Absolute

NEET-UG & JEE (Main)

CHEMISTRY Vol - 1.1

For all Medical and Engineering Entrance Examinations held across India.

1985 MCQs with Hints

As per latest syllabus issued by NMC & NTA

Entropy

When ice melts spontaneously above 0°C at 1 atm, entropy increases as the liquid state is more disordered than the solid state.

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M.Sc. (Organic Chemistry)

Now with more study techniques

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Absolute

NEET (UG) & JEE (Main)

Chemistry Vol. 1.1

Now with more study techniques

Updated as per latest syllabus for:
NEET (UG) 2024 issued by **NMC on 6th October, 2023**
JEE (Main) 2024 issued by **NTA on 1st November, 2023**

Salient Features

- Comprehensive theory for every topic.
- Subtopic-wise segregation of MCQs for efficient practice
- Exhaustive coverage of questions including questions from previous years' NEET (UG), JEE (Main) and other competitive examinations till year 2023:
  - **1985** MCQs
  - Numerical Value Type (NVT) questions
  - Solutions to the questions are provided for better understanding
- Multiple study techniques to enhance understanding and problem solving
- Topic Test with answer keys provided in each chapter for self-assessment
- Includes Question Papers and Answer Keys (Solutions through Q.R. code) of:
  - NEET (UG) 2022
  - NEET (UG) 2023
  - NEET (UG) 2023 (Manipur)
  - JEE (Main) 2022 25th July (Shift - I)
  - JEE (Main) 2023 24th Jan (Shift - II)
- Q.R. codes provide:
  - Video links for boosting conceptual retention
  - Solutions to Topic Tests and previous exam papers of year 2022 and 2023
- Separate list of questions excluded from the NEET (UG) and JEE (Main) 2024 syllabus

Scan the adjacent QR code in *Quill - The Padhai App* to access solutions/hints to Topic Test.

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PREFACE

Target's **'Absolute Chemistry Vol - 1.1'** is a complete guidebook, extremely handy for preparation of various competitive exams like NEET (UG), JEE (Main). This edition provides an unmatched comprehensive amalgamation of theory with MCQs. The chapters are aligned with the syllabus for NEET (UG) and JEE (Main) examinations and runs parallel to NCERT curriculum. The book provides the students with scientifically accurate context, several study techniques and skills required to excel in these examinations.

The sections of **Theory, Quick Review**, **Formulae, MCQs** and **Topic Test** form the backbone of every chapter and ensure adequate revision.

These MCQs are framed considering the importance given to every topic as per the NEET-UG & JEE (Main) exam. They are a healthy mix of theoretical, numerical, reactions and graphical based questions.

The level of difficulty of these questions is at par with that of various competitive examinations held across India. Questions from various examinations such as NEET (UG), JEE (Main), MHT CET, KCET, WB JEE, AP EAMCET, TS EAMCET, AP EAPCET, GUJ CET are exclusively covered.

Previous Years' Question Papers:

Question Papers and Answer Keys of **NEET (UG) 2022**, **2023** and **2023 (Manipur)** as well as **JEE (Main) 2022** 25th July (Shift - I) and **JEE (Main) 2023** 24th Jan (Shift - II) have been provided to offer students glimpse of the complexity of questions asked in entrance examination. Solutions are also provided through a separate Q.R. code.

The papers have been split topic-wise to let the students know which of the topics were more relevant in the latest examination.

All the questions included in a chapter have been specially created and compiled to enable students solve complex problems which require strenuous effort with promptness.

Considering the latest modifications in the syllabus of NEET (UG) and JEE (Main) examinations, a list of questions based on the concepts excluded from the syllabus is provided. The purpose of providing these questions is to display various question types and their level of difficulty that have been asked in previous examinations.

All the features of this book pave the path of a student to excel in examination. The features are designed keeping the following elements in mind: Time management, easy memorization or revision and non-conventional yet simple methods for MCQ solving.

We hope the book benefits the learner as we have envisioned.

A book affects eternity; one can never tell where its influence stops.

Publisher

Edition: Seventh

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on: mail@targetpublications.org

KEY FEATURES

Strategy
'**Strategy**' illustrates a general step-by-step approach towards solving a problem.

Smart tip
'**Smart tips**' comprise important theoretical or formula based short tricks considering their usage in solving MCQ.

Caution
'**Caution**' apprises students about mistakes which are made while solving an MCQs.

Smart Code
'**Smart Code**' showcases simple and smart mnemonic created for selected concepts.

QR code
'**QR code**' provides:

i. Access to a video/PDF in order to boost understanding of a concept or activity.

ii. Solutions to Topic Test of each chapter, NEET (UG) 2022, 2023 and 2023 (Manipur) as well as JEE (Main) 2022 and 2023 question papers.

Solved Examples
'**Solved Examples**' are provided consistently throughout the book to help you hone your problem-solving skills.

Clock Symbol
'**Clock Symbol**' instructs students that given MCQ can be solved apace by applying either smart tips, smart codes or thinking hatke.

Connection
'**Connection**' enables students to interlink concepts covered in different chapters.

Thinking Hatke
'**Thinking Hatke**' reveals quick witted approach to crack the specific question.

Remember This
'**Remember This**' includes key points, important reactivity orders, exceptions, point of difference, misconceptions, etc.

Gyan Guru
'**Gyan Guru**' illustrates real life applications or examples related to the concept discussed.

Knowledge Badhao!
'**Knowledge Badhao**' includes additional information relevant to concept.

Frequently Asked Questions

- **Why Absolute Series?**

Gradually, every year the nature of competitive entrance exams is inching towards conceptual understanding of topics. Moreover, it is time to bid adieu to the stereotypical approach of solving a problem using a single conventional method.

To be able to successfully crack the NEET/JEE (Main) examinations, it is imperative to develop skills such as data interpretation, appropriate time management, knowing various methods to solve a problem, etc. With Absolute Series, we are sure, you'd develop all the aforementioned skills and take a more holistic approach towards problem solving. The way you'd tackle advanced level MCQs with the help of Hints, Solved examples, Smart tips, Smart codes and Thinking Hatke would give you the necessary practice that would be a game changer in your preparation for the competitive entrance examinations.

- **What is the intention behind the launch of Absolute Series?**

The sole objective behind the introduction of Absolute Series is to cater to needs of students across a varied background and effectively assist them to successfully crack the NEET/JEE (Main) examinations. With a healthy mix of MCQs, we intend to develop a student's MCQ solving skills within a stipulated time period.

- **What do I gain out of Absolute Series?**

After using Absolute Series, students would be able to:

a. assimilate the given data and apply relevant concepts with utmost ease.
b. tackle MCQs of different pattern such as match the columns, diagram based questions, multiple concepts and assertion-reason efficiently.
c. garner the much needed confidence to appear for competitive exams.
d. easy and time saving methods to tackle tricky questions will help ensure that time consuming questions do not occupy more time than you can allot per question.

- **How to derive the best advantage of the book?**

To get the maximum benefit of the book, we recommend :

a. Go through the detailed theory and Examples solved alongwith at the beginning of a chapter for concept clarity. Commit Smart Tips into memory and pay attention to Caution, Remember This.
b. Read through the Quick review section to summarize the key points in chapter.
c. Know all the Formulae compiled at the end of theory by heart.
d. Using subtopic wise segregation as a leverage, complete MCQs in each subtopic at your own pace. Questions from exams such as JEE (Main), NEET-UG are tagged and placed along the flow of subtopic. Mark these questions specially to gauge the trends of questions in various exams.
e. Be extra receptive to Thinking Hatke, Alternate Method and application of Smart Tips. Assimilate them into your thinking.

Best of luck to all the aspirants!

CONTENTS

Note: ☒ *Complete chapter excluded from the NEET (UG) and JEE (Main) 2024 syllabus (in index)*

◑ *Part of the chapter excluded from the NEET (UG) and JEE (Main) 2024 syllabus (in index)*

Questions based on the concepts excluded from NEET (UG) and JEE (Main) 2024 Syllabus

Chapter Name	Subtopic Name	Questions excluded from 2024 Syllabus	Page No.
2. Structure of Atom	2.0 Introduction	All Questions	Theory - 47 MCQs - 76
	2.1 Fundamental particles		Theory - 47 to 50 MCQs - 76 to 78
	2.2 Atomic number and mass number		Theory - 50 and 51 MCQs - 78 and 79
	2.3 Isotopes and isobars		Theory - 51 and 52 MCQs - 79 and 80
	Miscellaneous	19, 12, 16, 17, 18	93, 94
	Numerical Value Type Questions (NVT)	4	95
	Topic Test	6, 7, 8, 9, 19	109
5. States of Matter	Entire Chapter Deleted		212
6. Thermodynamics	6.11 Third law of thermodynamics	All Questions	Theory - 288 MCQs - 308
	Topic Test	21	326
NEET (UG) 2022	Section A	6	410
	Section B	10	411
NEET (UG) 2023	Section A	2, 7, 8	412
NEET (UG) 2023 (Manipur)	Section A	6, 7	414
JEE (Main) 2022 25th July (Shift - I)	Numerical Value Type Questions (NVT)	2	416
All questions of JEE (Main) 2023 belonging to chapters of Absolute Vol. 1.1 are within the scope of 2024 syllabus.			

Note: i. *The above table contains the list of chapters/subtopics/question numbers that are excluded from the latest syllabus of NEET (UG) and JEE (Main) 2024.*

ii. *These questions are covered to give an idea about the variety and difficulty levels of questions asked in the examination over the years.*

3 Classification of Elements and Periodicity in Properties

* marked section is only for JEE (Main) **marked section is for NEET-UG

3.0 Introduction

➢ **Significance of classification:**

i. At present, about **118 elements** are known and many more are being discovered. These elements form a large number of compounds.

ii. A systematic study of these elements and their compounds is possible only when these elements are arranged in such a way that similar elements are placed together while dissimilar elements are separated from one another.

➢ **Brief history of the development of periodic table:**

- **"Unitary theory" (1815): Proposed by William Prout**

Statement: *The values of the atomic masses of all elements were whole numbers or varied only slightly from the whole numbers, if hydrogen was considered the basis of all atomic masses.*

E.g.
i. ^{12}C – Made up of 12 units of hydrogen.
ii. ^{40}Ca – Made up of 40 units of hydrogen.

Limitations:
This theory was ruled out as it was found that Cu has atomic mass 63.5 and Cl has atomic mass 35.5, also the existence of isotopes (two isotopes of Cu with atomic masses 63 and 65 and that of Cl with atomic masses 35 and 37) was not known in those days.

- **"Law of Triads" (1817): Proposed by the German chemist, Johann Dobereiner**

Statement: *The elements can be arranged in a group of three called 'triads' in such a way that the middle element have an atomic mass almost the average of the atomic masses of other two elements and also the properties of middle element were in between those of other two members.*

E.g.

Triad I	
Element	**Atomic mass**
Ca	40
Sr	88
Ba	137

Triad II	
Element	**Atomic mass**
Cl	35.5
Br	80
I	127

Triad III	
Element	**Atomic mass**
Li	7
Na	23
K	39

Limitation: The law was applicable only to few elements.

- **Cooke's Homologous series (1854): Proposed by J. P. Cooke**

Statement: *On the basis of their physical and chemical properties, elements can be classified in several homologous series in which atomic masses of elements increase in a regular fashion.*

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To see complete chapter buy **Target Notes** or **Target E-Notes**

Atomic Number	Name	Symbol	IUPAC official Name	IUPAC symbol
101	Unnilunium	Unu	Mendelevium	Md
102	Unnilbium	Unb	Nobelium	No
103	Unniltrium	Unt	Lawrencium	Lr
104	Unnilquadium	Unq	Rutherfordium	Rf
105	Unnilpentium	Unp	Dubnium	Db
106	Unnilhexium	Unh	Seaborgium	Sg
107	Unnilseptium	Uns	Bohrium	Bh
108	Unniloctium	Uno	Hassnium	Hs
109	Unnilennium	Une	Meitnerium	Mt
110	Ununnilium	Uun	Darmstadium	Ds
111	Unununium	Uuu	Rontgenium	Rg
112	Ununbium	Uub	Copernicium	Cn
113	Ununtrium	Uut	Nihomium	Nh
114	Ununquadium	Uuq	Flerovium	Fl
115	Ununpentium	Uup	Moscovium	Mc
116	Ununhexium	Uuh	Livermorium	Lv
117	Ununseptium	Uus	Tennessine	Ts
118	Ununoctium	Uuo	Oganesson	Og

3.2 s, p, d AND f-BLOCK ELEMENTS

- **Division of elements in s, p, d and f block:**
  The periodic table has been divided into 4 blocks based on the electronic configuration of the atoms.
  (max. = maximum, n = outermost energy shell)

Block	Last electron enters	General outer electronic configuration	Elements consisted	Types of element present
's'	s-orbital (max. electrons = 2)	ns^1 and ns^2 (n = 1 to 7)	Group 1 (alkali metals) Group 2 (alkaline earth metals)	Metals
'p'	p-orbital (max. electrons = 6)	$ns^2\ np^{1-6}$ (n = 2 to 6)	Group 13 to Group 18 elements (except He)	Metals, nonmetals and metalloids
'd'	d-orbital (max. electrons = 10)	$(n-1)\ d^{1-10}\ ns^{1 \text{ or } 2}$ (n = 4 to 7)	Group 3 to Group 12 elements	Metals
'f'	f-orbital (max. electrons =14)	$(n-2)\ f^{1-14}\ (n-1)\ d^{0 \text{ or } 1}\ ns^2$ (n = 6 and 7)	Lanthanide and actinide series	Metals

Connections
In chapter 2: Structure of Atom, you have studied in detail about how to write electronic configuration of elements.

EXAMPLE - 3.1

Determine the group number of aluminium (Z = 13) in the modern periodic table.

Solution:

Electronic configuration of ${}_{13}Al$: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 2p^1$
Since the last electron enters in the p-subshell, Al belongs to p-block in the periodic table.

- **s-Block elements:**

i. The last electron enters s-orbital of the valence shell.
ii. They are placed on the extreme left of the periodic table.
iii. They are never found in free state as they are highly reactive.
iv. Alkali metals readily lose outermost electron to form +1 ion while alkaline earth metals lose two electrons to form +2 ion.
v. The compounds of s-block elements are predominantly ionic (except of those of lithium and beryllium).

REMEMBER THIS

Group number of s-block elements = Number of valence electrons

- **p-Block elements:**

i. The last electron enters p-orbital of the valence shell.
ii. They are placed on extreme right of periodic table.
iii. Group 16 is called chalcogens, group 17 is called halogens and group 18 elements are known as noble gases or inert gas elements.
iv. p-Block elements along with s-block elements are known as representative elements or main group elements.

REMEMBER THIS

Group number of p-block elements = 18 – number of electrons required to attain complete octet

- **d-Block elements:**

i. The last electron enters d-orbital of penultimate shell, i.e., (n – 1) d-orbital.
ii. They are placed in the middle portion of the periodic table.
iii. There are four d series elements (3d, 4d, 5d and 6d series).
iv. They are also called transition elements as they form a bridge between chemically active s-block elements and less active group 13 and 14 elements.

- **f-Block elements:**

i. The last electron enters into f-orbital of pre-penultimate shell, i.e., (n – 2) f-orbital.
ii. They are placed at the bottom of the periodic table.
iii. This block consists of series of lanthanides and actinides.
iv. They are also called inner transition elements or rare earth elements.
v. Elements after uranium are called transuranic elements.

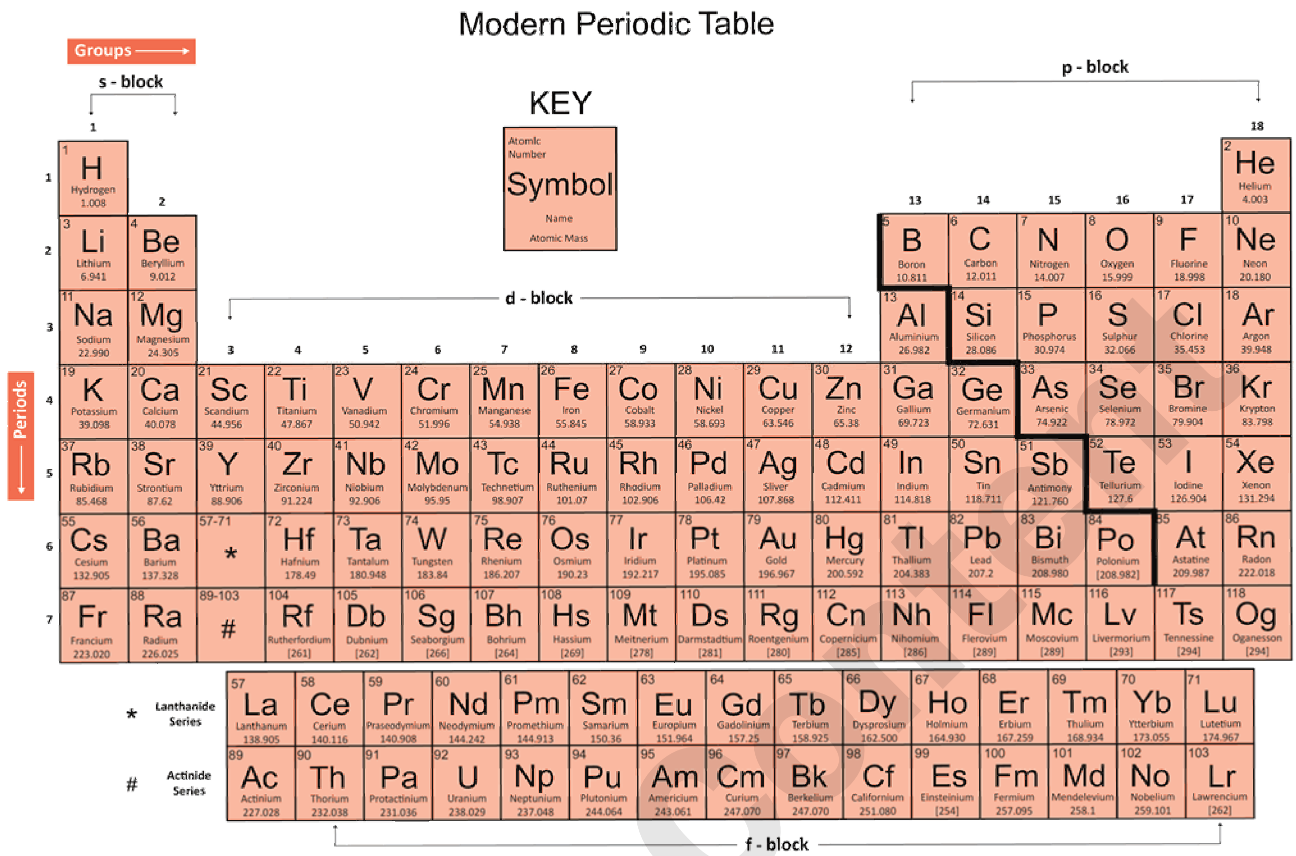
EXAMPLE - 3.2

The element Z = 119 has not yet been discovered. In which family or group would you place this element?

Solution:

The element with Z = 119 would have condensed electronic configuration of $[Og]8s^1$. Therefore, it would be placed in group 1 (alkali metals).

➢ **Modern Periodic Table**



➢ **Groups (American tradition)**

IA IIA IIIB IVB VB VIB VIIB VIIIB IB IIB IIIA IVA VA VIA VIIA VIIIA

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
s-Block												p-Block Elements (Nonmetals)					
1																	2
3	4	d-Block Elements (Transition Metals)										5	6	7	8	9	10
Alkali Metals	Alkaline earth	earth Metals								Coinage Metals		13	14	Pnictogens	Chalcogens	Halogens	Noble Gases
		21	22								30	31	32				
		39	40								48	49	50				
		57*	72								80	81	82	83	84	85	86
87	88	89**	104							111	112	113	114	115	116	117	118

Lanthanides *	58														71
Actinides **	90														103

Reactive Metals

f-Block Elements (Inner-Transition Metals)

Periodic table: Some individual groups of elements with specific names

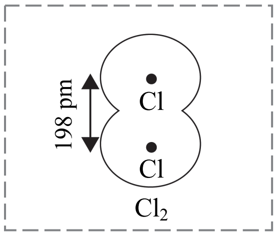
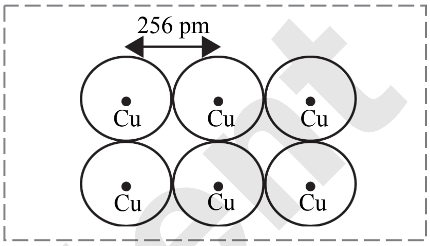
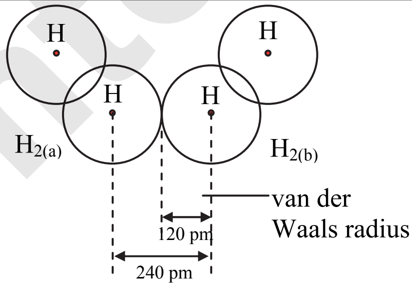
3.3 PERIODIC TRENDS IN PROPERTIES OF ELEMENTS

➢ **Periodicity:**

The periodic recurrence of elements having similar properties after regular intervals is called ***periodicity****.*

➢ **Atomic radius:**

Atomic radius (atomic size) of an atom may be regarded as the distance from the centre of the nucleus of an atom to the outermost shell (valence shell) of electrons.

	Example
Covalent radius: Half the distance between the radii of two similar atoms covalently bonded to each other by single bond	**Cl_2 molecule:** Cl – Cl bond distance in Cl_2 molecule = 198 pm Covalent radius of Cl = Half of the bond distance $= \frac{198 \text{ pm}}{2} = 99 \text{ pm}$ 
Metallic radius: Half the distance between the centres of nucleus of two adjacent atoms of a metallic crystal	**Solid copper:** Distance between two adjacent Cu atoms = 256 pm Metallic radius of Cu = Half of this distance $= \frac{256 \text{ pm}}{2} = 128 \text{ pm}$ 
van der Waals radius: Half the internuclear distance between two identical non-bonded isolated atoms or two adjacent identical atoms belonging to two neighbouring molecules of the same substance in the solid state.	Internuclear distance between two adjacent H-atoms of two neighbouring H_2 molecules in solid state = 240 pm van der Waals radius of H = Half of this distance = 120 pm 

REMEMBER THIS

van der Waals radius > Metallic radius > Covalent radius

Knowledge Badhao!

The quantum mechanical model of atom describes the extranuclear part of atom as the electron cloud which implies that an atom has no definite boundary. Atomic radius is estimated in terms of the electron density surface which encloses typically 95% or more, which is orbitary (present around the orbit) of the electron density.

Factors affecting atomic radius

Number of shells

Atomic size (atomic radius) increases with increase in number of shells

Atomic radius ∝ Number of shells

Nuclear charge

With increase in nuclear charge, nucleus attracts electrons strongly and thus, atomic radius decreases.

Atomic radius $\propto \left(\frac{1}{\text{nuclear charge}}\right)$

Shielding effect or Screening effect

The inner shell electrons prevent (shield) the outermost electrons from the attractive influence of nucleus. This is called shielding effect. Atomic radius increases with increase in shielding effect.

Atomic radius ∝ Shielding effect

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- **Chemical reactivity:**

a. The chemical reactivity is highest at the two extremes (except noble gases) of a period and is lowest in the centre.

b. This can be related to the metallic and nonmetallic character of elements.

c. Metallic character decreases from left to right across the period, while it increases down the group.

d. Nonmetallic character increases from left to right across the period while it decreases down the group.

e. **Nature of oxides:**

Elements on the left side of periodic table $\Rightarrow$ Basic oxides

Elements on the right side of periodic table $\Rightarrow$ Acidic oxides

Elements in the centre of the periodic table $\Rightarrow$ Amphoteric or neutral oxides

f. Reducing property of the elements decreases while oxidizing property increases across the period from left to right. The reducing property increases while the oxidizing property decreases down the group.

Quick Review

- **Classification of modern periodic table:**

Block	Last electron enters	Consists of
‘s’	s orbital (Maximum electrons = 2)	Group 1 (alkali metals) Group 2 (alkaline earth metals) [Representative elements]
‘p’	p orbital (Maximum electrons = 6)	Group 13 to group 17 elements [Representative elements] and Group 18 elements [Noble gases or inert gas elements]
‘d’	d orbital (Maximum electrons = 10)	Group 3 to group 12 elements [Transition elements]
‘f’	f orbital (Maximum electrons = 14)	Lanthanide and actinide series [Inner transition elements]

- **Factors affecting atomic radius:**

Factors affecting atomic radius

Number of orbits or shells	Nuclear charge	Shielding effect or Screening effect
Atomic radius $\propto$ Number of shells	Atomic radius $\propto \left(\frac{1}{\text{Nuclear charge}}\right)$	Atomic radius $\propto$ Shielding effect

- **Factors affecting ionization enthalpy (IE):**

Factors affecting ionization enthalpy (IE)

Size (radius) of atom	Nuclear charge	Shielding effect or Screening effect
$IE \propto \left(\frac{1}{\text{Size of atom}}\right)$	$IE \propto$ Nuclear charge	$IE \propto \left(\frac{1}{\text{Shielding effect}}\right)$

➢ **Factors affecting electronegativity:**

Factors affecting electronegativity

Atomic size (radius)	**Nuclear charge**	**Shielding effect or Screening effect**
Electronegativity $\propto \left(\frac{1}{\text{Atomic radius}}\right)$	Electronegativity $\propto$ Nuclear charge	Electronegativity $\propto \left(\frac{1}{\text{Shielding effect}}\right)$

➢ **General trends of different properties in periods and groups:**

GROUPS →

PERIODS ↓

Property	Along period (GROUPS →)	Down the group (PERIODS ↓)
Atomic radius	*Decreases*	*Increases*
Ionic radius	*Decreases*	*Increases*
Ionization enthalpy	*Increases*	*Decreases*
Electron gain enthalpy	*Increases*	*Decreases*
Electronegativity	*Increases*	*Decreases*
Valency	*Increases up to 4 and then decreases*	*Constant*
Metallic character / Nonmetallic character	*Decreases/ Increases*	*Increases / Decreases*

Multiple Choice Questions

3.0 Introduction

1. In Unitary theory, the values of the atomic mass of all the elements were considered _______.
   (A) prime numbers (B) even numbers
   (C) odd numbers (D) whole numbers

2. Unitary theory implied that all elements were made up of _______.
   (A) protons, electrons and neutrons
   (B) H-atoms
   (C) nucleus
   (D) only electrons

3. The atomic masses of Li and K are 7 and 39, respectively. According to Dobereiner's triad rule, the atomic mass of sodium will be _______.
   (A) 23 (B) 32 (C) 46 (D) 64

4. In which of the following options, the law of triad is applicable? **[TS EAMCET (Med.) 2021]**
   (A) Na, K, Rb (B) Cl, Br, I
   (C) C, N, O (D) Mg, Ca, Sr

5. Newland proposed the law of _______.
   (A) triads
   (B) homologous series
   (C) octaves
   (D) none of these

6. In Newland's law of octaves, the properties of every eighth element was similar to those of the _______.
   (A) first (B) second
   (C) third (D) fourth

7. The law of octaves applies to which of the following set of elements?
   (A) B, N, Ne (B) Be, Mg, Ca
   (C) Ar, K, Ca (D) Se, Te, As

8. In Lothar Meyer's arrangement of elements, physical properties like atomic volume, density, etc. were plotted against _______.
   (A) atomic number
   (B) atomic mass
   (C) both (A) and (B)
   (D) neither (A) nor (B)

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To see complete chapter buy **Target Notes** or **Target E-Notes**

4. Some periodic properties are given below. The number of properties that shows increase in general periodic trend down a group is _______.
   i. Atomic radius
   ii. Ionic radius
   iii. Ionization enthalpy
   iv. Electron gain enthalpy
   v. Electronegativity
   vi. Nonmetallic character
   vii. Valency

[Ans: 2]

5. Among the following, the number of species that are isoelectronic with Ne are _______.
   N^{3-}, O^{2-}, Cl, F, F^{-}, Na^{+}, Mg^{+}, Mg^{2+}, O^{-}

[Ans: 5]

Answers to MCQs

3.0 : 1. (D) 2. (B) 3. (A) 4. (B) 5. (C) 6. (A) 7. (B) 8. (B) 9. (D) 10. (C)
11. (A) 12. (A)

3.1 : 1. (C) 2. (B) 3. (B) 4. (D) 5. (B) 6. (D) 7. (A) 8. (C) 9. (C) 10. (C)
11. (B) 12. (D) 13. (D) 14. (A) 15. (A) 16. (A) 17. (B) 18. (D) 19. (D) 20. (D)
21. (D) 22. (A) 23. (A) 24. (B) 25. (A) 26. (C) 27. (C) 28. (C)

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

3.3 : 1. (C) 2. (A) 3. (D) 4. (A) 5. (D) 6. (A) 7. (A) 8. (B) 9. (D) 10. (D)
11. (B) 12. (A) 13. (C) 14. (B) 15. (D) 16. (A) 17. (D) 18. (A) 19. (A) 20. (A)
21. (C) 22. (B) 23. (C) 24. (C) 25. (B) 26. (A) 27. (C) 28. (A) 29. (D) 30. (A)
31. (C) 32. (B) 33. (C) 34. (C) 35. (D) 36. (A) 37. (C) 38. (C) 39. (B) 40. (C)
41. (D) 42. (C) 43. (D) 44. (A) 45. (A) 46. (B) 47. (C) 48. (C) 49. (B) 50. (A)
51. (C) 52. (C) 53. (B) 54. (B) 55. (C) 56. (D) 57. (B) 58. (C) 59. (C) 60. (A)
61. (C) 62. (B) 63. (D) 64. (C) 65. (A) 66. (A) 67. (A) 68. (B) 69. (A) 70. (B)
71. (A) 72. (B) 73. (A) 74. (C) 75. (C) 76. (C) 77. (B) 78. (A) 79. (B) 80. (C)
81. (B) 82. (C) 83 (D) 84. (D) 85. (D) 86. (C) 87. (C) 88. (B) 89. (D) 90. (D)
91. (C) 92. (D) 93. (A) 94. (C) 95. (B) 96. (B) 97. (D) 98. (B)

Misc.: 1. (C) 2. (B) 3. (A) 4. (D) 5. (A) 6. (C) 7. (C) 8. (A) 9. (C) 10. (C)
11. (A) 12. (C) 13. (A) 14. (D) 15. (C) 16. (A) 17. (B) 18. (C)

Hints to MCQs

3.0 Introduction

3. According to Dobereiner's triad rule, the middle element should possess atomic mass almost the average of the other two elements. Average of 7 and 39 is 23.

4. According to Dobereiner's law of triads, the atomic mass of the central element was nearly the arithmetic mean of atomic masses of other two elements.

Cl	Br	I	Arithmetic mean
35.5	80	127	$\frac{35.5+127}{2} = 81.25 \approx 80$

3.1 Modern Periodic Law and Long Form of the Periodic Table

5. d-block has 10 columns because a maximum of 10 electrons can occupy d-subshell.

8. The third row starts with element Na and is followed by Mg, Al, Si, P, S, Cl and Ar.

11. There are two elements in period 1 and eight elements in period 2. Hence, the tenth element in the periodic table belongs to period 2 and its group number is 18.

14. The chlorides of first group elements give neutral solution. For example, NaCl, which is salt of strong acid (HCl) and strong base (NaOH). Hence, solution of NaCl is neutral.

19. Elements with atomic number 93 and above are transuranic elements.

24. Third row elements include group 1, 2 and group 13 to 18.

27.

Digits present in atomic number	1	2	3
Numerical Root	un	bi	tri
Abbreviation	U	b	t

28. Unununium - Roentgenium

3.2 s, p, d AND f - BLOCK ELEMENTS

2. Electronic configuration of the element with atomic number 3: $1s^2\ 2s^1$
Electronic configuration of the element with atomic number 12: $1s^2\ 2s^2\ 2p^6\ 3s^2$
Since the last electron in both the elements enters in s-subshell, they belong to s-block.

6. Elements with atomic number 11 and 37 are s-block elements and are present in group 1 of periodic table of the elements.

7. Electronic configuration of element with $Z = 20$ is, $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$
Since last electron enters in s-orbital, it is an s-block element, i.e., representative element.

8. Electronic configuration of element with $Z = 120$ is [Og] $8s^2$. Since it contains two electrons in s-orbital of its valence shell, it must be placed in group 2 of the periodic table.

9. Elements with atomic numbers, 12, 20, 4, 88 have outer shell electronic configuration of ns^2. Hence, they belong to same group (group 2).

12. $_{13}Al$: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$
Since the last electron in Al enters in p-subshell, it belongs to p-block.

13. Electronic configuration of the element with atomic number 31: [Ar] $3d^{10}\ 4s^2\ 4p^1$
Since the last electron enters in p-subshell, the element belongs to p-block.

18. Element with atomic number 118 is named as oganesson and it would be placed in group 18 (noble gas).

19. Electronic configuration: [Ar] $3d^{10}\ 4s^2\ 4p^3$
The last electron enters in p-subshell, the element belongs to p-block and has three valence electrons and it belongs to group 15.

20. Electronic configuration of the element with atomic number 16: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
The last electron enters in p-subshell, the element belongs to p-block and has six valence electrons and it belongs to group 16.

22. $_{14}Si$: [Ne] $3s^2\ 3p^2$; $_{15}P$: [Ne] $3s^2\ 3p^3$
$_{16}S$: [Ne] $3s^2\ 3p^4$; $_{12}Mg$: [Ne] $3s^2$

23. Electronic configuration of element with atomic number:
9: 2, 7
17: 2, 8, 7
35: 2, 8, 18, 7
53: 2, 8, 18, 18, 7
85: 2, 8, 18, 18, 32, 7
Since they all contain 7 electrons in their valence shell, they are all halogens.

Thinking Hatke - Q. 23
Since electronic configuration of element with atomic number 9 is (2, 7), it is a halogen and hence, rest other elements also belong to halogen family.

24. The number of electrons present in the given element = 19 – 10 = 9
∴ The element is fluorine and it belongs to p-block.

25. Elements present in the same group have same number of valence electrons.

26. Electronic configuration: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
The last electron enters in p-subshell, the element belongs to p-block and has six valence electrons and it belongs to group 16.

27. The elements belonging to the same group have same valence shell configuration. Therefore, the electronic configuration of the element below the given element would be, $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^3$ and hence, its atomic number is 33.

28. P (phosphorus) is a p-block element, hence valence electron cannot enter d-orbital.

31. In the third row, sodium (alkali metal) and magnesium (alkali earth metal) belong to s–block while aluminium, silicon, phosphorous, sulphur, chlorine and argon are p–block elements.

32. The element belongs to d-block as the last electron enters in d-subshell.

CAUTION

As per the Aufbau principle, filling of electrons takes place first in 4s-subshell, followed by 3d-subshell. Therefore, the last electron enters in 3d-subshell and the element belongs to d-block.

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To see complete chapter buy **Target Notes** or **Target E-Notes**

Topic Test

1. In the modern periodic table, the period to which an element belongs is same as its _______.
   (A) atomic number
   (B) atomic mass
   (C) principal quantum number
   (D) azimuthal quantum number

2. Which of the following is CORRECT regarding the following iodine species?
   I, I^+ and I^-
   (A) Radius of I > Radius of I^-
   (B) Radius of I^- < Radius of I^+
   (C) Radius of I < Radius of I^+
   (D) Radius of I^- > Radius of I^+

3. Atomic mass of Cl = 35.5 and of I = 127. According to Dobereiner's triad rule, atomic mass of Br will be _______.
   (A) 152.5 (B) 162.5
   (C) 81.25 (D) 91.5

4. Long form of the periodic table is based on the properties of elements as a function of their _______.
   (A) atomic size (B) atomic mass
   (C) electronegativity (D) atomic number

5. Atomic numbers 15, 33, 51 represent the following family _______.
   (A) carbon family (B) nitrogen family
   (C) oxygen family (D) none of these

6. The element californium belongs to the family of _______.
   (A) actinide series
   (B) alkali metal
   (C) alkaline earth family
   (D) lanthanide series

7. An element of atomic number 21 will be placed in group _______.
   (A) 2 (B) 3
   (C) 7 (D) 18

8. The electronic configuration of an element is $1s^2\ 2s^2\ 2p^6\ 3s^2$. It is a/an _______.
   (A) metal (B) nonmetal
   (C) metalloid (D) inert gas

9. Which one of the following sets of ions represents the collection of isoelectronic species?
   (A) K^+, Cl^-, Mg^{2+}, Sc^{3+}
   (B) Na^+, Ca^{2+}, Sc^{3+}, F^-
   (C) K^+, Ca^{2+}, Sc^{3+}, Cl^-
   (D) Na^+, Mg^{2+}, Al^{3+}, Cl^-

10. Among Na, Mg and Al, the variation in ionization energy can be represented as _______.
    (A) Na > Mg > Al (B) Na < Mg < Al
    (C) Na > Mg < Al (D) Na < Mg > Al

11. Elements of the same group in the periodic table are characterized by the same _______.
    (A) ionization potential
    (B) electronegativity
    (C) electron affinity
    (D) number of valence electrons

12. Among the following, which atom has the smallest atomic radius?
    (A) Mg (B) Na
    (C) K (D) Ca

13. The places that were left empty in his periodic table by Mendeleev were for _______.
    (A) aluminium and silicon
    (B) gallium and germanium
    (C) arsenic and antimony
    (D) molybdenum and tungsten

14. Which of the following electronic configurations represents the element with the maximum electron affinity?
    (A) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
    (B) $1s^2\ 2s^2\ 2p^6$
    (C) $1s^2\ 2s^2\ 2p^5$
    (D) $1s^2\ 2s^2\ 2p^6\ 3s^1$

15. Valency of aluminium is 3 while that of oxygen is 2. What would be the molecular formula of the compound formed by these two elements?
    (A) Al_3O_2 (B) AlO_2
    (C) Al_2O_3 (D) Al_2O

Answers

1.	(C)	2.	(D)	3.	(C)	4.	(D)
5.	(B)	6.	(A)	7.	(B)	8.	(A)
9.	(C)	10.	(D)	11.	(D)	12.	(A)
13.	(B)	14.	(A)	15.	(C)		