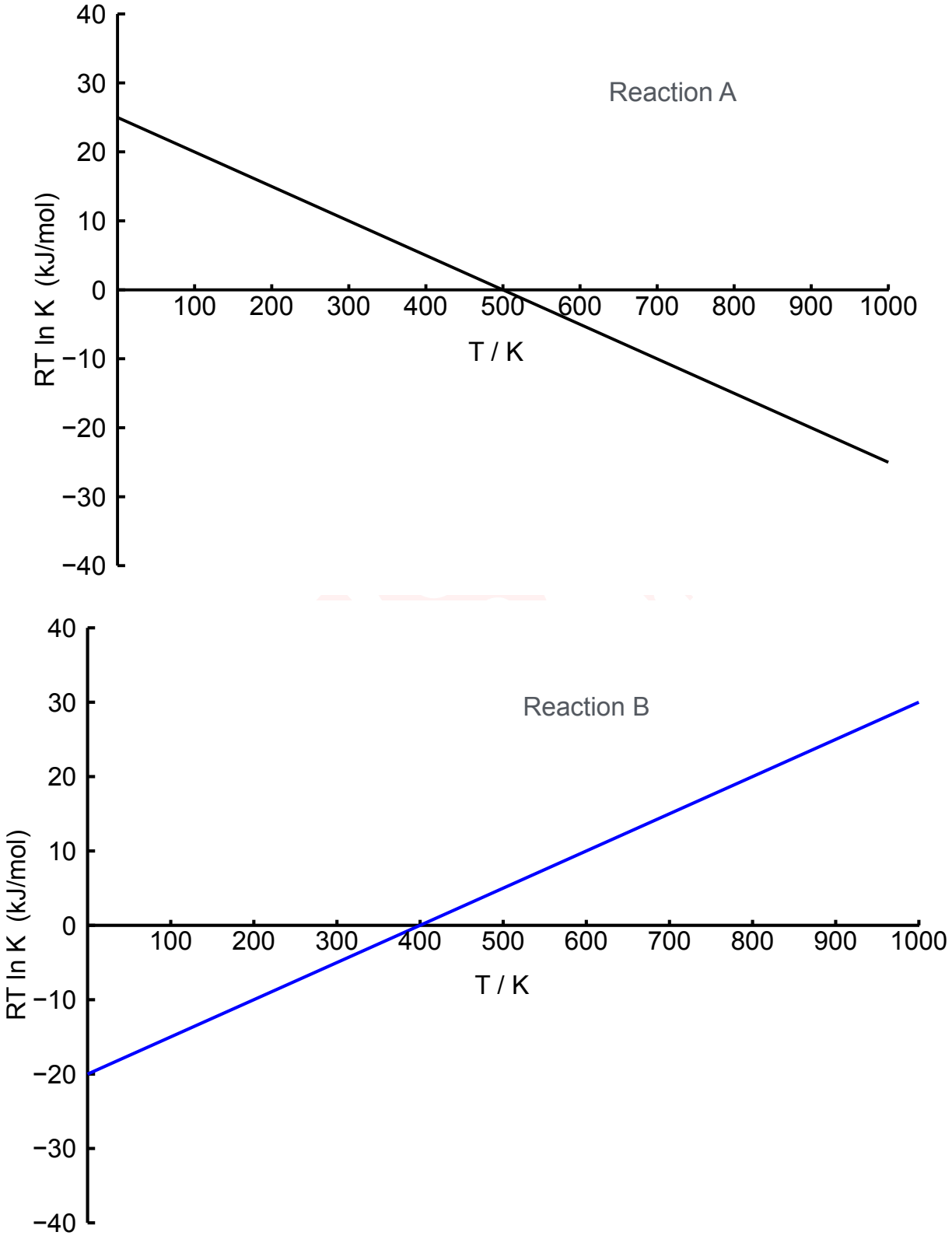
46. A certain quantity of a hydrocarbon fuel sample ($C_X\ H_Y$) is burnt in excess $O_2(g)$ to ensure complete combustion. The combustion produced 11.93 g $CO_2(g)$, 2.19 g $H_2O(g)$, and 311 kJ of heat. Mass of the fuel burnt in this combustion is

(A) 3.493 g (B) 14.02 g (C) 11.93 g (D) 3.250 g

47. The photon with the longest wavelength required for the electronic transition in an atom of hydrogen is:

(A) $n = 1 \rightarrow n = 3$ (B) $n = 2 \rightarrow n = 6$ (C) $n = 3 \rightarrow n = 1$ (D) $n = 1 \rightarrow n = 6$

48. Consider two reactions A and B for which the variation of RT ln K with temperature is given in the plots below. If the enthalpy change for the reactions are –25 kJ/mol and 20 kJ/mol, respectively for A and B, the correct statement is:



(A) The equilibrium constant for Reaction B decreases as temperature increases.

(B) The entropy change for Reaction A is 50 kJ/mol.

(C) Reaction A remains spontaneous only at temperatures less than 500K

(D) At 400 K, reaction B changes from exothermic to endothermic reaction.

PART A-2 · ONE OR MORE CORRECT OPTIONS

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

49. Alkyl lithium compounds are of interest in organic synthesis as efficient alkylating agents. Consider the following two reactions

(i) $C_4H_9Li + C_6H_6 \rightarrow C_6H_5Li + C_4H_{10}$

(ii) $C_5H_5Li + C_6H_6 \rightarrow C_6H_5Li + C_5H_6$

The CORRECT statement(s) for the above two reactions is/are:

(A) Reaction (i) will proceed because the more acidic hydrocarbon will react with the Li-derivative of less acidic hydrocarbon to liberate less acidic hydrocarbon.

(B) Reaction (ii) will proceed because the less acidic hydrocarbon will react with the Li-derivative of more acidic hydrocarbon to liberate more acidic hydrocarbon.

(C) Both the reactions will proceed because the more acidic hydrocarbon will react with the Li-derivative of more acidic hydrocarbon to liberate less acidic hydrocarbon.

(D) Both the reactions proceed because the less acidic hydrocarbon will react with the Li-derivative of more acidic hydrocarbon to liberate less acidic hydrocarbon.

50. A mixture gave light yellow precipitate with silver nitrate which did not dissolve completely with ammonia solution. It gave positive chromyl chloride test. When organic layer test was performed with addition of excess of concentrated nitric acid, a violet coloured organic layer first formed which then changed to orange colour. Brown ring test was positive but brown coloured gas was not intensified on heating the mixture with copper turnings and concentrated sulphuric acid. Which of the anions were present?

(A) Chloride, bromide, iodide

(B) Chloride, nitrate, iodide

(C) Fluoride, nitrate, bromide

(D) Chloride, iodide, nitrite

51. Consider the following half-cell reactions

$$H^+_{(aq)} + e^- \rightleftharpoons 1/2H_{2(g)}\ E^0 = 0.00\ V$$

$$V^{3+}_{(aq)} + e^- \rightleftharpoons V^{2+}_{(aq)}\ E^0 = -0.255\ V$$

$$VO^{2+} + e^- + 2H^+ \rightleftharpoons V^{3+}_{(aq)} + H_2O_{(l)}\ E^0 = +0.337\ V$$

$$1/2O_{2(g)} + 2e^- + 2H^+ \rightleftharpoons H_2O_{(l)}\ E^0 = +1.23\ V$$

Using above equations, the correct statement(s) is/are

(A) Oxidation of $V^{2+}_{(aq)}$ to $V^{3+}_{(aq)}$ by H^+ is a spontaneous reaction.

(B) Oxidation of $V^{3+}_{(aq)}$ to $V^{4+}_{(aq)}$ by H^+ is a nonspontaneous reaction.

(C) H^+ is a better oxidizing agent than O_2.

(D) O_2 will be able to oxidize $V^{2+}_{(aq)}$ to $V^{3+}_{(aq)}$.

52. The suitable combinations of physico-chemical methods that can be used to assign the correct formula to the compound $CoCl_3.4NH_3$ are

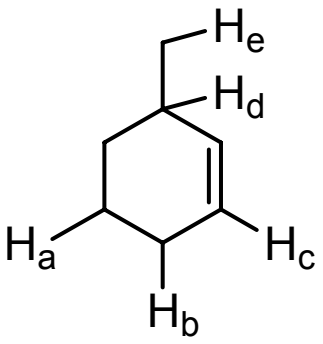
(A) Addition of Ag^+ ions

(B) Electrical conductance of aqueous solution

(C) Depression in freezing point

(D) Thermal decomposition of the complex under controlled conditions

53. Given below is the structure of a compound **X**. Identify the correct statement(s) from below.



X

(A) Compound X has two vinylic protons, and two allylic protons.

(B) Compound X (9.6 gram) will react with excess of bromine to give a dibromide (25.6 gram).

(C) The carbon radical that generated by cleavage of C-H_d bond will be more stable than that generated by cleavage of C-H_b bond.

(D) Compound X on ozonolysis followed by treatment with Zn/H_2O will give a dial.

54. Which of the following statement(s) is/are incorrect for sugars?

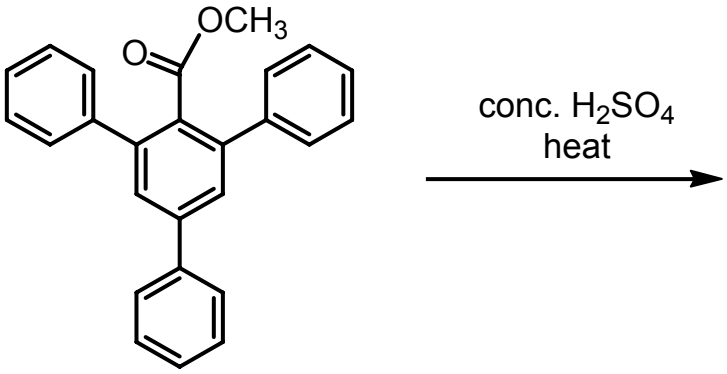
(A) If a disaccharide is dextrorotatory, it means both its monosaccharides will also be essentially dextrorotatory.

(B) The designations (+) and (–) can also be referred to as D- and L- respectively

(C) The predominant hemiacetal form of glucose is formed by bond formation between C_1 and C_6

(D) All nucleic acids contain 2-deoxy-D-ribose as the aldopentose

55. When the following reaction was performed, the product obtained gave a bright orange red precipitate with 2, 4-dinitrophenylhydrazine and does not react with saturated solution of $NaHCO_3$.



This implies:

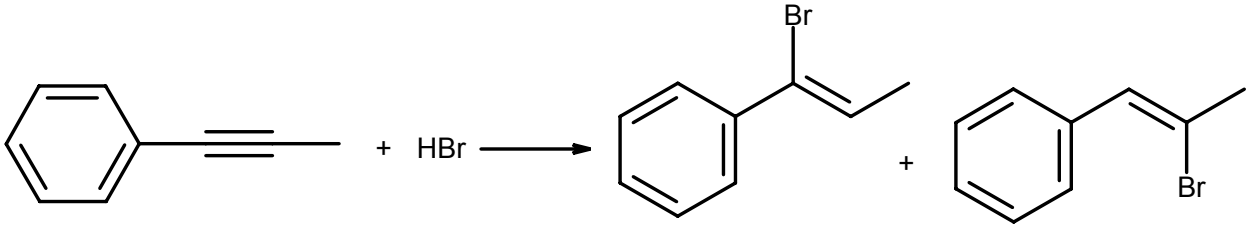
(A) hydrolysis has taken place

(B) intramolecular Friedal Crafts reaction has been favoured

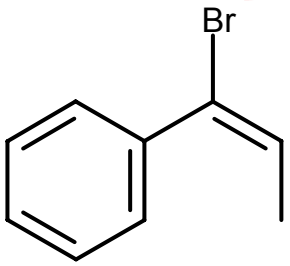
(C) intermolecular Friedal Crafts reaction has taken place

(D) the product has a carbonyl functional group

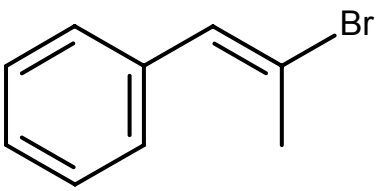
56. The following reaction was performed.



However, on investigation it was discovered that there were additional product(s) in the reaction mixture. The additional product(s) is/are

(A) 

(B) a vicinal dibromide

(C) 

(D) a geminal dibromide

57. Two open beakers A and B are kept inside a sealed box. Initially, beaker A contains 30 mL of 0.050 M glucose solution and beaker B contains 30 mL of 0.035 M fructose solution. Enough time was given to ensure that the water vapour in the system is in equilibrium. Under the equilibrium conditions,

Assume density of solution to be 1 gm/cm^3

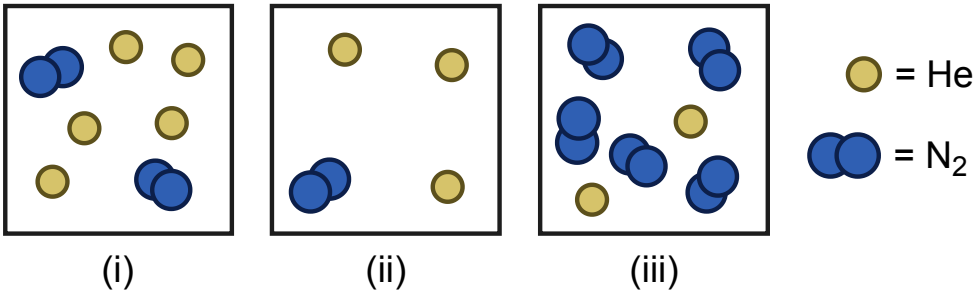
(A) Volume of solution in A decreased to 25 mL

(B) Volume of solution in B decreased to 25 mL

(C) Volume of solution in A increased to 35 mL

(D) Volume of solution in B increased to 35 mL

58. Three different gaseous mixtures (i), (ii) and (iii) of helium and nitrogen are placed in boxes of equal volume as shown below:



The true statement(s) from the following is/are

(A) Box (ii) has the lowest pressure

(B) Box (ii) has the lowest partial pressure of helium

(C) Box (ii) has the lowest density

(D) Pressure of box (iii) is less than pressure of box (i)

59. Identify the isotonic solution(s) from the following mixtures of aqueous solutions at 298 K. (Assume complete dissociation of the electrolytes in water)

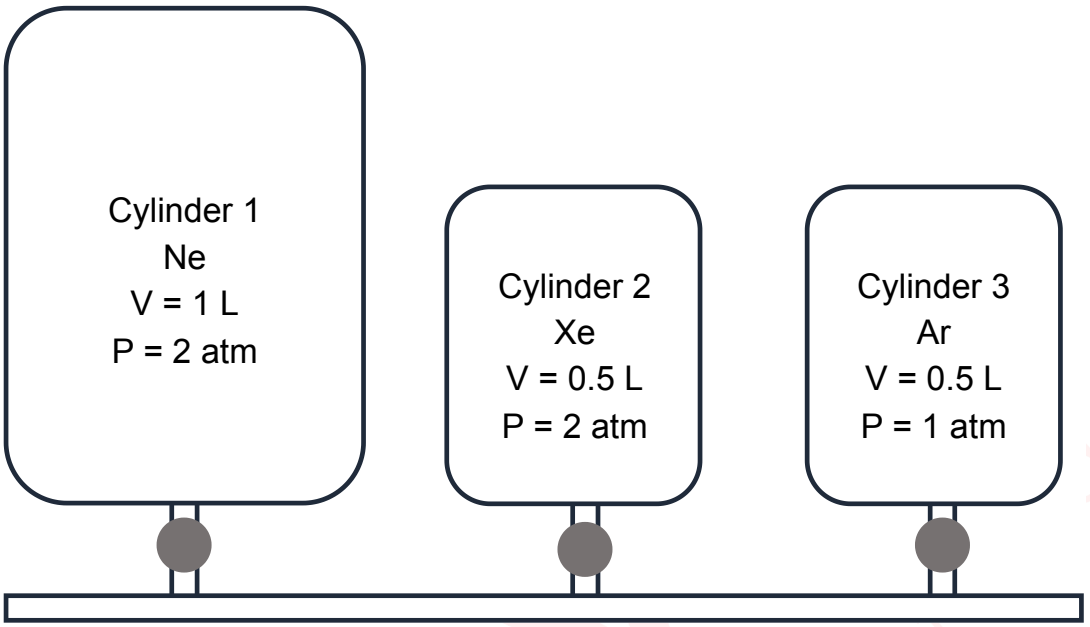
(A) 100 mL 0.5 M glucose solution and 110 mL 0.2 M $CuSO_4$ solution

(B) 200 mL 0.5 M acetamide solution and 300 mL 0.1 M NaCl solution

(C) 400mL 0.1 M $BaCl_2$ solution and 100 mL 0.2 M KCl solution

(D) 200mL 0.13 M $CaCl_2$ solution and 200mL 0.125 M HCl solution

60. Three cylinders connected with valves are shown in the diagram. All the cylinders are at same temperature. Which of the following statement(s) is/are true once the valves are opened and the system is allowed to reach equilibrium?



NOTE: Volume of connecting tubes may be neglected.

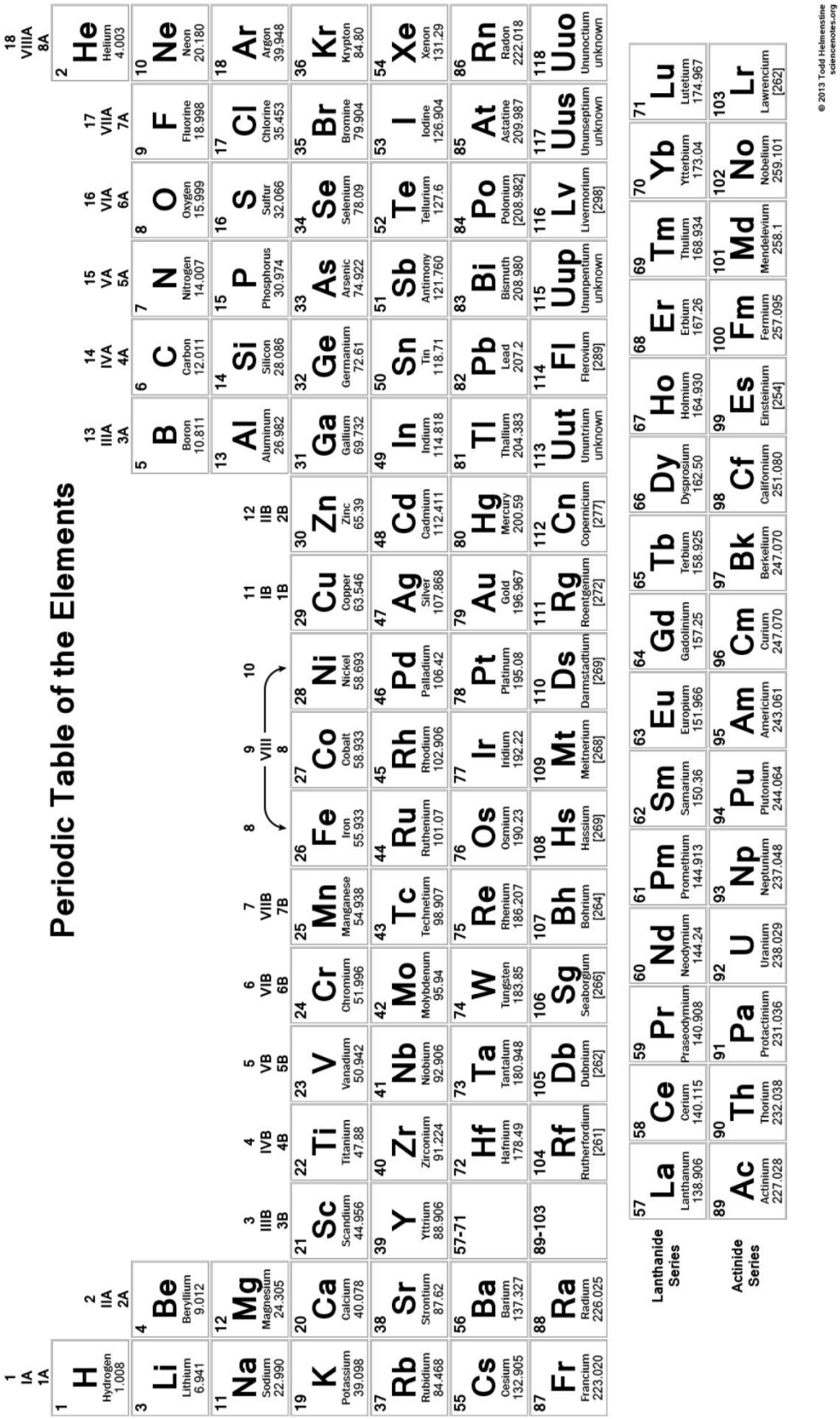
(A) Total pressure of the system will be 1.75 atm

(B) The partial pressure of Ne in cylinder 1 will be higher than that in cylinder 2 and 3

(C) The correct order of partial pressures will be p(Ne) > p(Xe) > p(Ar)

(D) Number of moles of gas in cylinder 2 will be lower than its initial value.

Given in the question paper



ANSWER KEY

NSEC 2025 · 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	(D)	3	—★	4	(A)	5	(D)
6	(C)	7	(D)	8	(B)	9	(A)	10	(D)
11	(A)	12	(C)	13	(C)★	14	(D)	15	(C)
16	(C)	17	(B)★	18	(C)★	19	(C)	20	(B)
21	(B)	22	(B)	23	(D)	24	(B)	25	(D)
26	(C)	27	(A)	28	(C)	29	(D)	30	(D)
31	(C)	32	(C)★	33	(D)	34	(A)	35	(B)
36	(A)	37	(D)★	38	(B)	39	(D)	40	(B)
41	(C)	42	(A)	43	(B)	44	(A)	45	(A)
46	(A)	47	(B)	48	(C)	49	(A)	50	(A)
51	(A), (B), (D)	52	(A), (B), (C), (D)★	53	(B), (C), (D)	54	(A), (B), (C), (D)	55	(B), (D)
56	(A), (B), (C), (D)	57	(B), (C)	58	(A), (C)	59	(B), (C), (D)	60	(A), (C), (D)

★ Answers as per Zigyan

- **Q3** — As per Zigyan: no option is correct; dropped by IAPT.
- **Q13** — As per Zigyan: (C); IAPT key (C).
- **Q17** — As per Zigyan: (B); IAPT key (B).
- **Q18** — As per Zigyan: (C); IAPT key (C).
- **Q32** — As per Zigyan: (C); IAPT key (C).
- **Q37** — As per Zigyan: (D); IAPT key (A).
- **Q52** — As per Zigyan: (A), (B), (C), (D); IAPT key (A), (B), (C), (D).

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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

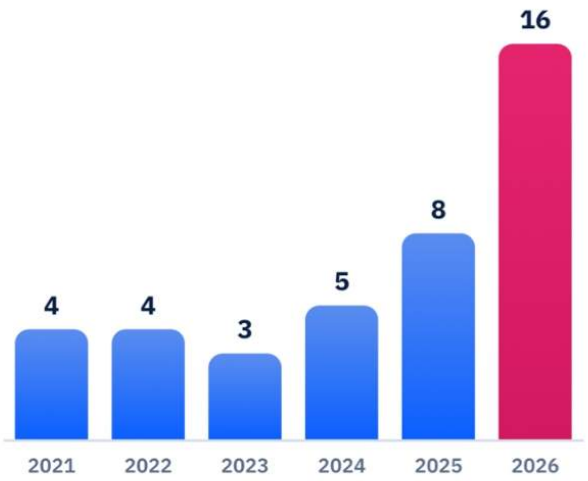
40
JEE Advanced selections in 6 years

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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