7 YEARS (2019 to 2025)

JEE Main

All 143 Shifts

CHAPTER-WISE & TOPIC-WISE
SOLVED PAPERS

CONCENTRATE ON RELEVANCE: 2019-25 REFLECTING REAL JEE PATTERNS

4000+ PYQs

2019
JEE TRANSFORMATION

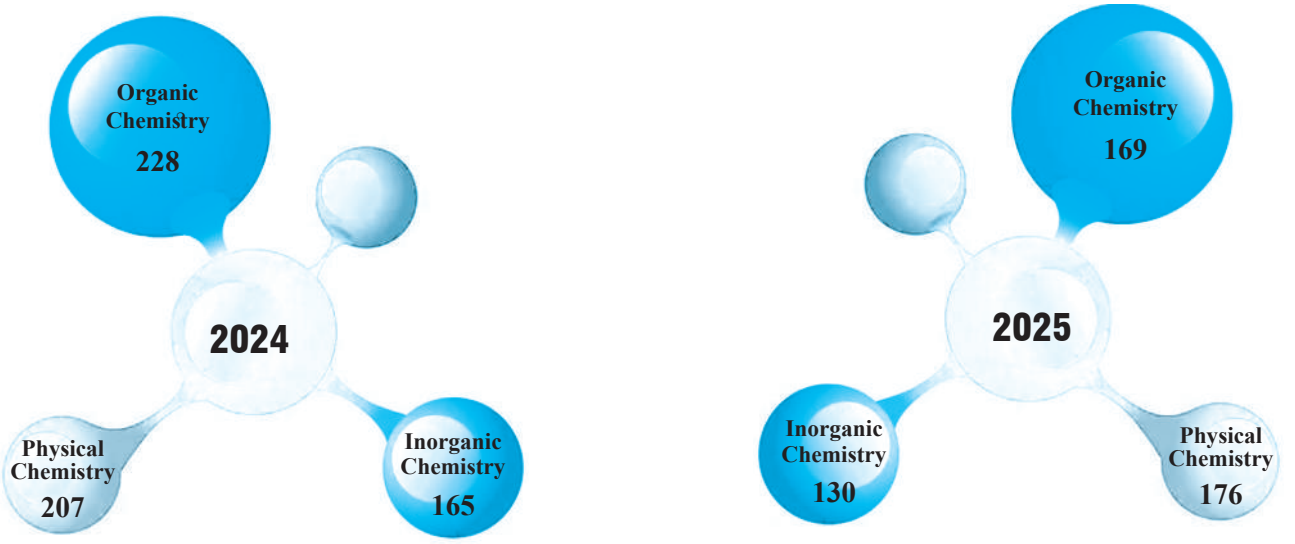
- Shifted 100% Online
- Multiple Shifts Started in Jan & April
- Integer Type introduced from 2019-20
- More than enough (4000+) PYQs to practice

CHEMISTRY

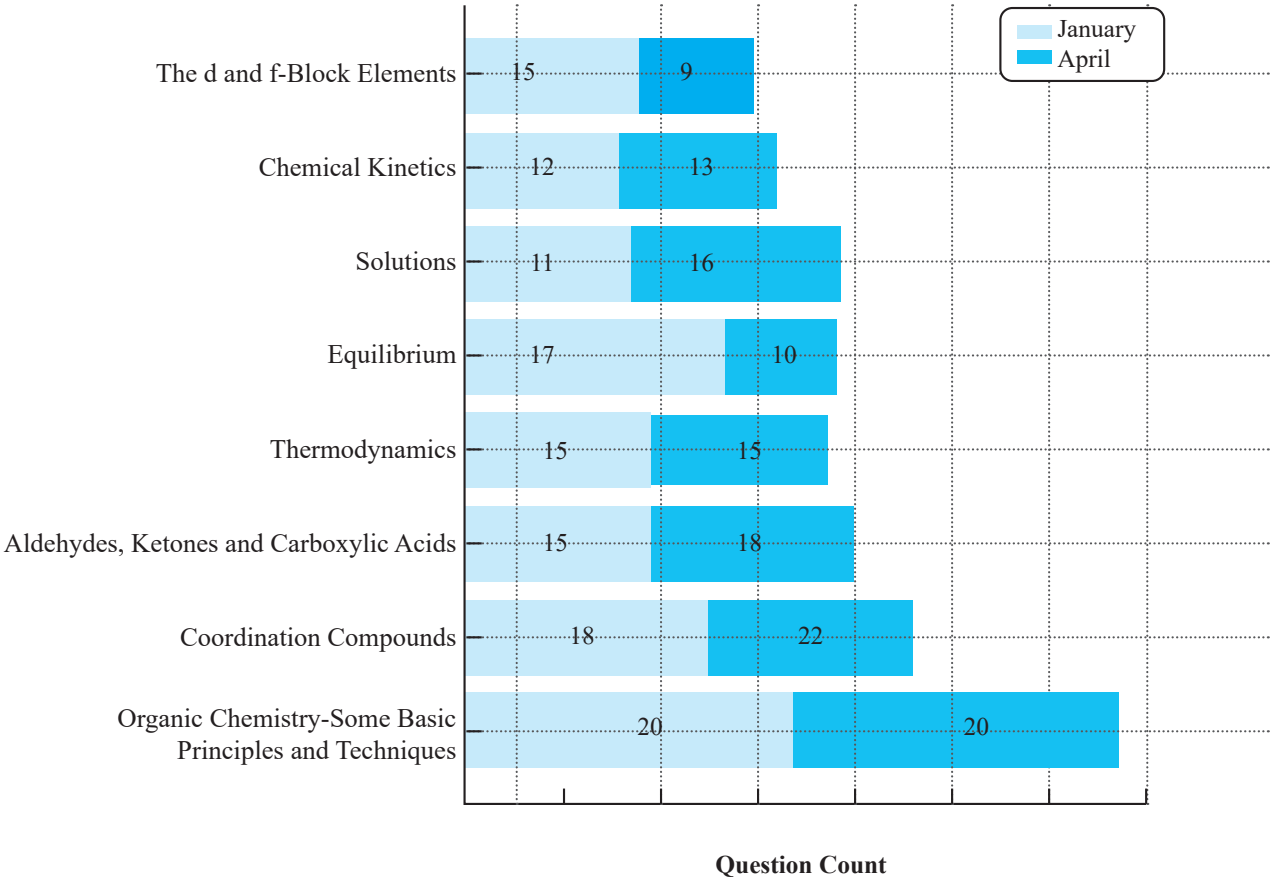
100% Solved by Expert Faculties | 100% Verified from NTA Answer Keys

Paper Analysis (2024-25)

Subdicipline Question Trends



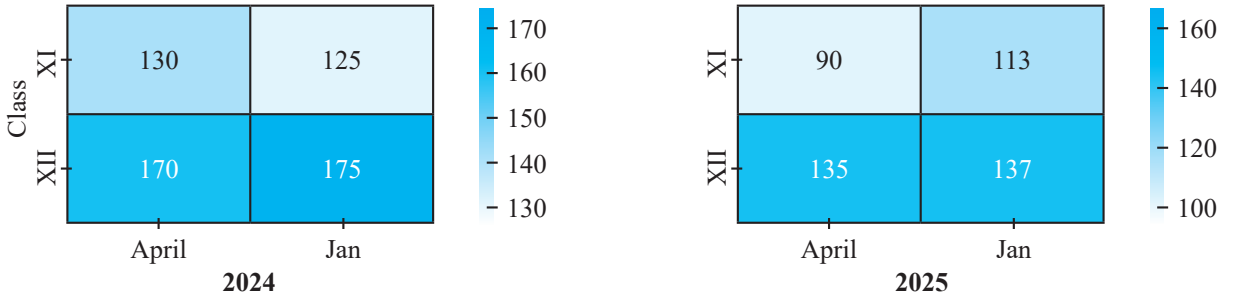
Major Chemistry Chapters (≫50% Weightage)



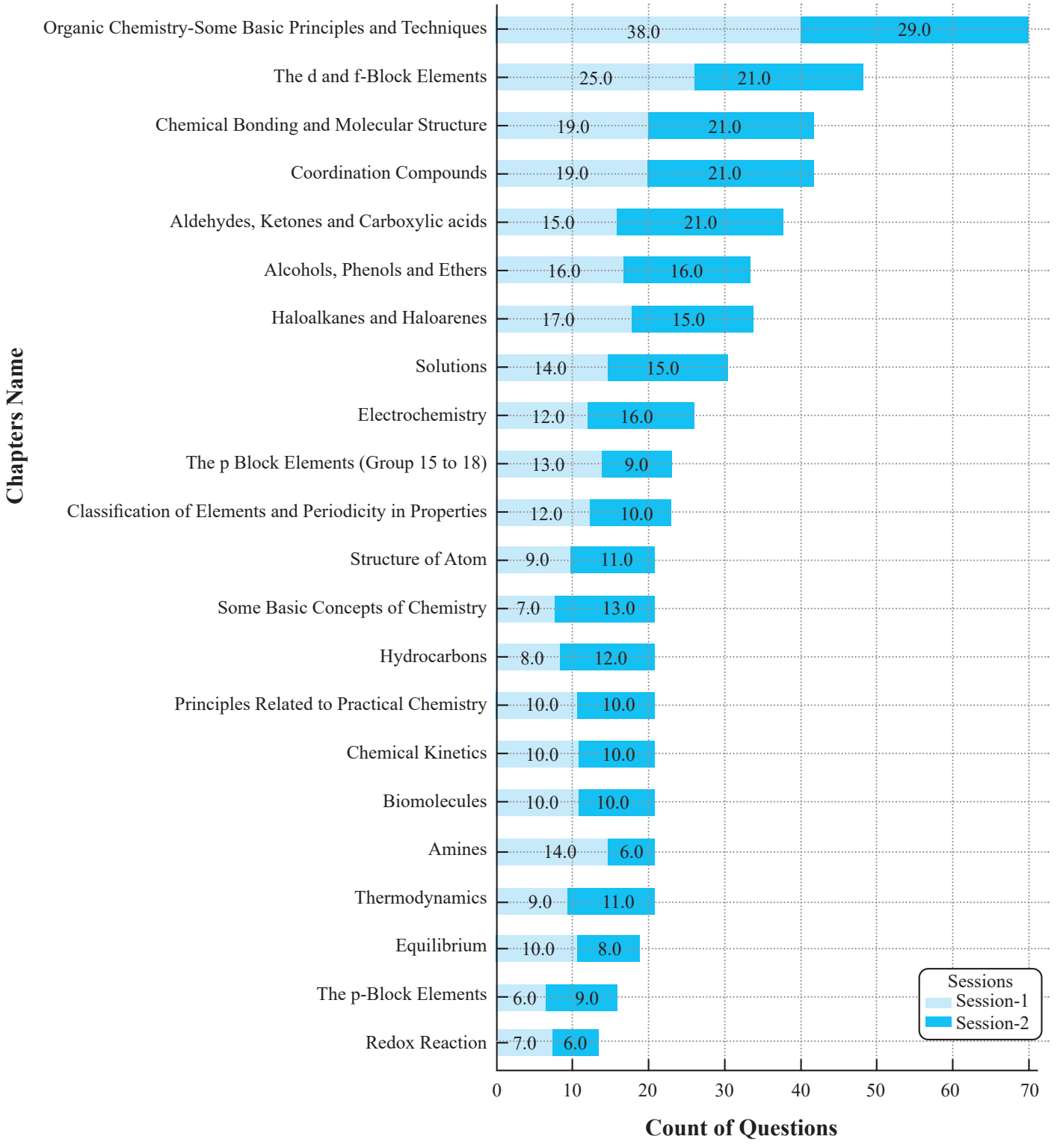
Chapter-wise Weightage Analysis

	Chapter Name	Jan	April
50% Questions Asked from these 8 chapters	Organic Chemistry-Some Basic Principles and Techniques	20	20
	Coordination Compounds	18	22
	Aldehydes, Ketones and Carboxylic Acids	15	18
	Thermodynamics	15	15
	Equilibrium	17	10
	Solutions	11	16
	Chemical Kinetics	12	13
	The d and f-Block Elements	15	9
	Electrochemistry	14	9
	Some Basic Concepts of Chemistry	11	11
	Biomolecules	11	11
	Haloalkanes and Haloarenes	14	7
	Classification of Elements and Periodicity in Properties	14	6
	Structure of Atom	10	9
	Hydrocarbons	13	6
	Amines	10	9
	Alcohols, Phenols and Ethers	8	7
	Chemical Bonding and Molecular Structure	8	6
	Principles Related to Practical Chemistry	5	8
	The p-Block Elements (Group 15 to 18)	4	6
	The p-Block Elements	2	7
	Redox Reactions	3	0

Class-wise Distribution of Question



Chapters Count Per Session-2024

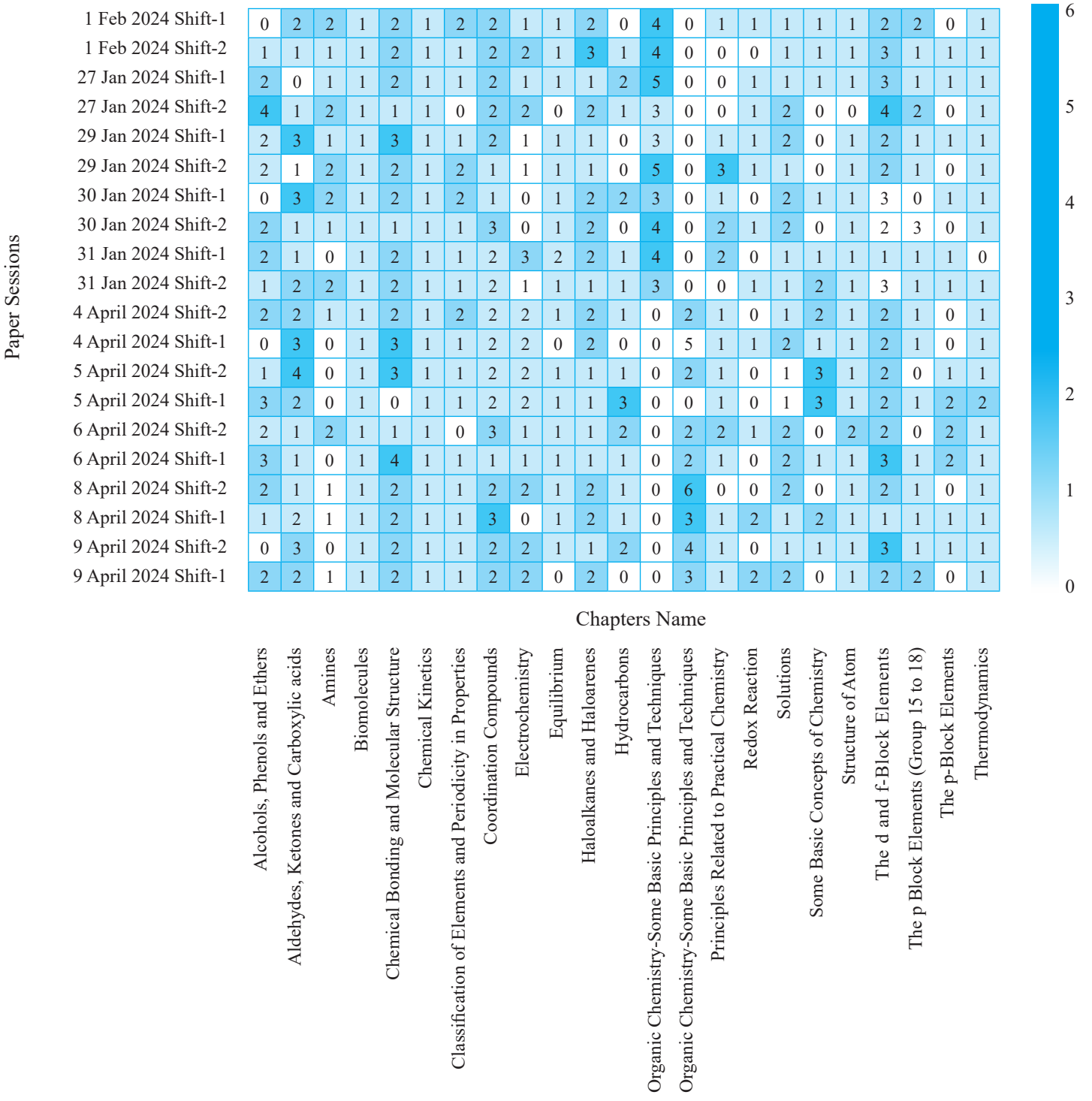


Focus Variability: The number of questions on "Coordination Compounds" increased from Session-1 to Session-2, indicating a shift in emphasis, while "The d and f-Block Elements" and "Solutions" saw a reduction.

Consistent Topics: Chapters like "Aldehydes, Ketones and Carboxylic Acids" and "Amines" had a consistent question count across sessions, suggesting their steady importance in the curriculum.

Consistent Importance: "Chemical Bonding and Molecular Structure" and "Coordination Compounds" consistently attract a lot of questions each year, underlining their foundational significance.

Heatmap of Chapter Occurences Across Different Paper Sessions-2024



Highly Tested: "Coordination Compounds" and "Organic Chemistry" continue to be key focus areas in most sessions.

Less Emphasized: "Redox Reactions" and "The p-Block Elements" have fewer appearances, suggesting they are less prioritized in the curriculum.

CONTENTS

1 Some Basic Concepts of Chemistry

Equilibrium in Physical and Chemical Processes

1. Choose the **correct** statements.

(A) Weight of a substance is the amount of matter present in it.

(B) Mass is the force exerted by gravity on an object.

(C) Volume is the amount of space occupied by a substance.

(D) Temperatures below 0°C are possible in Celsius scale, but in Kelvin scale negative temperature is not possible.

(E) Precision refers to the closeness of various measurements for the same quantity.

Choose the **correct** answer from the options given below:

[29 Jan, 2025 (Shift-I)]

(*a*) (B), (C) and (D) Only (*b*) (C), (D) and (E) Only

(*c*) (A), (B) and (C) Only (*d*) (A), (D) and (E) Only

2. The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 'A' $\times 10^{12}$ hertz and that has a radiant intensity in that direction of $\frac{1}{\text{'B'}}$ watt per steradian. 'A' and 'B' are respectively.

[09 April, 2024 (Shift-II)]

(*a*) 540 and $\frac{1}{683}$ (*b*) 540 and 683

(*c*) 450 and $\frac{1}{683}$ (*d*) 450 and 683

Uncertainty in Measurement and Laws of Chemical Combinations

3. Which of the following have same number of significant figures?

[8 April, 2023 (Shift-II)]

(A) 0.00253 (B) 1.0003

(C) 15.0 (D) 163

Choose the correct answer from the options given below

(*a*) A, B and C only (*b*) C and D only

(*c*) A, C and D only (*d*) B and C only

4. Using the rules for significant figures, the correct answer for the expression $\frac{0.02858\times 0.112}{0.5702}$

[29 June, 2022 (Shift-II)]

(*a*) 0.005613 (*b*) 0.00561

(*c*) 0.0056 (*d*) 0.006

5. The number of significant figure in 0.00340 is _____.

[25 July, 2021 (Shift-II)]

6. The number of significant figures in 50000.020 $\times 10^{-3}$ is_____.

[26 Feb, 2021 (Shift-I)]

Dalton's Atomic Theory

7. Choose the Incorrect Statement about Dalton's Atomic Theory

[04 April, 2024 (Shift-II)]

(*a*) Compounds are formed when atoms of different elements combine in any ratio

(*b*) All the atoms of a given element have identical properties including identical mass

(*c*) Matter consists of indivisible atoms

(*d*) Chemical reactions involve recorganization of atoms

8. The incorrect postulates of the Dalton's atomic theory are:

(A) Atoms of different elements differ in mass.

(B) Matter consists of divisible atoms.

(C) Compounds are formed when atoms of different element combine in a fixed ratio.

(D) All the atoms of given element have different properties including mass.

(E) Chemical reactions involve reorganisation of atoms.

Choose the correct answer from the options given below:

[05 April, 2024 (Shift-I)]

(*a*) (B), (D), (E) only (*b*) (A), (B), (D) only

(*c*) (C), (D), (E) only (*d*) (B), (D) only

Atomic & Molecular Masses

9. The average molar mass of chlorine is 35.5 g mol^{-1}. The ratio of ^{35}Cl to ^{37}Cl in naturally occurring chlorine is close to:

[6 Sept, 2020 (Shift-II)]

(*a*) 4 : 1 (*b*) 3 : 1

(*c*) 2 : 1 (*d*) 1 : 1

Mole Concept and Molar Masses

10. 20 mL of sodium iodide solution gave 4.74 g silver iodide when treated with excess of silver nitrate solution. The molarity of the sodium iodide solution is _____ M. (Nearest Integer value)

(Given : $Na = 23, I = 127, Ag = 108, N = 14, O = 16$ g mol^{-1})

[08 April, 2025 (Shift-II)]

11. The amount of calcium oxide produced on heating 150 kg limestone (75% pure) is_____kg. (Nearest integer)

Given : Molar mass (in g mol^{-1}) of Ca-40, O-16, C-12

[04 April, 2025 (Shift-II)]

12. Mass of magnesium required to produce 220 mL of hydrogen gas at STP on reaction with excess of dil. HCl is

Given : Molar mass of Mg is 24 g mol^{-1}.

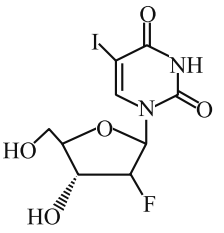
[03 April, 2025 (Shift-II)]

(*a*) 235.7 g (*b*) 0.24 mg (*c*) 236 mg (*d*) 2.444 g

13. Among 10^{-9} g (each) of the following elements, which one will have the highest number of atoms?
Element : Pb, Po, Pr and Pt **[03 April, 2025 (Shift-I)]**

(*a*) Po (*b*) Pr (*c*) Pb (*d*) Pt

14. 0.1 mol of the following given antiviral compound (P) will weigh _____ $\times 10^{-1}$ g **[02 April, 2025 (Shift-I)]**



(P)

(Given: molar mass in g mol^{-1} H: 1, C : 12, N : 14, O : 16, F : 19, I : 127)

15. On complete combustion 1.0 g of an organic compound (X) gave 1.46 g of CO_2 and 0.567 g of H_2O. The empirical formula mass of compound (X) is _____ g.
(Given molar mass in g mol^{-1} C : 12, H : 1, O : 16)

[02 April, 2025 (Shift-I)]

(*a*) 30 (*b*) 45 (*c*) 60 (*d*) 15

16. 0.01 mole of an organic compound (X) containing 10% hydrogen, on complete combustion produced 0.9 g H_2O. Molar mass of (X) is _____ g mol^{-1}. **[23 Jan, 2025 (Shift-II)]**

17. 2.8×10^{-3} mol of CO_2 is left after removing 10^{21} molecules from its '*x*' mg sample. The mass of CO_2 taken initially is
Given: $N_A = 6.02 \times 10^{23}$ mol^{-1} **[23 Jan, 2025 (Shift-I)]**

(*a*) 48.2 mg (*b*) 98.3 mg
(*c*) 150.4 mg (*d*) 196.2 mg

18. 0.05 cm thick coating of silver is deposited on a plate of 0.05 m^2 area. The number of silver atoms deposited on plate are _____ $\times 10^{23}$. (At mass Ag = 108, $d = 7.9$ g cm^{-3})

[30 Jan, 2024 (Shift-I)]

19. The number of molecules and moles in 2.8375 litres of O_2 at STP are respectively **[10 April, 2023 (Shift-I)]**

(*a*) 7.527×10^{22} and 0.250 mol (*b*) 1.505×10^{23} and 0.250 mol
(*c*) 7.527×10^{23} and 0.125 mol (*d*) 7.527×10^{22} and 0.125 mol

20. Match List-I with List-II. **[10 April, 2023 (Shift-II)]**

LIST-I		LIST-II	
A.	16g of CH_4(g)	I.	Weighs 28 g
B.	1g of H_2(g)	II.	60.2×10^{23} electrons
C.	1 mole of N_2(g)	III.	Weighs 32g
D.	0.5 mol of SO_2(g)	IV.	Occupies 11.4 L volume at STP

Choose the correct answer from the options given below:

(*a*) (A)-(I), B-(III), C-(II), D-(IV)
(*b*) (A)-(II), B-(III), C-(IV), D-(I)
(*c*) (A)-(II), B-(IV), C-(III), D-(I)
(*d*) (A)-(II), B-(IV), C-(I), D-(III)

21. When 0.01 mol of an organic compound containing 60% carbon was burnt completely, 4.4 g of CO_2 was produced. The molar mass of compound is _____ g mol^{-1} (Nearest integer)

[29 Jan, 2023 (Shift-II)]

22. Production of iron in blast furnace follows the following equation
$Fe_3O_4(s) + 4CO(g) \longrightarrow 3Fe(l) + 4CO_2(g)$
When 4.640 kg of Fe_3O_4 and 2.520 kg of CO are allowed to react then the amount of iron (in g) produced is:
[Given: Molar Atomic mass (g mol^{-1}); Fe = 56
Molar Atomic mass (g mol^{-1}); O = 16
Molar Atomic mass (g mol^{-1}); C = 12] **[29 June, 2022 (Shift-I)]**

(*a*) 1400 (*b*) 2200 (*c*) 3360 (*d*) 4200

23. SO_2Cl_2 on reaction with excess of water results into acidic mixture

$$SO_2Cl_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$$

16 moles of NaOH is required for the complete neutralisation of the resultant acidic mixture. The number of moles of SO_2Cl_2 used is:

[25 July, 2022 (Shift-I)]

(*a*) 16 (*b*) 8 (*c*) 4 (*d*) 2

24. Hemoglobin contains 0.34% of iron by mass. The number of Fe atoms in 3.3 g of hemoglobin is (Given: Atomic mass of Fe is 56 u, $N_A = 6.022 \times 10^{23}$ mol^{-1}.) **[26 July, 2022 (Shift-II)]**

(*a*) 1.21×10^5 (*b*) 12.0×10^{16} (*c*) 1.21×10^{20} (*d*) 3.4×10^{22}

25. 250 g solution of D-glucose in water contains 10.8% of carbon by weight. The molality of the solution is nearest to
(Given: Atomic weights are, H = 1u ; C = 12u ; O = 16u)

[27 July, 2022 (Shift-I)]

(*a*) 1.03 (*b*) 2.06 (*c*) 3.09 (*d*) 5.40

26. The number of N atoms in 681 g of $C_7H_5N_3O_6$ is $x \times 10^{21}$. The value of x is_____.
($N_A = 6.02 \times 10^{23}$ mol^{-1}) (Nearest Integer)

[25 June, 2022 (Shift-I)]

27. A protein 'A' contains 0.30% of glycine (molecular weight 75). The minimum molar mass of the protein 'A' is _____ $\times 10^3$ g mol^{-1} [nearest integer] **[25 June, 2022 (Shift-II)]**

28. CNG is an important transportation fuel. When 100 g CNG is mixed with 208 g oxygen in vehicles, it leads to the formation of CO_2 and H_2O and produces large quantity of heat during this combustion, then the amount of carbon dioxide produced in grams is_____. (nearest integer)
[Assume CNG to be methane] **[26 June, 2022 (Shift-II)]**

29. 56.0 L of nitrogen gas is mixed with excess of hydrogen gas and it is found that 20 L of ammonia gas is produced. The volume of unused nitrogen gas is found to be___ L.

[25 July, 2022 (Shift-II)]

30. Chlorophyll extracted from the crushed green leaves was dissolved in water to make 2 L solution of Mg of concentration 48 ppm. The number of atoms of Mg in this solution is $x \times 10^{20}$ atoms. The value of x is _____. (Nearest Integer)
(Given: Atomic mass of Mg is 24 g mol^{-1}; $N_A = 6.02 \times 10^{23}$ mol^{-1})

[26 July, 2022 (Shift-I)]

31. 1 L aqueous solution of H_2SO_4 contains 0.02 m mol H_2SO_4. 50% of this solution is diluted with deionized water to give 1 L solution (A). In solution (A), 0.01 m mol of H_2SO_4 are added. Total m mols of H_2SO_4 in the final solution is _____ $\times 10^3$ m moles.

[25 June, 2022 (Shift-I)]

32. Two elements A and B forms 0.15 moles of A_2B and AB_3 type compounds. If both A_2B and AB_3 weigh equally, then the atomic weight of A is_____ times of atomic weight of B.

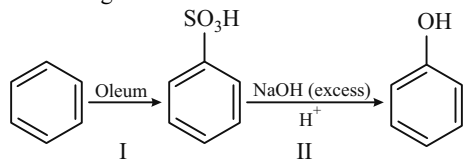
[27 June, 2022 (Shift-I)]

33. Number of grams of bromine that will completely react with 5.0 g of pent-1-ene is _____ $\times 10^{-2}$ g. (Atomic mass of Br = 80 g/mol) (Nearest Integer) **[25 June, 2022 (Shift-I)]**

34. The moles of methane required to produce 81 g of water after complete combustion is_____ $\times 10^{-2}$ mol. (nearest integer)

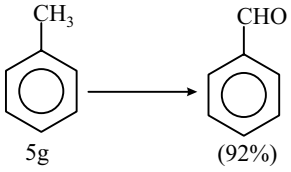
[26 June, 2022 (Shift-II)]

35. In the following reaction



The % yield for reaction I is 60% and that of reaction II is 50%. The overall yield of the complete reaction is_____% [Nearest integer] **[27 July, 2022 (Shift-I)]**

36. In the below reaction, 5g of toluene is converted into benzaldehyde with 92% yield. The amount of benzaldehyde produced is_____ $\times 10^{-2}$ g. (Nearest integer) **[27 July, 2022 (Shift-II)]**



37. A reaction of 0.1 mole of Benzylamine with bromomethane gave 23g of Benzyl trimethyl ammonium bromide. The number of moles of bromomethane consumed in this reaction are $n \times 10^{-1}$, when n = ____ (Round off to the nearest integer) (Given: Atomic masses: C: 12.0 u, H : 1.0u, N : 14.0u, Br : 80.0u] **[18 March, 2021 (Shift-I)]**

38. 4g equimolar mixture of NaOH and Na_2CO_3 contains x g of NaOH and y g of Na_2CO_3. The value of x is _____ g. (Nearest Integer)

[20 July, 2021 (Shift-II)]

39. Consider the complete combustion of butane, the amount of butane utilized to produce 72.0 g of water is_____ $\times 10^{-1}$g, (in nearest integer) **[25 July, 2021 (Shift-I)]**

40. The number of atoms in 8 g of sodium is $x \times 10^{23}$. The value of x is _____. (Nearest integer)

[Given: $N_A = 6.02 \times 10^{23}$ mol^{-1}, Atomic mass of Na = 23.0 u]

[1 Sept, 2021 (Shift-I)]

41. The $NaNO_3$ weighed out to make 50 mL of an aqueous solution containing 70.0 mg Na^+ per mL is____g. (Rounded off to the nearest integer) **[26 Feb, 2021 (Shift-II)]**

[Given; Atomic weight in g mol^{-1} –Na : 23; N :14; O :16]

42. The minimum number of moles of O_2 required for complete combustion of 1 mole of propane and 2 moles of butane is _____.

[5 Sept, 2020 (Shift-I)]

43. The mass of ammonia in grams produced when 2.8 kg of dinitrogen quantitatively reacts with 1 kg of dihydrogen is _____.

[4 Sept, 2020 (Shift-I)]

44. Ferrous sulphate heptahydrate is used to fortify foods with iron. The amount (in grams) of the salt required to achieve 10 ppm of iron in 100 kg of wheat is _____

Atomic weight: Fe = 55.85; S = 32.00; O = 16.00

[8 Jan, 2020 (Shift-I)]

45. $NaClO_3$ is used, even in spacecraft, to produce O_2. The daily consumption of pure O_2 by a person is 492L at 1 atm, 300 K. How much amount of $NaClO_3$, in grams, is required to produce O_2 for the daily consumption of a person at 1 atm, 300 K?

$NaClO_3(s) + Fe(s) \rightarrow O_2(g) + NaCl(s) + FeO(s)$

R = 0.082 L atm mol^{-1} K^{-1}. **[8 Jan, 2020 (Shift-II)]**

46. At 300 K and 1 atmospheric pressure, 10 mL of a hydrocarbon required 55 mL of O_2 for complete combustion and 40 mL of CO_2 is formed. The formula of the hydrocarbon is:

[10 April, 2019 (Shift-I)]

(*a*) C_4H_8 (*b*) C_4H_7Cl (*c*) C_4H_{10} (*d*) C_4H_6

47. 5 moles of AB_2 weigh 125×10^{-3} kg and 10 moles of A_2B_2 weigh 300×10^{-3} kg. The molar mass of $A_{(M_A)}$ and molar mass of $B_{(M_B)}$ in kg mol^{-1} are: **[12 April, 2019 (Shift-I)]**

(*a*) $M_A = 50 \times 10^{-3}$ and $M_B = 25 \times 10^{-3}$

(*b*) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$

(*c*) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$

(*d*) $M_A = 10 \times 10^{-3}$ and $M_B = 5 \times 10^{-3}$

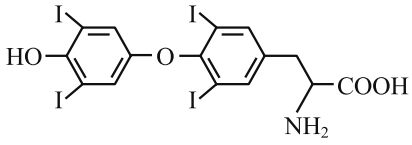
Percentage Composition and Empirical & Molecular Formula

48. On combustion 0.210 g of an organic compound containing C, H and O gave 0.l27 g H_2O and 0.307 gCO_2. The percentages of hydrogen and oxygen in the given organic compound respectively are: **[08 April, 2025 (Shift-II)]**

(*a*) 53.41, 39.6 (*b*) 6.72, 53.41

(*c*) 7.55, 43.85 (*d*) 6.72, 39.87

49. Thyroxine, the hormone has given below structure.



The percentage of iodine in thyroxine is.....%. (nearest integer)

(Given molar mass in g mol^{-1} C:12, H:1, O:16, N:14, I:127)

[07 April, 2025 (Shift-I)]

50. An organic compound weighing 500 mg , produced 220 mg of CO_2, on complete combustion. The percentage composition of carbon in the compound is.....%. (nearest integer)

(Given molar mass in g mol^{-1} of C : 12, O : 16)

[07 April, 2025 (Shift-I)]

51. The elemental composition of a compound is 54.2% C, 9.2% H and 36.6% O.

If the molar mass of the compound is 132 g mol^{-1}, the molecular formula of the compound is :

[Given : The relative atomic mass of C : H : O = 12 : 1 : 16]

[24 Jan, 2025 (Shift-II)]

(*a*) $C_6H_{12}O_3$ (*b*) $C_4H_8O_2$ (*c*) $C_4H_9O_3$ (*d*) $C_6H_{12}O_6$

52. Quantitative analysis of an organic compound (X) shows following % composition.

C: 14.5% Cl: 64.46%

H: 1.8%

(Empirical formula mass of the compound (X) is _____ $\times 10^{-1}$

(Given molar mass in g mol $^{-1}$ of C:12, H:1, O:16, Cl:35.5)

[28 Jan, 2025 (Shift-I)]

53. A sample of $CaCO_3$ and $MgCO_3$ weighed 2.21 g is ignited to constant weight of 1.152 g. The composition of mixture is:

(Given molar mass in g mol^{-1}

$CaCO_3$: 100, $MgCO_3$: 84) **[31 Jan, 2024 (Shift-II)]**

(*a*) 1.187 g $CaCO_3$ + 1.023 g $MgCO_3$

(*b*) 1.023 g $CaCO_3$ + 1.023 g $MgCO_3$

(*c*) 1.187 g $CaCO_3$ + 1.187 g $MgCO_3$

(*d*) 1.023 g $CaCO_3$ + 1.187 g $MgCO_3$

54. 10 mL of gaseous hydrocarbon on combustion gives 40 mL of CO_2(g) and 50 mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is _____.

[01 Feb, 2024 (Shift-II)]

55. An organic compound has 42.1% carbon, 6.4% hydrogen and remainder is oxygen. If its molecular weight is 342, then its molecular formula is: **[05 April, 2024 (Shift-I)]**

(*a*) $C_{11}H_{18}O_{12}$ (*b*) $C_{12}H_{20}O_{12}$ (*c*) $C_{14}H_{20}O_{10}$ (*d*) $C_{12}H_{22}O_{11}$

56. A metal chloride contains 55.0% of chlorine by weight. 100 mL vapours of the metal chloride at STP weigh 0.57 g. The molecular formula of the metal chloride is

(Given: Atomic mass of chlorine is 35.5 u)

[12 April, 2023 (Shift-I)]

(*a*) MCl_2 (*b*) MCl_4 (*c*) MCl_3 (*d*) MCl

57. An organic compound gives 0.220 g of CO_2 and 0.126 g of H_2O on complete combustion. If the % of carbon is 24, then the % hydrogen is _____ $\times 10^{-1}$. (Nearest integer) **[13 April, 2023 (Shift-I)]**

58. 0.5 g of an organic compound (X) with 60% carbon will produce _____ $\times 10^{-1}$ g of CO_2 on complete combustion.

[8 April, 2023 (Shift-I)]

59. 120 g of an organic compound that contains only carbon and hydrogen gives 330 g of CO_2 and 270 g of water on complete combustion. The percentage of carbon and hydrogen, respectively are **[24 June, 2022 (Shift-I)]**

(*a*) 25 and 75 (*b*) 40 and 60 (*c*) 60 and 40 (*d*) 75 and 25

60. Compound A contains 8.7% Hydrogen, 74% Carbon and 17.3% Nitrogen. The molecular formula of the compound is,

Given: Atomic masses of C, H and N are 12, 1 and 14 amu respectively. The molar mass of the compound A is 162 g mol^{-1}.

[28 June, 2022 (Shift-II)]

(*a*) $C_4H_6N_2$ (*b*) C_2H_3N (*c*) C_5H_7N (*d*) $C_{10}H_{14}N_2$

61. 116 g of a substance upon dissociation reaction yields 7.5 g of hydrogen, 60g of oxygen and 48.5 g of carbon. Given that the atomic masses of H, O and C are 1,16 and 12 g/mol respectively. The data agrees with how many formulae of the following?

[27 June, 2022 (Shift-II)]

(*a*) CH_3COOH (*b*) HCHO

(*c*) CH_3OOCH_3 (*d*) CH_3CHO

62. A 2.0 g sample containing MnO_2 is treated with HCl liberating Cl_2. The Cl_2 gas is passed into a solution of KI and 60.0 mL of 0.1 M $Na_2S_2O_3$ is required to titrate the liberated iodine. The percentage of MnO_2 in the sample is____. (Nearest integer)

[Atomic masses (in u) Mn = 55; Cl = 35.5; O = 16, I = 127, Na = 23, K = 39, S = 32] **[28 June, 2022 (Shift-I)]**

63. On complete combustion 0.30 g of an organic compound gave 0.20 g of carbon dioxide and 0.10 g of water. The percentage of carbon in the given organic compound is _____. (Nearest integer)

[26 June, 2022 (Shift-I)]

64. The complete combustion of 0.492 g of an organic compound containing 'C', 'H' and 'O' gives 0.793g of CO_2 and 0.442 g H_2O. The percentage of oxygen composition in the organic compound is _____. (nearest integer) **[28 June, 2022 (Shift-II)]**

65. In the estimation of bromine, 0.5 g of an organic compound gave 0.40 g of silver bromide. The percentage of bromine in the given compound is _____% (Nearest integer)

(Relative atomic masses of Ag and Br are 108 u and 80 u, respectively). **[28 June, 2022 (Shift-II)]**

66. Complete combustion of 1.80 g of an oxygen containing compound ($C_x H_y O_z$) gave 2.64 g of CO_2 and 1.08g of H_2O. The percentage of oxygen in the organic compound is **[25 Feb, 2021 (Shift-I)]**

(*a*) 53.33 (*b*) 50.33 (*c*) 63.53 (*d*) 51.63

67. Complete combustion of 750g of an organic compound provides 420 g of CO_2 and 210 g of H_2O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and _____ respectively. (Round off to the nearest Integer).

[16 March, 2021 (Shift-I)]

68. Methylation of 10 g of benezene give 9.2 g of toluene. Calculate the percentage yield of toluene _____ . (Nearest integer)

[22 July, 2021 (Shift-II)]

69. The percentage composition of carbon by mole in methane is:

[8 April, 2019 (Shift-II)]

(*a*) 80% (*b*) 25% (*c*) 75% (*d*) 20%

70. A 10 mg effervescent tablet containing sodium bicarbonate and oxalic acid releases 0.25 ml of CO_2 at T = 298.15 K and p = 1 bar. If molar volume of CO_2 is 25.0 L under such condition, what is the percentage of sodium bicarbonate in each tablet?[Molar mass of $NaHCO_3$ = 84 g mol^{-1}] **[11 Jan, 2019 (Shift-I)]**

(*a*) 0.84 (*b*) 33.6 (*c*) 16.8 (*d*) 8.4

Stoichiometry & Stoichiometric Calculations

71. Butane reacts with oxygen to produce carbon dioxide and water following the equation given below.

$$C_4H_{10(g)} + \frac{13}{2}O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O(l)$$

If 174.0 kg of butane is mixed with 320.0 kg of O_2, the volume of water formed in litres is ____.(Nearest integer)

[Given: (a) Molar mass of C, H, O are 12, 1, 16 g mol^{-1} respectively, (b) Density of water = 1 g mL^{-1}] **[07 April, 2025 (Shift-II)]**

72. $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g)\ H_2O(l)$

Consider the above reaction, what mass of $CaCl_2$ will be formed if 250 mL of 0.76 M HCl reacts with 1000 g of $CaCO_3$?

(Given: Molar mass of Ca, C, O, H and Cl are 40, 12, 16, 1 and 35.5 g mol^{-1}, respectively) **[02 April, 2025 (Shift-I)]**

(*a*) 3.908 g (*b*) 2.636 g (*c*) 10.545 g (*d*) 5.272 g

73. Some CO_2 gas was kept in a sealed container at a pressure of 1 atm and at 273 K. This entire amount of CO_2 gas was later passed through an aqueous solution of $Ca(OH)_2$. The excess unreacted $Ca(OH)_2$ was later neutralized with 0.1 M of 40 mL HCl. If the volume of the sealed container of CO_2 was x, then x is _____ cm^3 (nearest integer).
[**Given :** The entire amount of $CO_2(g)$ reacted with exactly half the initial amount of $Ca(OH)_2$ present in the aqueous solution.]
[22 Jan, 2025 (Shift-I)]

74. When 81.0 g of aluminium is allowed to react with 128.0 g of oxygen gas, the mass of aluminium oxide produced in grams is _____. (Nearest integer)
Molar mass of Al is 27.0 g mol^{-1}
Molar mass of O is 16.0 g mol^{-1} **[23 Jan, 2025 (Shift-II)]**

75. Consider the following reaction occurring in the blast furnace:
$Fe_3O_{4(s)} + 4CO_{(g)} \rightarrow 3Fe_{(l)} + 4CO_2(g)$
'x' kg of iron is produced when 2.32×10^3 kg Fe_3O_4 and 2.8×10^2 kg CO are brought together in the furnace. The value of 'x' is _____. (nearest integer)
{Given:
molar mass of Fe_3O_4 = 232 g mol^{-1}
molar mass of CO = 28 g mol^{-1}
molar mass of Fe = 56 g mol^{-1}} **[24 Jan, 2025 (Shift-I)]**

76. Mass of methane required to produce 22 g of CO_2 after complete combustion is _____ g.
(Given Molar mass in g mol^{-1}
C = 12.0
H = 1.0
O = 16.0) **[27 Jan, 2024 (Shift-I)]**

77. Number of moles of methane required to produce 22g $CO_{2(g)}$ after combustion is x × 10^{-2} moles. The value of x is
[31 Jan, 2024 (Shift-I)]

78. A compound (x) with molar mass 108 g mol^{-1} undergoes acetylation to give product with molar mass 192 g mol^{-1}. The number of amino groups in the compound (x) is ____. **[31 Jan, 2024 (Shift-II)]**

79. Consider the following reaction:
$3PbCl_2 + 2(NH_4)_3PO_4 \rightarrow Pb_3(PO_4)_2 + 6NH_4Cl$
If 72 mmol of $PbCl_2$ is mixed with 50 mmol of $(NH_4)_3PO_4$, then amount of $Pb_3(PO_4)_2$ formed is _____ mmol. (nearest integer)
[01 Feb, 2024 (Shift-I)]

80. Combustion of glucose ($C_6H_{12}O_6$) produces CO_2 and water. The amount of oxygen (in g) required for the complete combustion of 900 g of glucose is: [Molar mass of glucose in $gmol^{-1}$) = 180
[08 April, 2024 (Shift-I)]
(*a*) 480 (*b*) 960 (*c*) 800 (*d*) 32

81. If 279 g of aniline is reacted with one equivalent of benzenediazonium chloride, the maximum amount of aniline yellow formed will be _____ g (nearest integer).
(consider complete conversion) **[08 April, 2024 (Shift-I)]**

82. 9.3 g of pure aniline upon diazotisation followed by coupling with phenol gives an orange dye. The mass of orange dye produced (assume 100% yield/ conversion) is _____ g. (nearest integer)
[06 April, 2024 (Shift-I)]

83. The number of moles of methane required to produce 11g $CO_2(g)$ after complete combustion is:
(Given molar mass of methane in g mol^{-1} : 16)
[05 April, 2024 (Shift-II)]
(*a*) 0.75 (*b*) 0.25 (*c*) 0.35 (*d*) 0.5

84. X g of enthanamine was subjected to reaction with $NaNO_2$/HCl followed by hydrolysis to liberate N_2 and HCl. The HCl generated was completely neutralised by 0.2 moles of NaOH. X is ____ g.
[05 April, 2024 (Shift-II)]

85. In the Claisen-Schmidt reaction to prepare 351 g of dibenzalacetone using 87 g of acetone, the amount of benzaldehyde required is _____g. (Nearest integer)
[05 April, 2024 (Shift-II)]

86. 9.3 g of pure aniline is treated with bromine water at room temperature to give a white precipitate of the product 'P'. The mass of product 'P' obtained is 26.4 g. The percentage yield is ____%.
[05 April, 2024 (Shift-I)]

87. X g of ethylamine is subjected to reaction with $NaNO_2$/HCl followed by water; evolved dinitrogen gas which occupied 2.24 L volume at STP. X is _____ × 10^{-1} g. **[04 April, 2024 (Shift-I)]**

88. From 6.55 g of aniline, the maximum amount of acetanilide that can be prepared will be ___ ×10^{-1} g.
[04 April, 2024 (Shift-II)]

89. When a hydrocarbon A undergoes combustion in the presence of air, it requires 9.5 equivalents of oxygen and produces 3 equivalents of water. What is the molecular formula of A?
[29 Jan, 2023 (Shift-II)]
(*a*) C_8H_6 (*b*) C_9H_9 (*c*) C_6H_6 (*d*) C_9H_6

90. When a hydrocarbon A undergoes complete combustion it requires 11 equivalents of oxygen and produces 4 equivalents of water. What is the molecular formula of A? **[31 Jan, 2023 (Shift-II)]**
(*a*) C_9H_8 (*b*) $C_{11}H_4$ (*c*) C_5H_8 (*d*) $C_{11}H_8$

91. 1 g of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01 mol of CO_2. The molar mass of M_2CO_3 is ___ g mol^{-1}. (Nearest integer) **[13 April, 2023 (Shift-II)]**

92. On complete combustion, 0.492 g of an organic compound gave 0.792 g of CO_2. The % of carbon in the organic compound is _____ (Nearest integer) **[31 Jan, 2023 (Shift-I)]**

93. Number of hydrogen atoms per molecule of a hydrocarbon A having 85.8% carbon is _____
(Given: Molar mass of A = 84 g mol^{-1}) **[25 Jan, 2023 (Shift-II)]**

94. Zinc reacts with hydrochloric acid to give hydrogen and zinc chloride. The volume of hydrogen gas produced at STP from the reaction of 11.5 g of zinc with excess HCl is _____ L (Nearest integer)
(Given : Molar mass of Zn is 65.4g mol^{-1} and Molar volume of H_2 at STP = 22.7L) **[31 Jan, 2023 (Shift-I)]**

95. Assume carbon burns according to following equation:
$2C_{(s)} + O_{2(g)} \rightarrow 2CO(g)$
When 12 g carbon is burnt in 48 g of oxygen, the volume of carbon monoxide produced is _____× 10^{-1} L at STP [nearest integer]
[Given: Assume CO as ideal gas, Mass of C is 12 g mol^{-1}, Mass of O is 16 g $mol^{-1}$and molar volume of an ideal gas at STP is 22.7 L mol^{-1}] **[31 Jan, 2023 (Shift-II)]**

114. The first and second ionisation enthalpies of a metal are 496 and 4560 kJ mol^{-1}, respectively. How many moles of HCl and H_2SO_4, respectively, will be needed to react completely with 1 mole of the metal hydroxide?

[9 Jan, 2020 (Shift-II)]

(*a*) 1 and 1 (*b*) 1 and 2

(*c*) 2 and 0.5 (*d*) 1 and 0.5

115. 5 g of zinc is treated separately with an excess of
(A) dilute hydrochloric acid and
(B) aqueous sodium hydroxide.
The ratio of the volumes of H_2 evolved in these two reactions is:

[9 Jan, 2020 (Shift-II)]

(*a*) 1 : 4 (*b*) 1 : 1 (*c*) 1 : 2 (*d*) 2 : 1

116. The ammonia(NH_3) released on quantitative reaction of 0.6 g urea (NH_2CONH_2) with sodium hydroxide(NaOH) can be neutralized by **[7 Jan, 2020 (Shift-II)]**

(*a*) 100 mL of 0.1 N HCl (*b*) 100 mL of 0.2 N HCl

(*c*) 200 mL of 0.2 N HCl (*d*) 200 mL of 0.4 N HCl

117. A solution of phenol in chloroform when treated with aqueous NaOH gives compound P as a major product. The mass percentage of carbon in P is _____. (to the nearest integer) (Atomic mass: C = 12 ; H = 1 ; O = 16) **[6 September, 2020 (Shift-II)]**

118. For the following reaction, the mass of water produced from 445 g of $C_{57}H_{110}O_6$ is:

$2C_{57}H_{110}O_6\,(s) + 163\,O_2\,(g) \rightarrow 114\,CO_2\,(g) + 110\,H_2O\,(l)$

[9 Jan, 2019 (Shift-II)]

(*a*) 490 g (*b*) 445 g (*c*) 495 g (*d*) 890 g

119. 50 mL of 0.5 M oxalic acid is needed to neutralize 25 ml of sodium hydroxide solution. The amount of NaOH in 50 mL of the given sodium hydroxide solution is: **[12 Jan, 2019 (Shift-I)]**

(*a*) 40 g (*b*) 10 g (*c*) 20 g (*d*) 80 g

120. For a reaction,

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$;

Identify dihydrogen (H_2) as a limiting reagent in the following reaction mixtures. **[9 April, 2019 (Shift-I)]**

(*a*) 14 g of N_2 + 4 g of H_2 (*b*) 28 g of N_2 + 6 g of H_2

(*c*) 56 g of N_2 + 10 g of H_2 (*d*) 35 g of N_2 + 8 g of H_2

ANSWER KEY

1. (*b*)	**2.** (*b*)	**3.** (*c*)	**4.** (*b*)	**5.** [3]	**6.** [8]	**7.** (*a*)	**8.** (*d*)	**9.** (*b*)	**10.** [1]
11. [63]	**12.** (*c*)	**13.** (*b*)	**14.** [372]	**15.** (*a*)	**16.** [100]	**17.** (*d*)	**18.** [11]	**19.** (*d*)	**20.** (*d*)
21. [200]	**22.** (*c*)	**23.** (*c*)	**24.** (*c*)	**25.** (*b*)	**26.** [5418]	**27.** [25]	**28.** [143]	**29.** [46]	**30.** [24]
31. [0]	**32.** [2]	**33.** [1143]	**34.** [225]	**35.** [30]	**36.** [530]	**37.** [3]	**38.** [1]	**39.** [464]	**40.** [2]
41. [13]	**42.** [18]	**43.** [3400]	**44.** [496]	**45.** [2130]	**46.** (*d*)	**47.** (*c*)	**48.** (*b*)	**49.** [65]	**50.** [12]
51. (*a*)	**52.** [1655]	**53.** (*a*)	**54.** [14]	**55.** (*d*)	**56.** (*a*)	**57.** [56]	**58.** [11]	**59.** (*d*)	**60.** (*d*)
61. [2]	**62.** [13]	**63.** [18]	**64.** [46]	**65.** [34]	**66.** (*a*)	**67.** [3]	**68.** [78]	**69.** (*d*)	**70.** (*d*)
71. [138]	**72.** (*c*)	**73.** [45]	**74.** [153]	**75.** [420]	**76.** [8]	**77.** [50]	**78.** [2]	**79.** [24]	**80.** (*b*)
81. [591]	**82.** [20]	**83.** (*b*)	**84.** [9]	**85.** [318]	**86.** [80]	**87.** [45]	**88.** [95]	**89.** (*a*)	**90.** (*a*)
91. [100]	**92.** [44]	**93.** [12]	**94.** [4]	**95.** [227]	**96.** [1]	**97.** [224]	**98.** [3]	**99.** (*c*)	**100.** (*c*)
101. (*c*)	**102.** [1]	**103.** [2]	**104.** [25]	**105.** [2]	**106.** [63]	**107.** [77]	**108.** [8]	**109.** [16]	**110.** [78]
111. [80]	**112.** [18]	**113.** [19]	**114.** (*d*)	**115.** (*b*)	**116.** (*b*)	**117.** [69]	**118.** (*c*)	**119.** (*)	**120.** (*c*)

EXPLANATIONS

1. **(*b*)** Weight is the force of gravity on an object, while mass is the amount of matter.

2. **(*b*)** The candela is the luminous intensity of a source that emits monochromatic radiation of $\nu = 540 \times 10^{12}$ Hz, and has a radiant intensity in that direction of $\frac{1}{683}$ w/sr. It is unit of Candela.

Hence, *A* and *B* are 540 and 683 respectively.

3. **(*c*)** To determine the no. of significant figures certain rules are followed. According to the given options rules are mentioned as,

(A) 0.00253

Zeros to the left of first non-zero digits are not significant.

Significant figures = 3(2, 5, 3)

(B) 1.0003

Zeros between non-zero digit are significant.

Thus, 1.0003 has 5 significant figures.

(C) 15.0

If a number ends in zeros and if these zeros are to the right of a decimal point, then it will be significant.

Significant figures = 3

(D) 163

All non zero digits are significant.

Significant figures = 3

Hence, number given in A, C and D have same significant figures.

4. **(*b*)** The given expression using the rules for significant figures can be solved as:

$$\frac{0.02858 \times 0.112}{0.5702} = 0.00561$$

5. **[3]** In 0.00340, number of significant figure is 3.

6. **[8]** The no of significant figure in the given number is 8.

7. (*a*) In compound atoms of different elements combine in fixed ratio by mass & not in any ratio.

8. (*d*) (B) Matter consists of indivisible atoms.

(D) All the atoms of given element have same properties including mass.

9. (*b*)

	^{35}Cl	^{37}Cl
Molar ratio be	x	1 – x

Average molar mass

$$= \frac{n_1M_1 + n_2M_2}{n_1 + n_2}$$

M_{avg} $35 \times x + 37(1 - x) = 35.5$

$35x + 37 - 37x = 35.5$

$2x = 1.5$

$x = 0.75$; $1 - x = 0.25$

So, ratio of $^{35}Cl : {}^{37}Cl = \frac{0.75}{0.25} = 3 : 1$

10. **[1]**

$$NaI_{(aq)} + AgNO_{3(aq)} \rightarrow AgI_{(s)} + NaNO_3(aq)$$

20 mL (Excess) 4.74 g

number of moles of I^- in NaI = number of moles of (I^-) in $AgI = \frac{4.74}{235}$

number of moles of $NaI = \frac{4.74}{235}$

Molarity $[NaI] = \frac{4.74}{235 \times 0.02} = 1.008$

11. **[63]** $CaCO_3 \rightarrow CaO + CO_2$

Moles of $CaCO_3 = \frac{112500g}{100}$.

CaO produced from the reaction of $CaCO_3$ gives 1125 moles.

Mass of CaO $= \frac{1125 \times 56}{1000} = 63kg.$

12. (*c*) The reaction occurs as:

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

Volume of hydrogen gas evolved = 220 ml

Moles of H_2 gas

= Volume of H_2 evolved/Volume at STP

$= \frac{220 \times 10^{-3}}{22.4} =$ Moles of Mg utilised

∴ Mass of Mg used = Moles of Mg used × Molar Mass of Mg

$\frac{220 \times 10^{-3}}{22.4} \times 24$

$= 235.7 \times 10^{-3}g$

= 235.7 mg

13. (*b*)

$$\text{Number of atoms} = \frac{\text{Mass (g)}}{\text{Molar Mass (g / mol)}} \times N_A$$

- $M_{Po} = 209$
- $\boxed{M_{Pr} = 141}$
- $M_{Pb} = 207$
- $M_{Pt} = 195$

Since Pr has the smallest atomic mass among the given elements, it will have the highest number of atoms in 10^{-9} grams.

14. **[372]** Molar mass of the given compound = 372 g

i.e., 1 mol of the compound weigh = 372 g

∴ 0.1 mol of the compound will weigh

$= \frac{372}{0.1}g = 372 \times 10^{-1}g$

15. (*a*) No. of moles of carbon

$= n_{CO_2} = \frac{1.46}{44} = 0.033$ moles

Mass of carbon = 0.033 × 12 = 0.396 g

No. of moles of hydrogen atom

$= 2 \times n_{H_2O} = 2 \times \frac{0.567}{18} = 0.063$

Mass of hydrogen atom = 0.063 × 1

= 0.063 g

Mass of oxygen atom

$= 1 - (M_{carbon} + M_{hydrogen})$

= 1 – (0.396 + 0.063)

= 1 – 0.459 = 0.541 g

No. of mole of oxygen atom

$= \frac{0.541}{16} = 0.033$

∴ Empirical formula of compound = CH_2O

Hence, empirical formula mass

= 12 + 2 + 16 = 30 g

16. **[100]** Organic compound

$$\xrightarrow{\text{Combustion}} \underset{0.9\ gm}{H_2O}$$

So, $n_{H_2O} = \frac{w_{H_2O}}{M_{H_2O}} = \frac{0.9}{18} = 0.05$ mole

So, mole of H in $H_2O = 0.05 \times 2 = 0.1$ mole.

So, 0.01 mole of organic compound which contain 10% Hydrogen produce 0.1 mole of H.

So, 0.01 mole of organic compound produce = 10 mole of H = 10 g of H.

So, wt % of H

$= \frac{\text{wt of H in 1mole compound}}{\text{Molar mass of compound}} \times 100$

$10 = \frac{10}{M} \times 100$

M = 100 g/mol.

17. (*d*) Remaining moles of $CO_2 = 2.8 \times 10^{-3}$ moles

Removed molecules of $CO_2 = 10^{21}$ molecules

Now,

Removed moles of CO_2

$= \frac{10^{21}}{6.02 \times 10^{23}} = 1.66 \times 10^{-3}$ moles

Therefore, initial moles of CO_2

$= 2.8 \times 10^{-3} + 1.66 \times 10^{-3}$

$= 4.46 \times 10^{-3}$ moles

Hence, the mass of CO_2 taken initially is $= 4.46 \times 10^{-3} \times 44 = 0.1962$ g = 196.2 mg

18. **[11]** Volume of silver coating = 0.05 × 0.05 × 10000 = 25 cm^3

Mass of silver deposited = 25 × 7.9 g

$\left(\therefore d = \frac{\text{mass}}{\text{volume}}\right)$

Moles of silver atoms $= \frac{25 \times 7.9}{108}$

Number of silver atoms

$= \frac{25 \times 7.9}{108} \times 6.023 \times 10^{23}$

$= 11.01 \times 10^{23}$

19. (*d*) 22.4 L of O_2 at STP → 1 mole

2.8375 L of O_2 at STP

$= \frac{2.8375}{22.4} = 0.125$ moles

⇒ Number of molecules = 0.125

$N_A = 7.525 \times 10^{22}$

20. (*d*) $n = \frac{\text{Weight}}{\text{Molar mass}}$

16g CH_4 = 1 mole CH_4

1 mole $CH_4 \rightarrow 10 \times 6.02 \times 10^{23}$ electrons

$= 60.2 \times 10^{23}$ electrons

1g H_2 = 0.5 mole H_2

1 mole H_2 at STP → 22.4 L

0.5 mole H_2 at STP → 11.2 L ≈ 11.4 L

1 mole of N_2 = 28 g

(∵ $M_{N_2} = 28$ g/mol)

0.5 mole of SO_2 = 32 g

(∵ $M_{SO_2} = 64$ g/mol)

21. **[200]**

Let M is the molar mass of the compound (g/mol)

mass of compound = 0.01 M gm

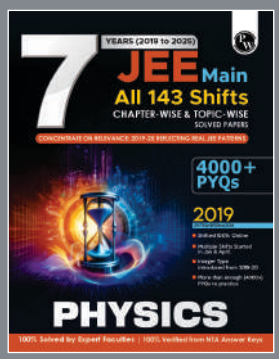
mass of carbon $= 0.01M \times \frac{60}{100}$

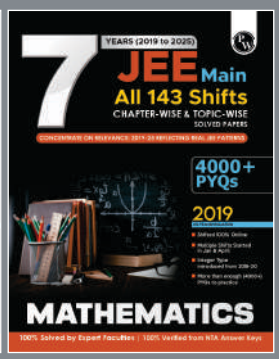
moles of carbon $= \frac{0.01M}{12} \times \frac{60}{100}$

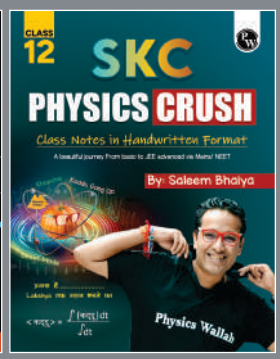
moles of CO_2 from combustion $= \frac{4.4}{44}$

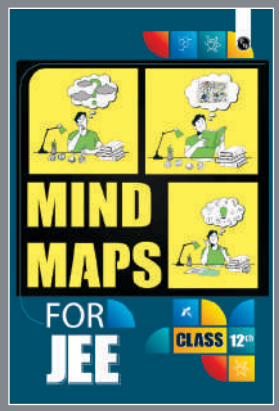
= moles of carbon

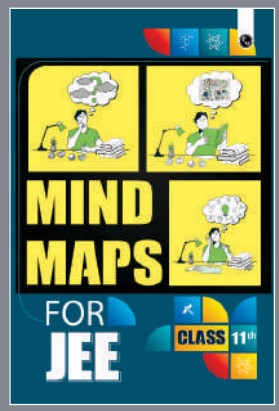
Important Books for JEE Preparation

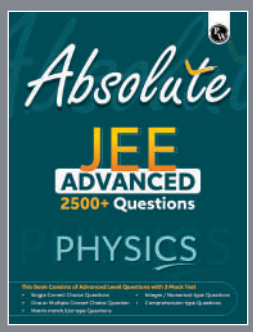


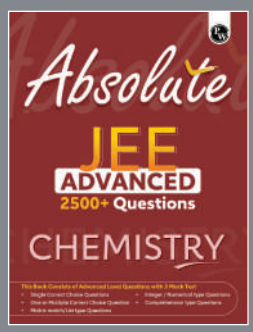


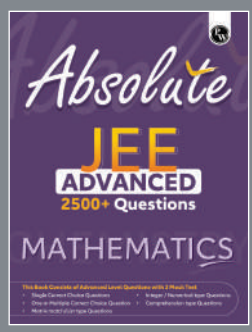


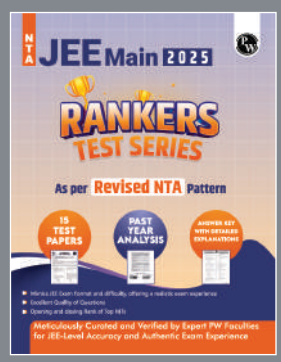


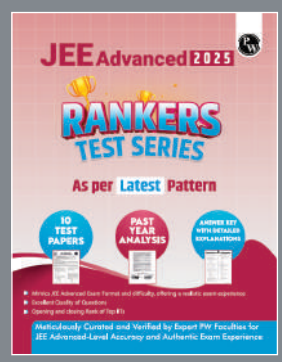


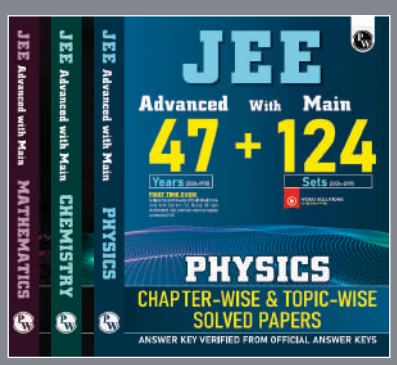


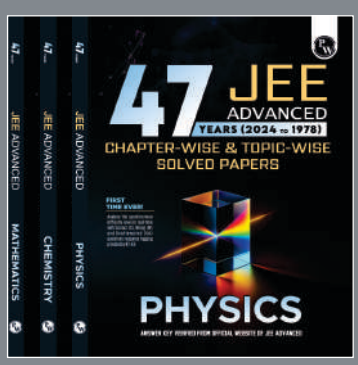


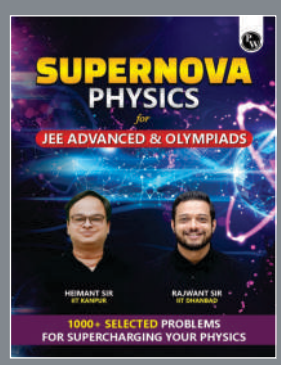


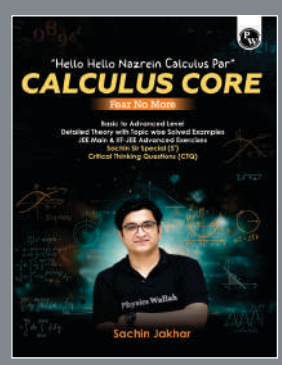












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