SAMPLE CONTENT

SCIENCE AND TECHNOLOGY PART- 1

BASED ON NEW SYLLABUS

Mirage

The phenomenon of mirage occurs when light rays suffer total internal reflection while passing through layers of air at different temperature.

STD. X

(ENG. MED.)

Target Publications Pvt. Ltd.

Written as per the latest syllabus prescribed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune.

STD. X

Science and Technology

Part - 1

Salient Features

- Written as per the new textbook
- Exhaustive coverage of entire syllabus
- Ample numericals for thorough revision
- Memory maps provided for revision at a glance
- 'Illustrative Examples' provided for numerical elaboration
- 'Reading between the lines' provided for concept elaboration
- Chapter-wise assessment with every chapter for knowledge testing
- Model Question Paper in accordance with the latest paper pattern
- Includes Board Question Paper of March 2019
- Activity demonstration/concept explanation videos included wherever required
- Includes relevant MCQs and Questions from practical notebook

This book comprises of **QR Codes** at strategic touch points. You can simply scan this Code through your Smartphone camera and get a plethora of subject knowledge at your disposal. The QR Codes included herein would take you to videos that shall provide you a better understanding of 'Activities', 'Experiments', 'Projects' and 'Try This' section of the book. We hope students would maximize the use of this book with the aid of these videos.

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PREFACE

While designing the book, our main intention was to create a book that would act as a single point of reference for students. We wanted this book to provide students, the much needed answers for their textual questions as well as build up their knowledge quotient in the process.

Science and Technology: Std. X Part - 1 has been prepared as per the new syllabus and paper pattern which is more child-centric and focuses on active learning along-with making the process of education more enjoyable and interesting.

We have infused the book with a liberal sprinkling of real life examples, pictorial explanations and additional questions. A series of 'Intext Questions' along with questions titled under 'Use your brain power', 'Can you tell' and various similar titles pave the way for a robust concept building.

Every chapter begins with covering all the textual content in the format of Objectives, Question - Answers, Give Reasons, Numericals, Diagram-based questions, paragraph based questions and a host of other Objective and Subjective type of questions. A detailed thinking process involved in solving numerical problems is explained in step wise manner in 'Illustrative Examples.' The solution to these examples is elaboration of the answer of the numerical and not the exact solution expected in examination. For the students to grasp a better understanding of the concept lying behind the answer, 'Reading between the lines' (not a part of the answer) has been provided wherever necessary. To aid the students in their exam preparation, selected questions from the practical notebook are included. Standard values of basic physical quantities are provided under the section 'Values to remember.' To enhance audio-visual learning, videos showing demonstration of activities / concept explanation are included wherever required.

Wherever possible questions are allotted with marks in accordance with new marking scheme. The question without marks can be modified as per the new marking scheme and asked in examination. Memory maps have been included wherever needed which provides a quick revision of the important topics of a chapter. The chapter eventually ends with a Chapter wise Assessment that stands as a testimony to the fact that the child has understood the chapter thoroughly. Model question paper, designed as per the latest paper pattern, is a unique tool to enable self-assessment for the students.

We have provided videos that intend to help students understand the Paper Pattern. The students can view this video by scanning the **QR Code** provided

With absolute trust in our work, we hope, our holistic efforts towards making this book an ideal knowledge hub for students pays off.

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 at: mail@targetpublications.org

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

Best of luck to all the aspirants!

From,
Publisher

Edition : Second

PAPER PATTERN

- There will be separate question papers for Part 1 and Part 2 of 40 marks each.
- Duration of each paper will be 2 hours.

Question No.	Type of Questions	Total Marks
1.	(A) 5 Questions of 1 mark each (Objectives)	05
	(B) 5 Questions of 1 mark each (Practicals / Projects based MCQs)	05
2.	7 Questions of 2 marks each (solve any 5)	10
3.	7 Questions of 3 marks each (solve any 5)	15
4.	2 Questions of 5 marks each (solve any 1)	05

Distribution of marks according to question type and aims

Sr. No.	Question type	Marks	Marks with option	% Marks
1.	Objective	10	10	25
2.	Very short answer	10	14	25
3.	Short answer	15	21	37.5
4.	Long answer	5	10	12.5
	Total	**40**	**55**	**100**

Sr. No.	Aims	Marks	Marks with option	% Marks
1.	Knowledge	10	10	25
2.	Understanding	10	15	25
3.	Application	16	25	40
4.	Skill	4	5	10
	Total	**40**	**55**	**100**

[**Reference**: महाराष्ट्र राज्य पाठ्यपुस्तक निर्मिती व अभ्यासक्रम संशोधन मंडळ, पुणे निर्मित मूल्यमापन आराखडा]

[**P.S.** Scan this **Q.R. Code** to get a better understanding of the Paper Pattern.]

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Note: Textual exercise questions are represented by * mark.
Textual solved examples are represented by + mark.
Practical notebook questions are represented by ◆ mark.

Exam Pointers

Students are expected to write the answers in their Examination as illustrated below.

Fill in the blanks - Write the complete statement and underline the answer.

1. In Dobereiner's triads, atomic mass of the middle element was approximately equal to the mean of the _____ of the other two elements.

Ans: In Dobereiner's triads, atomic mass of the middle element was approximately equal to the mean of the atomic masses of the other two elements.

Find out the correlation – Determine the correlation between two components and write it in one sentence.

2. In Fleming's right hand rule-Thumb: Motion of conductor :: In Fleming's right hand rule-Index finger: _____

Ans: In Fleming's right hand rule-Thumb: Motion of conductor :: In Fleming's right hand rule-Index finger: **Magnetic field**

MCQ - Write the answer of each MCQ with option number.

3. When _____ is passed through fresh lime water, it turns milky.

(A) H_2 (B) CO_2

(C) CO (D) SO_2

Ans: 3. (B) CO_2

Numericals - Write the valid final answer along with the correct unit.

4. Calculate the escape velocity on the surface of the moon given the mass and radius of the moon to be 7.34×10^{22} kg and 1.74×10^{6} m respectively.

Ans: $v_{esc} = 2.372$ km/s

Reading between the lines

The explanation provided under 'Reading between the lines' is not expected to be a part of the answer. Its sole purpose is to provide a sound understanding of the concept behind the answer.

1. What is the expected trend in the variation of nonmetallic character of elements from left to right in a period?

Ans: The nonmetallic character increases from left to right in a period. } **Answer**

Reading between the lines

While going from left to right within a period, electrons get added in the same shell. At the same time, protons get added in the nucleus increasing the nuclear charge. This increases the effective nuclear charge experienced by valence electrons. As a result, the tendency to gain electrons increases. Thus, the nonmetallic character increases from left to right in a period. } **Not part of the answer**

2 Periodic Classification of Elements

Fill in the blanks

1. Complete the following statements. ***[1 Mark each]***

i. In Dobereiner's triads, atomic mass of the middle element was approximately equal to the mean of the _____ of the other two elements.

ii. The law used by Newlands to arrange elements is known as _____.

iii. The element eka-silicon in Mendeleev's periodic table is now known as _____ in the modern periodic table.

iv. Atomic number (Z) of an element is the number of _____ present in the nucleus of an atom of that element.

v. The modern periodic table consists of _____ groups.

vi. _____ is the first element of group 16.

vii. Elements from atomic numbers 93 to _____ are manmade.

viii. Electron capacity of shell M is _____.

ix. There are _____ electrons in the outermost shell of an atom of chlorine.

x. Alkaline earth metal which does not react with water is _____.

Answers:

i.	atomic masses	ii.	law of octaves
iii.	germanium	iv.	protons
v.	18	vi.	Oxygen
vii.	118	viii.	32
ix.	7	x.	Beryllium

2. Select the appropriate options and complete the following paragraph. ***[3 Marks]***

(2, 7, 8, 18, 32, atomic mass, atomic number, hydrogen, lithium)

In the modern periodic table, all known elements are listed in increasing order of their _____. It starts with the lightest element-_____ and proceeds to the heavier elements. The modern periodic table has _____ groups and _____ periods. The first period contains only _____ elements while the seventh period contains _____ elements.

Answer:

In the modern periodic table, all known elements are listed in increasing order of their **atomic numbers**. It starts with the lightest element-**hydrogen** and proceeds to the heavier elements. The modern periodic table has **18** groups and **7** periods. The first period contains only **2** elements while the seventh period contains **32** elements.

Choose the correct alternative *[1 Mark each]*

***1. Choose the correct option and rewrite the statement.**

i. The number of electrons in the outermost shell of alkali metals is _____.
(A) 1 (B) 2 (C) 3 (D) 7

ii. Alkaline earth metals have valency 2. This means that their position in the modern periodic table is in _____.
(A) group 2 (B) group 16
(C) period 2 (D) d-block

iii. Molecular formula of the chloride of an element X is XCl. This compound is a solid having high melting point. Which of the following elements will be present in the same group as X?
(A) Na (B) Mg (C) Al (D) Si

iv. In which block of the modern periodic table are the nonmetals found?
(A) s-block (B) p-block
(C) d-block (D) f-block

Answers:

i. The number of electrons in the outermost shell of alkali metals is **1**.

ii. Alkaline earth metals have valency 2. This means that their position in the modern periodic table is in **group 2**.

iii. Molecular formula of the chloride of an element X is XCl. This compound is a solid having high melting point. **Na** will be present in the same group as X.

iv. In **p-block** of the modern periodic table, the nonmetals are found.

2. Select the correct option.

i. A student was asked to select two elements in a periodic table. He selects neon and argon. In both these elements, the number of electrons in the outermost shell is _____.
(A) 2 (B) 6 (C) 7 (D) 8

ii. Four students note down the names of two metals from period 3.
Rita: Sodium and silicon
Nilesh: Magnesium and aluminium
Rohan: Sodium and potassium
Preeti: Sodium and aluminium
Who have correctly noted down the names of the metals?
(A) Rita and Preeti
(B) Nilesh and Preeti
(C) Rita and Rohan
(D) Only Preeti

iii. The correct decreasing order of atomic radius is:
(A) F > O > S (B) F > S > O
(C) S > F > O (D) S > O > F

iv. When a small piece of beryllium was added to water taken in a beaker, what will you observe?
(A) Vigorous chemical reaction occurs with evolution of a gas.
(B) Formation of precipitate is seen.
(C) Colour of solution turns black.
(D) No reaction occurs.

v. The correct increasing order of reactivity of alkaline earth metals with water is:
(A) Be < Mg < Ca < Sr < Ba
(B) Be < Mg < Ca < Ba < Sr
(C) Ba < Mg < Ca < Sr < Be
(D) Be < Ca < Mg < Sr < Ba

vi. Which one of the following does not increase while moving down the group of the modern periodic table?
(A) Atomic radius
(B) Metallic character
(C) Valence electrons
(D) Number of shells

◆vii. Valency of the elements in the halogen group is_____.
(A) one (B) two
(C) three (D) four

◆viii. The most reactive element in the halogen group is_____.
(A) astetine (B) iodine
(C) chlorine (D) fluorine

◆ix. Halogen which is liquid at room temperature is_____.
(A) fluorine (B) astetine
(C) bromine (D) iodine

◆x. The metallic character of elements _____in a group from top to bottom.
(A) increases
(B) decreases
(C) remains constant
(D) shows indefinite behaviour

◆xi. Valency of elements _____ in a period from left to right.
(A) increases
(B) decreases
(C) remains constant
(D) increases in the beginning and then decreases

xii. Which of the following is the lightest inert gas?
(A) Argon (B) Helium
(C) Neon (D) Xenon

xiii. An inert gas element placed in period 6 is used in the treatment of cancer. Identify the element.
(A) Xenon (B) Radon
(C) Argon (D) Krypton

Answers:

i.	(D)	ii.	(B)	iii.	(D)
iv.	(D)	v.	(A)	vi.	(C)
vii.	(A)	viii.	(D)	ix.	(C)
x.	(A)	xi.	(D)	xii.	(B)
xiii.	(B)				

Name the following *[1 Mark each]*

*1. The period with electrons in the shells K, L and M.
*2. The group with valency zero.
*3. The family of nonmetals having valency one.
*4. The family of metals having valency one.
*5. The family of metals having valency two.
6. Name the group 18 element placed in period 3.
7. Name the element having atomic number 92.
8. Name the halogen which exists as solid.
9. Name the inert gas which contains electrons in K and L shells only.
10. Name the alkaline earth metal that reacts with steam only.

Answers:

1.	Period 3	2.	Group 18
3.	Halogens	4.	Alkali metals
5.	Alkaline earth metals	6.	Argon (Ar)
7.	Uranium (U)	8.	Iodine (I_2)
9.	Neon (Ne)	10.	Magnesium (Mg)

Right or Wrong. If wrong, write the correct sentence *[1 Mark each]*

1. Gallium oxide (Ga_2O_3) is an amphoteric oxide.
2. Hydrogen resembles alkali metals as well as halogens.
3. In the long form of periodic table, groups 3 to 12 constitute the p-block.
4. The chemical properties of the elements in the same group show similarity and gradation.
5. Radioactive and unstable elements have a very short life.
6. One picometer (pm) is equal to 10^{-12} meter.

7. Atomic radius increases while going from left to right within a period.
8. Electronegativity increases while going from left to right within a period.
9. Smaller the electropositivity or electronegativity of the element higher the reactivity.
10. The valency of group 16 elements is 2.

Answers:

1. Right
2. Right
3. Wrong
   In the long form of periodic table, groups 3 to 12 constitute the d-block.
4. Right
5. Right
6. Right
7. Wrong
   Atomic radius decreases while going from left to right within a period.
8. Right
9. Wrong
   Larger the electropositivity or electronegativity of the element higher the reactivity.
10. Right

Odd one out *[1 Mark each]*

1. Lithium, beryllium, boron, chlorine
2. Beryllium, magnesium, potassium, calcium
3. Fluorine, helium, neon, argon
4. Carbon, nitrogen, fluorine, sulphur
5. Lithium, sodium, magnesium, potassium
6. Fe, Co, Ni, Al
7. Fluorine, oxygen, bromine, iodine

Answers:

1. Chlorine
   Chlorine is placed in period 3 while others are placed in period 2 of the modern periodic table.
2. Potassium
   Potassium is placed in group 1 while others are placed in group 2 of the modern periodic table.
3. Fluorine
   Fluorine is a halogen while others are noble gases.
4. Sulphur
   Sulphur is placed in period 3 while other elements are placed in period 2 of the modern periodic table.
5. Magnesium
   Magnesium is an alkaline earth metal while others are alkali metals.
6. Al
   Aluminium (Al) is a p-block element while others are d-block elements.
7. Oxygen
   Oxygen is placed in group 16 while others are placed in group 17 of the modern periodic table.

Complete the analogy *[1 Mark each]*

1. Gallium oxide: Ga_2O_3 :: Gallium chloride : _____
2. Li: Second period :: Al : _____
3. Alkali metals: s-Block :: Transition elements : _____
4. Sulphur: _____ :: Calcium : (2, 8, 8, 2)
5. Valency of potassium atom : one :: Valency of argon atom : _____

Answers:

1. $GaCl_3$
   Formula of gallium oxide is Ga_2O_3 whereas the formula of gallium chloride is $GaCl_3$.
2. Third period
   Lithium (Li) belongs to second period whereas aluminium (Al) belongs to third period of the modern periodic table.
3. d-Block
   Alkali metals are placed in s-block whereas transition elements are placed in d-block of the modern periodic table.
4. (2, 8, 6)
   Electronic configuration of calcium is (2, 8, 8, 2) while electronic configuration of sulphur is (2, 8, 6).
5. Zero
   Valency of potassium atom is one whereas the valency of argon atom is zero.

Match the following

***1. Rearrange the columns 2 and 3 so as to match with the column 1.**

	Column 1		Column 2		Column 3
i.	Triad	a.	Lightest and negatively charged particle in all the atoms	1.	Mendeleev
ii.	Octave	b.	Concentrated mass and positive charge	2.	Thomson
iii.	Atomic number	c.	Average of the first and the third atomic mass	3.	Newlands
iv.	Period	d.	Properties of the eighth element similar to the first	4.	Rutherford
v.	Nucleus	e.	Positive charge on the nucleus	5.	Dobereiner
vi.	Electron	f.	Sequential change in molecular formulae	6.	Moseley

2. Match the groups given in Column I with the corresponding blocks of the periodic table given in Column II. *[2 Marks]*

	Column I		Column II
i.	Alkali metals	a.	Group 17
ii.	Alkaline earth metals	b.	Group 1
iii.	Halogen family	c.	Group 18
iv.	Inert gases	d.	Group 2

3. Match the elements given in Group 'A' with their electronic configuration given in Group 'B'. *[1 Mark]*

	Group 'A'		Group 'B'
i.	Potassium	a.	(2, 8, 1)
ii.	Aluminium	b.	(2, 8, 8, 1)
		c.	(2, 8, 3)
		d.	(2, 8, 2)

4. Match the groups given in Column I with the corresponding blocks of the periodic table given in Column II. *[1 Mark]*

	Column I		Column II
i.	Groups 1 and 2	a.	p-block
ii.	Groups 3 to 12	b.	d-block
		c.	f-block
		d.	s-block

Answers:

1. (i – c – 5), (ii – d – 3), (iii – e – 6), (iv – f – 1), (v – b – 4), (vi – a – 2)
2. (i – b), (ii – d), (iii – a), (iv– c)
3. (i – b), (ii – c)
4. (i – d), (ii – b)

Answer the following

1. Explain Dobereiner's triads giving one example. *[3 Marks]*

Ans: Dobereiner's triads:

i. Dobereiner suggested that properties of elements are related to their atomic masses. He classified existing elements in a tabular form by placing three elements having similar chemical properties in a group called triad.

ii. In each triad, the elements were placed according to increasing order of their atomic masses.

iii. The atomic mass of the middle element in each triad was approximately equal to the mean of the atomic masses of the other two elements.

iv. **Example:** In the triad of lithium, sodium and potassium, the atomic mass of sodium (23) is the mean of atomic masses of lithium (6.9) and potassium (39.1).

2. State the drawback of Dobereiner's triads. *[1 Mark]*

Ans: Drawback of Dobereiner's triads:

All the known elements could not be classified into triads.

3. Chlorine, bromine and iodine form a Dobereiner's triad. Chlorine has atomic mass 35.5 and iodine has atomic mass 126.9. Predict the atomic mass of bromine. *[1 Mark]*

Ans: As chlorine (Cl), bromine (Br) and iodine (I) form a triad, atomic mass of Br should be the mean of atomic masses of Cl and I.

$\therefore$ Atomic mass of Br = $\frac{35.5+126.9}{2}$ = 81.2

$\therefore$ Atomic mass of Br would be approximately 81 (actual mass is 79.9).

4. State Newlands' law of octaves. *[1 Mark]*

Ans: Newlands' law of octaves states that "When the elements are arranged in an increasing order of their atomic masses, the properties of the eighth element are similar to the first."

5. Explain Newlands' octaves. *[2 Marks]*

Ans: Newlands' octaves:

i. Newlands correlated the atomic masses of elements to their properties in a different way.

ii. He arranged the elements known at that time in an increasing order of their atomic masses.

iii. This arrangement started with the lightest element hydrogen and ended up with thorium.

iv. He found that every eighth element had properties similar to those of the first element as observed in octaves of music.

Example: Sodium is the eighth element from lithium and both have similar properties.

*[**Note:** Newlands' octaves are based on the seven main notes of music system. The seven notes in Indian music system are Sa, Re, Ga, Ma, Pa, Dha, Ni and the seven notes in western music system are Do, Re, Mi, Fa, So, La, Ti. The frequency of the notes goes on increasing from one note to the other. The note 'Sa' or 'Do' having double the original frequency comes again at the eighth place. This forms the octave of musical notes.]*

6. What were the demerits of Newlands' octaves? *[2 Marks]*

Ans: Demerits of Newlands' octaves:

i. Out of the 56 elements known, Newlands law of octaves was applicable only upto calcium.

ii. In order to fit all the known elements, Newlands placed two elements in the same position. For example, Co and Ni, Ce and La.

iii. Newlands' octaves did not have provision to accommodate the newly discovered elements.

Reading between the lines

After calcium, every eighth element did not possess similar properties to those of the first. He placed the metals Co and Ni, under the note 'Do' along with halogens, while Fe, having similarity with Co and Ni, away from them along with the nonmetals O and S under the note 'Ti'.

7. State Mendeleev's periodic law. *[1 Mark]*

Ans: Mendeleev's periodic law states that "The properties of elements are a periodic function of their atomic masses."

***8. Write short note on: Mendeleev's periodic law.** *[2 Marks]*

Ans:

i. Mendeleev organized the period table on the basis of atomic masses of elements.

ii. When he arranged the 63 elements known at that time in the increasing order of their atomic masses, he found that the chemical and physical properties of elements showed repetition after certain fixed interval.

iii. On the basis of this finding, he stated that 'properties of elements are a periodic function of their atomic masses'. This is known as Mendeleev's periodic law.

9. State the merits of Mendeleev's periodic table. *[2 Marks]*

Ans: Merits of Mendeleev's periodic table:

i. Mendeleev was the first to successfully classify all known elements.

ii. Mendeleev's periodic table helped to revise the atomic masses of some elements so as to give them proper places in the periodic table in accordance with their properties.
For example, the atomic mass of beryllium (Be) was previously determined to be 14.09. This value was changed to the correct value of 9.4 and beryllium (Be) was placed before boron (B).

iii. Mendeleev's periodic table had left some vacant spaces in it. These were for elements that were yet to be discovered.
Three of these unknown elements were named eka-boron, eka-aluminium and eka-silicon. He predicted properties of these elements even before they were discovered.
These elements are scandium (Sc), gallium (Ga) and germanium (Ge) respectively. The properties of these elements matched well with those predicted by Mendeleev.

iv. There was no place reserved for noble gases in Mendeleev's original periodic table. But, when noble gases were discovered later, they were placed in a new group called as 'zero group' in Mendeleev's periodic table without disturbing the positions of other elements.

10. State the demerits of Mendeleev's periodic table. *[2 Marks]*

Ans: Demerits of Mendeleev's periodic table:

i. The whole number atomic mass of the elements cobalt (Co) and nickel (Ni) is the same, that is, 59. Therefore, there was an ambiguity regarding the sequence of these elements in the Mendeleev's periodic table.

ii. Isotopes were discovered long time after Mendeleev developed the periodic table. Isotopes have same chemical properties but different atomic masses. Therefore, isotopes could not be given a proper place in Mendeleev's periodic table.

iii. In Mendeleev's periodic table, elements are arranged in an increasing order of atomic masses. However, the rise in atomic mass is not uniform. Hence, it was not possible to predict the number of elements that could be discovered between two heavy elements.

iv. No fixed position was given to hydrogen in Mendeleev's periodic table because it resembled alkali metals (group I) as well as halogens (group VII).

11. What is the difference between Mendeleev's periodic law and modern periodic law? *[1 Mark]*

Ans: Mendeleev's periodic law is based on atomic masses while modern periodic law is based on atomic numbers of elements.

12. State modern periodic law. *[1 Mark]*

Ans: Modern periodic law states that "The properties of elements are a periodic function of their atomic numbers."

***13. Write short note on: Structure of the modern periodic table.** *[2 Marks]*

Ans:

i. The modern periodic table consists of seven horizontal rows called the periods and eighteen vertical columns called the groups.

ii. The arrangement of the periods and groups results in the formation of boxes, where each box corresponds to the position of an element.

iii. In addition to these seven rows, lanthanide and actinide series are shown separately at the bottom of the periodic table. The first row is lanthanide series and the second row is actinide series.

iv. The entire periodic table is divided into four blocks: s-block, p-block, d-block and f-block.

v. **s-block:** contains group 1 and 2 elements
p-block: contains group 13 to 18 elements
d-block: contains group 3 to 12 elements (transition elements)
f-block: contains lanthanide and actinide series

vi. A zig-zag line is drawn in the p-block of the periodic table. Metals lie on the left side while nonmetals lie on the right side of this line. Metalloids lie along the border of this line.

14. Give four examples of each of the following: *[2 Marks each]*

i. Nonmetals

Ans: Carbon, phosphorus, sulphur, chlorine

ii. s-Block elements

Ans: Lithium, sodium, magnesium, calcium

iii. Alkali metals (or group 1 elements)

Ans: Lithium, sodium, potassium, rubidium

iv. Alkaline earth metals (or group 2 elements)

Ans: Beryllium, magnesium, calcium, Strontium

v. p-Block elements

Ans: Carbon, nitrogen, oxygen, fluorine

vi. d-block elements

Ans: Iron, cobalt, nickel, copper

vii. Halogen family

Ans: Fluorine, chlorine, bromine, iodine

viii. Period 2 elements

Ans: Boron, carbon, nitrogen, oxygen

ix. Period 3 elements

Ans: Aluminium, silicon, phosphorus, chlorine

15. Write short note on: Position of isotopes in the Mendeleev's and the modern periodic table.** ***[2 Marks]

Ans:

i. Isotopes were discovered long time after Mendeleev developed the periodic table.

ii. All isotopes of the same element have different atomic masses but same atomic number. They also have the same chemical properties.

iii. In Mendeleev's periodic table, elements are arranged in increasing order of their atomic masses such that chemically similar elements are placed together in a group. So, it was difficult to place them in Mendeleev's periodic table.

iv. In modern periodic table, elements are arranged in increasing order of their atomic numbers. Hence, all the isotopes of an element occupy the same position in the modern periodic table.

16. What are the periodic trends in the modern periodic table? ***[1 Mark]***

Ans: Valency, atomic size and metallic-nonmetallic character are some properties of elements which show periodic trends.

Reading between the lines

When the physical and chemical properties of elements in a period or a group of the modern periodic table are compared, certain regularity is observed in their variations. This is called as periodic trends in the modern periodic table.

17. Define: Atomic radius (Atomic size) ***[1 Mark]***

Ans: For an isolated atom, the distance between the centre of the nucleus of the atom and the outermost shell is called its atomic radius.

18. Intext Question. ***(Textbook page no. 26)***

How is the ability to lose or accept electrons in the valence shell determined? ***[1 Mark]***

Ans: The ability to lose or accept electrons in the valence shell is determined by: the effective nuclear charge exerting an attractive force on the valence electrons and the number of valence electrons.

19. What is meant by the term electropositivity of an element? ***[1 Mark]***

Ans: The tendency of an atom of an element to form cation by losing its valence electrons is called electropositivity of that element.

20. How does metallic character vary in a period and a group? ***[2 Marks]***

Ans:

i. In a period, metallic character decreases from left to right due to decrease in electropositivity.

ii. In a group, metallic character increases from top to bottom due to increase in electropositivity.

21. Write the names from the description.** ***[1 Mark each]

i. The metalloids in the second and third periods.

Ans: Boron and silicon

ii. Nonmetals in the third period.

Ans: Phosphorus, sulphur and chlorine

iii. Two elements having valency 4.

Ans: Carbon and silicon

22. Use your brain power! ***(Textbook page no. 27)***

i. What is the cause of nonmetallic character of elements? ***[1 Mark]***

Ans: The tendency to form anion by accepting outside electrons into its valence shell or electronegativity is the cause of nonmetallic character of an element.

Reading between the lines

This depends on the effective nuclear charge experienced by the valence electrons. As effective nuclear charge increases, the valence electrons are held with greater and greater attractive force. As a result electronegativity increases and the ability of an atom to become anion by accepting outside electron increases. In addition to this, the resulting anion has a special stability due to its complete octet. Thus, the effective nuclear charge and the tendency to achieve stable electronic configuration result in nonmetallic character of an element.

ii. What is the expected trend in the variation of nonmetallic character of elements from left to right in a period? ***[1 Mark]***

Ans: The nonmetallic character increases from left to right in a period.

Reading between the lines

While going from left to right within a period, electrons get added in the same shell. At the same time, protons get added in the nucleus increasing the nuclear charge. This increases the effective nuclear charge experienced by valence electrons. As a result, the tendency to gain electrons increases. Thus, the nonmetallic character increases from left to right in a period.

iii. What would be the expected trend in the variation of nonmetallic character of elements down a group? ***[1 Mark]***

Ans: The nonmetallic character decreases down a group.

Reading between the lines

While going down a group, atomic size increases due to the addition of shells. This reduces the effective nuclear charge experienced by valence electrons. As a result, the tendency to gain electrons decreases. Thus, the nonmetallic character decreases down a group.

◆**23. Answer the following questions with respect to the modern periodic table.**

i. Explain the gradation in reactivity of halogen family.

ii. What are the similarities in properties of elements in halogen family?

iii. Why are inert gases placed in zero group? ***[3 Marks]***

Ans:

i. While going from top to bottom within group 17, a gradation is observed in their physical state. Fluorine (F_2) and chlorine (Cl_2) are gases; bromine (Br_2) is a liquid while iodine (I_2) is a solid.

ii. All the members of halogen family have the general molecular formula (X_2) and all of them have seven valence electrons. Their valency is 1.

iii. Inert gases contain 8 electrons in their outermost shell except helium which contains 2 electrons. Their valency is zero. Hence, inert gases are placed in zero group.

24. Write a short note on noble gases. ***[2 Marks]***

Ans: Noble gases:

i. Elements present in group 18 on the extreme right of the modern periodic table are called noble gases.

ii. Noble gases include Helium (He), Neon (Ne), Argon (Ar), Krypton (Kr), Xenon (Xe), Radon (Rn) and Oganesson (Og).

iii. Their outermost shell contains 8 electrons except helium which contains 2 electrons. Their valency is zero.

iv. These elements are included in p-block of the modern periodic table.

25. Write the name and symbol of the element from the description.** ***[1 Mark each]

i. The atom having the smallest size.

Ans: Hydrogen (H)

***[Note:** Note that the atomic radii of noble gases are not considered here. Being monoatomic their (non-bonded radii) values are very large. Infact radii of noble gases should be compared, not with covalent radii but with the van der Waals radii of other elements (Reference: Maharashtra State Board Text Book, Standard XI, Sixth Edition 2017, Page no. 81). The van der Waals radius of hydrogen is 120 pm and that of helium is 140 pm.]*

ii. The atom having the smallest atomic mass.

Ans: Hydrogen (H)

iii. The most electronegative atom.

Ans: Fluorine (F)

iv. The noble gas with the smallest atomic radius.

Ans: Helium (He)

v. The most reactive nonmetal.

Ans: Fluorine (F)

***26. An element has its electronic configuration as (2, 8, 2). Now answer the following questions.**

i. What is the atomic number of this element?

ii. What is the group of this element?

iii. To which period does this element belong?

iv. With which of the following elements would this element resemble? (Atomic numbers are given in the brackets)

N (7), Be (4), Ar (18), Cl (17)

Ans:

i. Atomic number of the element is 12.

ii. The element belongs to group 2.

iii. The element belongs to period 3.

iv. The element would resemble beryllium (Be).

Reading between the lines

Atomic number of element is equal to the total number of electrons present in it. For any s-block element, group number is equal to the number of valence electrons. The period number for any element is the number of shells occupied by its electrons. The elements with the same number of valence electrons would have similar chemical properties. The electronic configuration of Be is (2, 2).

27. What is the difference between electropositivity and electronegativity of an element? *[1 Mark]*

Ans: The tendency of an element to form a cation by losing its valence electron is called electropositivity while the tendency of an element to form an anion by gaining electron in valence shell is called electronegativity

28. Consider the elements of period 2 in the modern periodic table. Answer the following questions with explanation.

i. Name the element in which both the shells are completely filled with electrons.

ii. Name the element which has same number of electrons in the first and second shell.

iii. Which is the most electropositive element in this period? *[3 Marks]*

Ans:

i. The element in which both the shells are completely filled with electrons is neon.

ii. The element which has same number of electrons in the first and second shell is beryllium.

iii. Lithium is the most electropositive element in period 2.

Reading between the lines

In berylium, the first shell has 2 electrons, so the second shell should also have 2 electrons. So, the electronic configuration should be (2, 2). Hence, the element is beryllium with electronic configuration (2, 2).

29. Write down the electronic configuration of the following elements from the given atomic numbers. Answer the following question with explanation. *[2 Marks each]

i. $_3$Li, $_{14}$Si, $_2$He, $_{11}$Na, $_{15}$P

Which of these elements belong to period 3?

Ans:

Element	Electronic configuration
$_3$Li	2, 1
$_{14}$Si	2, 8, 4
$_2$He	2
$_{11}$Na	2, 8, 1
$_{15}$P	2, 8, 5

The elements $_{14}$Si, $_{11}$Na and $_{15}$P belong to period 3 as three shells (K, L and M) are occupied by electrons.

ii. $_1$H, $_7$N, $_{20}$Ca, $_{16}$S, $_4$Be, $_{18}$Ar

Which of these elements belong to the second group?

Ans:

Element	Electronic configuration
$_1$H	1
$_7$N	2, 5
$_{20}$Ca	2, 8, 8, 2
$_{16}$S	2, 8, 6
$_4$Be	2, 2
$_{18}$Ar	2, 8, 8

The elements $_{20}$Ca and $_4$Be belong to second group as they have two valence electrons.

iii. $_7$N, $_6$C, $_8$O, $_5$B, $_{13}$Al

Which is the most electronegative element among these?

Ans:

Element	Electronic configuration
$_7$N	2, 5
$_6$C	2, 4
$_8$O	2, 6

Element	Electronic configuration
$_5$B	2, 3
$_{13}$Al	2, 8, 3

The most electronegative element is $_8$O as electronegativity decreases down a group while it increases moving across a period from left to the right.

Reading between the lines

Electronegativity is the tendency of an atom to form anion by accepting electrons and this tendency increases with increase in nuclear charge and decrease in atomic radius. Aluminium ($_{13}$Al) is a metal and it has tendency to lose electrons. Among the remaining given elements (period 2 elements), $_8$O has the highest nuclear charge and the smallest atomic radius. It will readily acquire two electrons to form anion having stable electronic configuration (2, 8). Thus, it is the most electronegative element.

iv. $_4$Be, $_6$C, $_8$O, $_5$B, $_{13}$Al

Which is the most electropositive element among these?

Ans:

Element	Electronic configuration
$_4$Be	2, 2
$_6$C	2, 4
$_8$O	2, 6

Element	Electronic configuration
$_5$B	2, 3
$_{13}$Al	2, 8, 3

The most electropositive element is $_{13}$Al electropositivity increases down a group while it decreases moving across a period from left to the right.

Reading between the lines

Electropositivity is the tendency of an atom to form cation by losing its valence electrons and this tendency increases with decrease in effective nuclear charge exerting attractive force on the valence electrons. Among the given elements, $_{13}$Al has the least effective nuclear charge exerting attractive force on valence electrons. This is because of the electrons in the inner shells, which lie in between the valence shell and the nucleus. These electrons act as a shield reducing the attractive force of the nucleus on the valence electrons. Thus, $_{13}$Al is the most electropositive element.

v. **$_{11}$Na, $_{15}$P, $_{17}$Cl, $_{14}$Si, $_{12}$Mg**
Which of these has the largest atoms?

Ans:

Element	Electronic configuration
$_{11}$Na	2, 8, 1
$_{15}$P	2, 8, 5
$_{17}$Cl	2, 8, 7
$_{14}$Si	2, 8, 4
$_{12}$Mg	2, 8, 2

The element which has the largest atom is $_{11}$Na because atomic size decreases moving across a period from left to the right.

vi. **$_{19}$K, $_{3}$Li, $_{11}$Na, $_{4}$Be**
Which of these atoms has the smallest atomic radius?

Ans:

Element	Electronic configuration
$_{19}$K	2, 8, 8, 1
$_{3}$Li	2, 1
$_{11}$Na	2, 8, 1
$_{4}$Be	2, 2

The element with the smallest atomic radius is $_{4}$Be because atomic size decreases moving across a period from left to the right while it increases down a group.

Reading between the lines

$_{19}$K, $_{3}$Li and $_{11}$Na belong to same group. Atomic radius decreases as the number of shells decreases. So, $_{3}$Li has the smallest radius among these three elements. $_{3}$Li and $_{4}$Be belong to same period. Among these two, $_{4}$Be has the highest effective nuclear charge exerting attractive force on valence electrons. Thus, it has the smallest atomic radius.

vii. **$_{13}$Al, $_{14}$Si, $_{11}$Na, $_{12}$Mg, $_{16}$S**
Which of the above elements has the highest metallic character?

Ans:

Element	Electronic configuration
$_{13}$Al	2, 8, 3
$_{14}$Si	2, 8, 4
$_{11}$Na	2, 8, 1
$_{12}$Mg	2, 8, 2
$_{16}$S	2, 8, 6

The element with the highest metallic character is $_{11}$Na as metallic character decreases moving across a period from left to the right.

Reading between the lines

All the given elements belong to period 3. $_{11}$Na has the least effective nuclear charge exerting attractive force on valence electron as it has largest atomic size. It can lose electron readily and thus, has the highest metallic character.

viii. **$_{6}$C, $_{3}$Li, $_{9}$F, $_{7}$N, $_{8}$O**
Which of the above elements has the highest nonmetallic character?

Ans:

Element	Electronic configuration
$_{6}$C	2, 4
$_{3}$Li	2, 1
$_{9}$F	2, 7
$_{7}$N	2, 5
$_{8}$O	2, 6

The element with the highest nonmetallic character is $_{9}$F as nonmetallic character increases moving across a period from left to the right

Reading between the lines

All the given elements belong to period 2. $_{9}$F has the highest electronegativity. It can gain an electron readily and thus, has the highest nonmetallic character.

Give reasons *[2 Marks each]*

***1. The third period contains only eight elements even though the electron capacity of the third shell is 18.**

Ans:

i. The number of elements in the first three periods depends on the electron capacity of the shells and the law of electron octet.

ii. The electron capacity of third shell is 18. So the third period should actually contain 18 elements. But it contains only 8 elements due to the law of electron octet.

***2. Elements belonging to the same group have the same valency.**

Ans:

i. The electronic configuration of the outermost shell is same for all the elements belonging to the same group.

ii. So, the number of valence electrons for all the elements in a group is the same.

iii. The valency of an element is determined by the valence electrons.
Hence, elements belonging to the same group have the same valency.

***3. Atomic radius goes on decreasing while going from left to right in a period.**

Ans:

i. While going from left to right in a period, atomic number increases. So, positive charge on the nucleus increases. At the same time, electrons get added in the same outermost shell.

ii. This increases effective nuclear charge. As a result, electrons are attracted closer to the nucleus decreasing the size of the atom.
Thus, atomic radius goes on decreasing while going from left to right in a period.

***4. Atomic radius goes on increasing down a group.**

Ans:

i. As we move from top to bottom in a group, number of shells increases.

ii. The outermost electrons go farther and farther from the nucleus, extending the radius and ultimately increasing the size of the atom even though the nuclear charge increases.
Hence, atomic radius goes on increasing down a group.

***5. Metallic character goes on decreasing while going from left to right in a period.**

Ans:

i. While going from left to right in a period, electrons are added to the same outermost shell. At the same time, protons get added in the nucleus increasing the nuclear charge. Hence, these electrons experience greater pull from the nucleus due to increased effective nuclear charge.

ii. As a result, it becomes difficult to remove a valence electron from the atom.
Hence, metallic character goes on decreasing while going from left to right in a period.

Distinguish between *[2 Marks each]*

1. Mendeleev's periodic table and Modern periodic table

Ans:

	Mendeleev's periodic table	Modern periodic table
i.	Elements are arranged in increasing order of their atomic masses.	Elements are arranged in increasing order of their atomic numbers.
ii.	It is not divided into any blocks.	It is divided into four blocks, namely s-block, p-block, d-block and f-block.
iii.	There are 8 groups.	There are 18 groups.
iv.	Isotopes could not be placed properly.	Isotopes occupy the same position as the element.

2. Metallic character and nonmetallic character

Ans:

	Metallic character	Nonmetallic character
i.	Metallic character is the tendency of an atom to lose electrons.	Nonmetallic character is the tendency of an atom to accept electrons.
ii.	Metallic character decreases from left to right in a period.	Nonmetallic character increases from left to right in a period.
iii.	In a group, metallic character increases from top to bottom.	In a group, non-metallic character decreases from top to bottom.
iv.	Elements having metallic character are said to be electropositive.	Elements having non-metallic character are said to be electronegative.

Complete the given chart/table

1. Complete the following table. *[2 Marks]*

Triad	Elements	Atomic mass
A	Lithium (Li)	6.9
	Sodium (Na)	–
	Potassium (K)	39
B	Calcium (Ca)	40.1
	Strontium (Sr)	–
	Barium (Ba)	137.3

Ans:

Triad	Elements	Atomic mass
A	Lithium (Li)	6.9
	Sodium (Na)	**23**
	Potassium (K)	39
B	Calcium (Ca)	40.1
	Strontium (Sr)	**88.7**
	Barium (Ba)	137.3

2. Complete the following table. *[3 Marks]*

Element	Atomic No.	Electronic configuration	Type of element
Sodium	11	2,8,1	Metal
Magnesium	12	2,8,2	–
–	13	2,8,3	Metal
Silicon	14	–	Metalloid
Phosphorus	15	2,8,5	–
–	16	–	Nonmetal
Chlorine	17	2,8,7	Nonmetal

Ans:

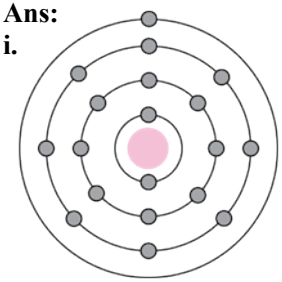
Element	Atomic No.	Electronic configuration	Type of element
Sodium	11	2,8,1	Metal
Magnesium	12	2,8,2	**Metal**
Aluminium	13	2,8,3	Metal
Silicon	14	**2,8,4**	Metalloid
Phosphorus	15	2,8,5	**Nonmetal**
Sulphur	16	**2,8,6**	Nonmetal
Chlorine	17	2,8,7	Nonmetal

Questions based on diagram

1. Draw electronic configuration diagram for:
i. Potassium
ii. Argon

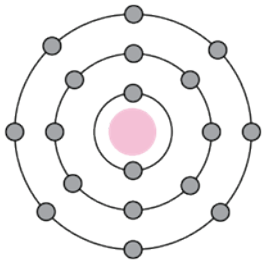
[1 Mark each]

Ans:
i.



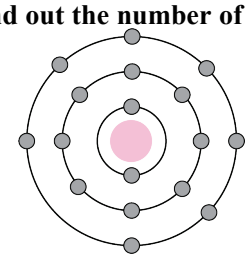
(Potassium)

ii.

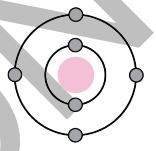


(Argon)

2. Find out the number of valence electrons and valency of the atoms represented in the following figures.
[1 Mark each]



(i)

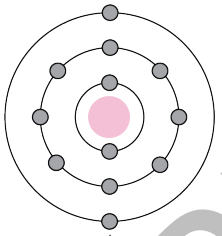


(ii)

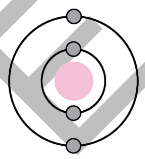
Ans: i. The number of valence electrons is 7.
∴ Valency = 1

ii. The number of valence electrons is 4.
∴ Valency = 4

3. Atoms of two different elements are represented in the following diagram. ***[3 Marks]***



A



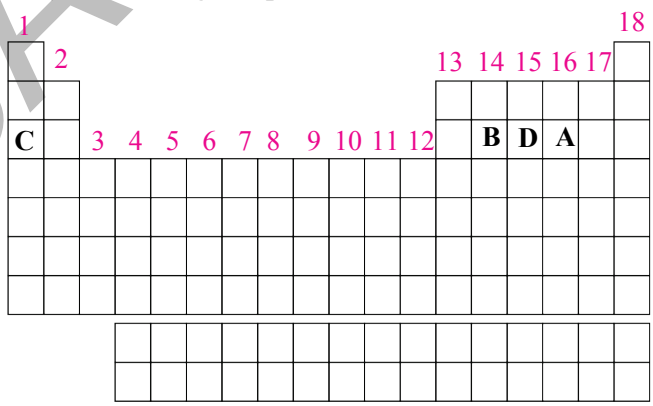
B

i. Identify elements A and B.
Ans: A is magnesium and B is beryllium.

ii. Do these elements belong to the same group? Justify your answer.
Ans: Yes, they belong to the same group as they have same number of valence electrons.

iii. Which element is more electropositive? Explain with reason.
Ans: Element A is more electropositive than element B. This is because electropositivity increases down the group with increase in atomic size.

4. Study the below given periodic table in which four elements are indicated by alphabets: A, B, C and D.
[3 Marks]



i. Which element is a metalloid? Name this element.

Ans: Element 'B' is a metalloid. It is silicon (Si).

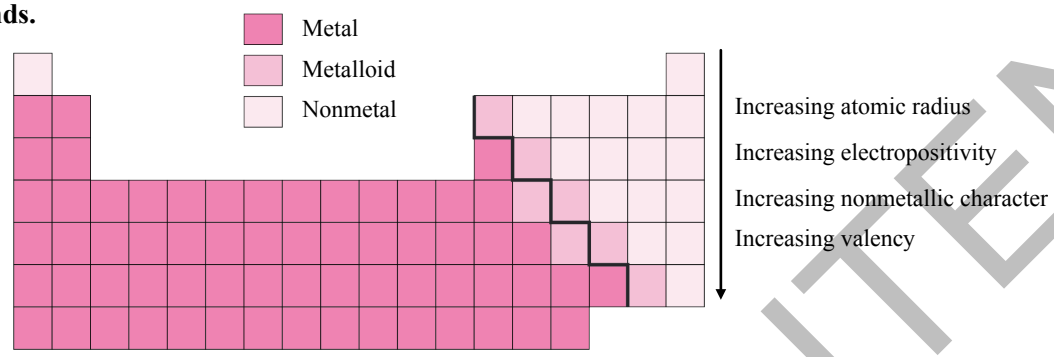
ii. Among 'C' and 'D' which element has larger atomic radius?

Ans: Element 'C' has larger atomic radius than element 'D'.

iii. Identify element 'A' and write its electronic configuration.

Ans: Element 'A' is sulphur (S). Its electronic configuration is (2, 8, 6).

5. Study the following periodic table. A student has marked two periodic trends incorrectly. Identify these trends. ***[1 Mark]***



Ans: The incorrectly marked periodic trend is nonmetallic character and valency.

Questions based on paragraph *[5 Marks]*

1. In the modern periodic table, the elements are arranged in the increasing order of their atomic numbers. This arrangement is based on the modern periodic law, which states that the properties of elements are a periodic function of their atomic numbers. In the modern periodic table, each column is called a group and each row is called a period. Elements within the same group show similarity and gradation in properties. This is due to the same number of electrons in the outermost shell.

Based on the above paragraph, answer the following questions:

i. State the law on which modern periodic table is based.

ii. How many groups are there in the modern periodic table?

iii. What is the number of valence electrons in an element of group 1 and group 18 respectively?

iv. What is the trend in the variation of valency while going down a group?

v. Which pair of elements do you think will have similar properties?

a. Sodium and Argon

b. Sodium and Potassium

c. Potassium and Neon

Ans:

i. The modern periodic table is based on the modern periodic law, which states that 'the properties of elements are a periodic function of their atomic numbers'.

ii. There are 18 groups in the modern periodic table.

iii. The number of valence electrons in an element of group 1 and group 18 are 1 and 8 respectively.

iv. While going down a group, the valency remains the same.

v. Sodium and potassium are alkali metals. They are placed in group 1 of the modern periodic table. Elements that are placed in the same group have similar properties. Hence, sodium and potassium will have similar properties.

2. In the following table, six elements A, B, C, D, E and F (here letters are not the usual symbols of the elements) of the modern periodic table with their atomic numbers are given.

3	4	5	6	7	8	9	10
A					E		G
11	12	13	14	15	16	17	18
B	C		D			F	

i. Which of these is an inert gas?

ii. Which of these is a halogen?

iii. Which of these are metals?

iv. If B combines with F, what would be the formula of the compound formed?

v. Write the electronic configuration of C and E.

Ans:

i. G is an inert gas (Neon) because its electronic configuration is (2, 8).

ii. F is a halogen (chlorine) because its atomic number is 17 and electronic configuration is (2, 8, 7).

iii. A, B and C are metals.

iv. B with atomic number 11 will have electronic configuration (2, 8, 1). It will lose one electron. F with atomic number 17 will have electronic configuration
(2, 8, 7). It will gain one electron.

∴ Compound formed will have formula BF.

v. Electronic configuration of C = (2, 8, 2) and that of E = (2, 6).

3. A scientist was studying reactions of metals and nonmetals. He knew group 1 and 2 elements are metals while group 17 elements are nonmetals. So, he chooses different elements from group 1, group 2 and group 17.

i. What is the valency of magnesium?

ii. Name the group 17 element which forms a diatomic molecule and exists in solid state at room temperature.

iii. Name the group 17 element which belongs to the same period as sodium.

iv. Write the formula of compound formed in the reaction between lithium and bromine.

v. Write the formula of compound formed in the reaction between calcium and fluorine.

Ans:

i. Magnesium is a group 2 element. Its valency is 2.

ii. Iodine is a group 17 element which forms I_2 and exists in solid state at room temperature.

iii. Sodium is placed in period 3. The group 17 element placed in period 3 is chlorine (Cl).

iv. Valency of Li is 1.

Valency of Br is 1.

∴ Formula of the compound is LiBr.

v. Valency of Ca is 2.

Valency of F is 1.

∴ Formula of the compound is CaF_2.

Apply your Knowledge

1. Can you recall? *(Textbook page no. 16)*

i. What are the types of matter?

Ans: The types of matter are pure substances (elements and compounds) and mixtures.

ii. What are the types of elements?

Ans: The types of elements are metals, nonmetals and metalloids.

iii. What are the smallest particles of matter called?

Ans: The smallest particle of matter is an atom.

*[**Note:** An atom consists of three main sub-atomic particles: electrons, protons and neutrons. Apart from these, an atom consists of several other sub-atomic particles like quarks, bosons, leptons, etc.]*

iv. What is the difference between the molecules of elements and compounds?

Ans: The molecules of an element are made of one or more atoms that are exactly alike whereas the molecules of compound are made up of atoms of different types.

2. Can you tell? *(Textbook page no. 16)*

Identify Dobereiner's triads from the following groups of elements having similar chemical properties.

i. Mg (24.3), Ca (40.1), Sr (87.6) **ii. S (32.1), Se (79.0), Te (127.6)**

iii. Be (9.0), Mg (24.3), Ca (40.1)

Ans: Dobereiner's triads are S (32.1), Se (79.0), Te (127.6) and Be (9.0), Mg (24.3), Ca (40.1).

Reading between the lines

- *Atomic mass of Ca* $= \frac{24.3+87.6}{2} = 55.95$

  However, actual atomic mass of Ca is 40.1. Hence, elements Mg, Ca and Sr do not form Dobereiner's triad.

- *Atomic mass of Se* $= \frac{32.1+127.6}{2} = 79.85 \approx 79$

  This is equal to the actual atomic mass of Se. Hence, elements S, Se and Te form a Dobereiner's triad.

- *Atomic mass of Mg* $= \frac{9.0+40.1}{2} = 24.55 \approx 24.3$

  This is equal to the actual atomic mass of Mg. Hence elements Be, Mg and Ca form a Dobereiner's triad.

3. Think about it. *(Textbook page no. 19)*

i. There are some vacant places in the Mendeleev's periodic table. In some of these places, the atomic masses are seen to be predicted. Enlist three of these predicted atomic masses along with their group and period.

Ans: Three of these predicted atomic masses along with their group and period are:

a. atomic mass = 44, group III and period 4

b. atomic mass = 68, group III and period 5

c. atomic mass = 72, group IV and period 5

ii. Due to uncertainty in the masses of some of the elements, a question mark is indicated before the symbol in the Mendeleev's periodic table. What are such symbols?

Ans:

No.	The symbols before which a question mark is indicated in Mendeleev's periodic table	Actual symbol and atomic mass of the element (based on modern periodic table)
a.	Yt = 88 placed in group III	Y = 88.906 placed in group 3
b.	Di = 138 placed in group III	La = 138.905 placed in group 3
c.	Ce = 140 placed in group IV	Ce = 140.116 placed in group 3 (lanthanide series)
d.	Er = 178 placed in group III	Lu = 174.967 placed group 3 (lanthanide series)
e.	La = 180 placed in group IV	Hf = 178.49 placed in group 4

4. Use your brain power! *(Textbook page no. 19)*

Chlorine has two isotopes, viz, Cl-35 and Cl-37. Their atomic masses are 35 and 37 respectively. Their chemical properties are same. Where should these be placed in Mendeleev's periodic table? In different places or in the same place?

Ans: The arrangement of elements in the Mendeleev's periodic table is done on the basis of atomic mass so that the elements having similar chemical properties are placed in the same group. Since the atomic masses of the isotopes of chorine are different but they have similar chemical properties, it would be difficult to assign them a proper position in Mendeleev's periodic table.

5. Use your brain power! *(Textbook page no. 20)*

i. Write the molecular formulae of oxides of the following elements by referring to the Mendeleev's periodic table: Na, Si, Ca, C, Rb, P, Ba, Cl, Sn

Ans:

Element	Molecular formula
Na	Na_2O
Si	SiO_2
Ca	CaO
C	CO_2
Rb	Rb_2O

Element	Molecular formula
P	P_2O_5
Ba	BaO
Cl	Cl_2O_7
Sn	SnO_2

ii. Write the molecular formulae of compounds of the following elements with hydrogen by referring to the Mendeleev's periodic table: C, S, Br, As, F, O, N, Cl

Ans:

Element	Molecular formula
C	CH_4
S	SH_2
Br	BrH
As	AsH_3

Element	Molecular formula
F	FH
O	OH_2
N	NH_3
Cl	ClH

6. Use your brain power! *(Textbook page no. 21)*

Position of the elements in the periodic table:

i. How is the problem regarding the position of cobalt (^{59}Co) and nickel (^{59}Ni) in Mendeleev's periodic table resolved in modern periodic table?

Ans: In Mendeleev's periodic table, the elements are arranged in the order of increasing atomic masses. So, there was an ambiguity regarding the sequence (or order) in which ^{59}Co and ^{59}Ni, having same whole number atomic mass, are placed. However, this problem was resolved in the modern periodic table. In the modern periodic table, the elements are arranged in the order of increasing atomic numbers. The atomic number of cobalt is 27 and that of nickel is 28. Thus, cobalt which has lower atomic number (27) is placed before nickel which has a higher atomic number (28).

ii. How did the position of $^{35}_{17}Cl$ and $^{37}_{17}Cl$ get fixed in the modern periodic table?

Ans: In the modern periodic table, the elements are arranged in the order of increasing atomic numbers. All the isotopes of an element have same atomic number. Therefore, isotopes $^{35}_{17}Cl$ and $^{37}_{17}Cl$ having same atomic number, which is equal to 17, will be placed at the same position in the modern periodic table.

iii. Can there be an element with atomic mass 53 or 54 in between the two elements, chromium $^{52}_{24}Cr$ and manganese $^{55}_{25}Mn$?

Ans: In the modern periodic table, the elements are arranged in the order of increasing atomic numbers. Each element differs from the successive element by 1 unit. Chromium $^{52}_{24}Cr$ having atomic number 24 and manganese $^{55}_{25}Mn$ having atomic number 25 differ from each other by 1 unit. Hence, there can be no element with atomic mass 53 or 54 in between the two elements, chromium $^{52}_{24}Cr$ and manganese $^{55}_{25}Mn$.

iv. What do you think? Should hydrogen be placed in group 17 of halogens or group 1 of alkali metals in the modern periodic table?

Ans: Hydrogen resembles alkali metals. It has one electron in its outermost shell like alkali metals. Its valency is 1 like alkali metals. It forms oxides (H_2O) similar to alkali metals (Na_2O). However, hydrogen also resembles halogens. It is a diatomic molecule (H_2) like halogens (F_2, Cl_2). It is one electron deficient to achieve stable electronic configuration similar to halogens. Due to this unique behaviour of hydrogen, it is difficult to assign any definite position to it in the periodic table.

7. Can you tell? ***(Textbook page no. 22)***

i. Go through the modern periodic table (Textbook page no. 23) and write the names one below the other of the elements of group 1.

Ans: Names of the elements of group 1:

Element	Hydrogen	Lithium	Sodium	Potassium	Rubidium	Cesium	Francium

ii. Write the electronic configuration of the first four elements in this group.

Ans: Electronic configuration of the first four elements in this group:

Element	Electronic configuration
Hydrogen	1
Lithium	2, 1

Element	Electronic configuration
Sodium	2, 8, 1
Potassium	2, 8, 8, 1

iii. Which similarity do you find in their configuration?

Ans: All the elements of group 1 have single electron in their outermost shell.

iv. How many valence electrons are there in each of these elements?

Ans: All the elements of group 1 have one valence electron.

***[Note:** Hydrogen is not considered as an alkali metals even though it is placed above lithium in the periodic table as it is not a metal.]*

8. Can you tell? ***(Textbook page no. 23)***

i. On going through the modern periodic table, it is seen that the elements Li, Be, B, C, N, O, F and Ne belong to the period 2. Write down electronic configuration of all of them.

Ans:

Element	Electronic configuration
Lithium (Li)	2, 1
Beryllium (Be)	2, 2
Boron (B)	2, 3
Carbon (C)	2, 4

Element	Electronic configuration
Nitrogen (N)	2, 5
Oxygen (O)	2, 6
Fluorine (F)	2, 7
Neon (Ne)	2, 8

ii. Is the number of valence electrons same for all these elements?

Ans: No, all these elements have different number of valence electrons.

iii. Is the number of shells the same in these?

Ans: Yes, all these elements have same number of shells (that is, K and L).

9. Intext Question. *(Textbook page no. 24)*

The elements in the third period, namely, Na, Mg, Al, Si, P, S, Cl and Ar have electrons in the three shells: K, L and M. Write down the electronic configuration of these elements and confirm.

Ans:

Element	Electronic configuration
Sodium (Na)	2, 8, 1
Magnesium (Mg)	2, 8, 2
Aluminium (Al)	2, 8, 3
Silicon (Si)	2, 8, 4

Element	Electronic configuration
Phosphorus (P)	2, 8, 5
Sulphur (S)	2, 8, 6
Chlorine (Cl)	2, 8, 7
Argon (Ar)	2, 8, 8

10. Can you recall? *(Textbook page no. 24)*

i. What are the values of 'n' for the shells K, L and M?

Ans:

Shell	K	L	M
Value of 'n'	1	2	3

ii. What is the maximum number of electrons that can be accommodated in a shell? Write formula.

Ans: The maximum number of electrons that can be accommodated in a shell depends on the value of 'n'. It can be calculated using the formula: $\mathbf{2n^2}$

iii. Deduce the maximum electron holding capacity of the shells K, L and M?

Ans:

Shell	Value of 'n'	$2n^2$	Electron capacity
K	1	2×1^2	2
L	2	2×2^2	8
M	3	2×3^2	18

11. Think about it. *(Textbook page no. 24)*

i. What is the relationship between the electronic configuration of an element and its valency?

Ans:

a. The valency of an element is determined by the number of electrons present in the outermost shell of its atoms, that is, the valence electrons.

b. From the electronic configuration of an element, the number of valence electrons can be determined.

c. For elements having 1 to 4 valence electrons, valency equals the number of valence electrons.

d. For elements having 5 to 8 valence electrons, valency equals [8 – (number of valence electrons)].

ii. The atomic number of beryllium is 4 while that of oxygen is 8. Write down the electronic configuration of the two and deduce their valency from the same.

Ans:

Element	Electronic configuration	Valence electrons	Valency
Beryllium (Be)	2, 2	2	2
Oxygen (O)	2, 6	6	8 – 6 = 2

iii. The table on Textbook page no. 25 is made on the basis of the modern periodic table. Write in it the electronic configuration of the first 20 elements below the symbol and write the valency below it.

Ans:

	1	2	13	14	15	16	17	18
1	$_{1}H$ 1 1							$_{2}He$ 2 0
2	$_{3}Li$ 2, 1 1	$_{4}Be$ 2, 2 2	$_{5}B$ 2, 3 3	$_{6}C$ 2, 4 4	$_{7}N$ 2, 5 3	$_{8}O$ 2, 6 2	$_{9}F$ 2, 7 1	$_{10}Ne$ 2, 8 0
3	$_{11}Na$ 2, 8, 1 1	$_{12}Mg$ 2, 8, 2 2	$_{13}Al$ 2, 8, 3 3	$_{14}Si$ 2, 8, 4 4	$_{15}P$ 2, 8, 5 3	$_{16}S$ 2, 8, 6 2	$_{17}Cl$ 2, 8, 7 1	$_{18}Ar$ 2, 8, 8 0
4	$_{19}K$ 2, 8, 8, 1 1	$_{20}Ca$ 2, 8, 8, 2 2						

iv. What is the periodic trend in the variation of valency while going from left to right within a period? Explain your answer with reference to period 2 and 3.

Ans:

	Element (Valency)							
Period 2	Li (1)	Be (2)	B (3)	C (4)	N (3)	O (2)	F (1)	Ne (0)
Period 3	Na (1)	Mg (2)	Al (3)	Si (4)	P (3)	S (2)	Cl (1)	Ar (0)

While going from left to right within a period, the valency first increases from 1 to 4 and then decreases to 0.

v. What is the periodic trend in the variation of valency while going down a group? Explain your answer with reference to the group 1, group 2 and group 18.

Ans:

	Group 1	Group 2	Group 18
Element (Valency)	Li (1)	Be (2)	He (0)
	Na (1)	Mg (2)	Ne (0)
	K (1)	Ca (2)	Ar (0)

While going down a group, the valency remains the same as the number of valence electrons remains the same.

12. Use your brain power! ***(Textbook page no. 25)***

Element	O	B	C	N	Be	Li
Atomic radius (pm)	66	88	77	74	111	152

i. By referring to the modern periodic table, find out the periods to which the above elements belong.

Ans: All the given elements lie in the period 2 of the periodic table.

ii. Arrange the above elements in a decreasing order of their atomic radii.

Ans: Li > Be > B > C > N > O

iii. Does this arrangement match with the pattern of the second period of the modern periodic table?

Ans: Yes. The arrangement of the elements as per the decreasing order of atomic radius matches with the second period of the modern periodic table.

iv. Which of the above elements have the biggest and the smallest atom?

Ans: Lithium (Li) has the biggest atom and oxygen (O) has the smallest atom.

v. What is the periodic trend observed in the variation of atomic radius while going from left to right within a period?

Ans: The atomic radius decreases while going from left to right within a period.

13. Use your brain power! ***(Textbook page no. 25)***

Element	K	Na	Rb	Cs	Li
Atomic radius (pm)	231	186	244	262	151

i. By referring to the modern periodic table, find out the groups to which the above elements belong.

Ans: All the given elements belong to group 1 of the modern periodic table.

ii. Arrange the above elements vertically downwards in an increasing order of atomic radii.

Ans:

Element	Li	Na	K	Rb	Cs

iii. Does this arrangement match with the pattern of the group 1 of the modern periodic table?

Ans: Yes. The arrangement of the elements as per the increasing order of atomic radius matches with the group 1 of the modern periodic table.

iv. Which of the above elements have the biggest and the smallest atom?

Ans: Cesium (Cs) has the biggest atom and lithium (Li) has the smallest atom.

v. What is the periodic trend observed in the variation of atomic radii down a group?

Ans: The atomic radius increases while moving down a group.

14. Use your brain power! ***(Textbook page no. 26)***

i. Look at the elements of third period. Classify them into metals and nonmetals.

Ans: The elements in the third period are Sodium (Na), Magnesium (Mg), Aluminium (Al), Silicon (Si), Phosphorus (P), Sulphur (S), Chlorine (Cl) and Argon (Ar). Out of these elements, Sodium (Na), Magnesium (Mg) and Aluminium (Al) which are to the left of the periodic table are metals and Phosphorus (P), Sulphur (S) and Chlorine (Cl) which are to the right of the periodic table are nonmetals.
[Note: *Silicon (Si) is a metalloid.****]***

ii. On which side of the period are the metals? Left or right?

Ans: Metals lie on the left side of the period.

iii. On which side of the period did you find the nonmetals?

Ans: Nonmetals lie on the right side of the period.

15. Internet my friend. ***(Textbook page no. 27)***
Collect information and mail it.

i. Inert gas elements **ii. Uses of various elements**

Ans:

i. Inert gas elements: There are seven elements that make up Group 18 of the periodic table. These elements are known as inert gas elements or noble gases. The elements are helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), radon (Rn) and oganesson (Og).
The noble gases are colourless and odourless.
They are chemically unreactive gases under standard conditions.
They are present in atmosphere in very trace amounts.
Radon and oganesson are radioactive.
Noble gases are able to diffuse through glass, rubber, some metals and plastic materials. This makes them difficult to handle in the laboratory.
Helium: It is the second most abundant element in the universe after hydrogen. It has the lowest boiling point of any substance known. It is used in balloons and to cool things.
Neon: It is used in advertising signs (neon lightings).
Argon: It is used in light bulbs.
Krypton: It is used in miner's cap lamps and in the signal lights on runways of airport.
Xenon: It is used in detection of mesons and gamma photons.
Radon: It is used in radiotherapy of cancer treatment.

ii. Uses of various elements:

a. Aluminium is widely used in vehicle and plane construction. It is used to make cans and utensils.

b. Antimony is often used in alloys with other metals to harden them. It is also used in flame-retardants, electronics and some pharmaceuticals.

c. Chlorine is a common oxidizing agent, meaning it readily accepts electrons from other atoms or molecules. Oxidation can kill microbes or whiten a substance, so for this reason, chlorine is commonly used as a bleach and disinfectant. It is also used in the chemical industry to cause reactions and form useful compounds, such as polyvinyl chloride (PVC).

d. Copper is widely used as a pure metal, most commonly in electrical wires and devices, construction and machinery. It is also often combined with other metals to form alloys, such as brass (with zinc), bronze (with tin).

e. Silicon is central to the electronics industry, because of its use as a semiconducting material in integrated circuits.

f. Zinc is used to galvanize steel and iron.

[Note: *Students can use the above information as reference and collect additional information about inert gas elements and uses of various elements on their own.****]***

***16. Project**
Find out the applications of all the inert gases, prepare a chart and display it in the class.

Ans: Uses of Helium:

i. Helium is light and non-combustible. Hence, it is used for filling balloons and air ships.
ii. It produces inert atmosphere in metallurgical operations and welding of metals.
iii. It is used for low temperature experiments.
iv. It is used in gas cooled nuclear reactors.
v. It is used in powerful super-conducting magnets which are used in NMR spectrometers and Magnetic Resonance Imaging (MRI) systems for clinical diagnosis.
vi. Helium-oxygen mixture is used in the treatment of asthma and for the respiration in deep sea diving. Under high pressure, helium is less soluble in blood than nitrogen.

Uses of Neon:

i. Neon bulbs are used in botanical gardens and in green houses.

ii. Neon lights are glass tubes filled with neon or mixture of neon and other gases at about 2mm pressure. They glow on electric discharge. They are attractive and have a great penetrating power in mist and fog. When the composition of gaseous mixture and the colour of tube is changed, various shades of neon light are observed.

iii. Neon is used in warning signals, spark plug and in television sets.

iv. Neon is used in safety devices, voltage stabilizers and rectifiers.

Uses of Argon:

i. It is used in incandescent and fluorescent discharge lamps.

ii. It provides inert atmosphere for welding and metallurgical processes (are welding of metals or alloys).

iii. It is used in gas chromatography.

iv. It is used in handling of air sensitive substances in laboratory.

v. Along with neon, it is used in neon lamps.

Uses of Krypton:

i. It is used in electric bulbs, discharge tubes and high efficiency miner's cap lamps.

ii. ^{85}Kr is used in the measurement of thickness sheets of metals and plastics.

iii. It is used in the preparation of krypton atomic lamp used in cosmic ray instruments.

iv. During electric discharge, it produces bright white light. Hence, it is used in the signal lights on runways of airport.

Uses of Xenon:

i. Along with krypton, it is used in flash bulbs which are used in high speed photography.

ii. Liquid xenon is used in detection of mesons and gamma photons.

Uses of Radon:

i. It is used in radiotherapy for cancer treatment.

ii. It is used in research in radioactivity.

iii. It is used in photographing the interior of steel castings and other opaque materials.

***[Note:** Students can use the above information as reference and find out additional information about the applications of inert gases on their own.]*

Memory Maps

Elements

Arranged or grouped on the basis of their properties as

Dobereiner's triads

- Dobereiner classified the existing elements in a tabular form by placing three elements having similar properties in a group called triad.
- Atomic mass of the middle element in the triad is approximately the mean of the atomic masses of other two elements.

Limitations led to →

Newlands' octaves

- Newlands arranged all the 56 existing elements at that time in an increasing order of their atomic masses.
- Every eighth element had properties similar to that of the first.

Modified to →

Mendeleev's Periodic Table

- Mendeleev arranged all the 63 known elements in an increasing order of their atomic masses and showed the repetition of chemical and physical properties of elements after certain intervals.

Research led to →

Modern Periodic Table

- Henry Moseley arranged elements in an increasing order of their atomic numbers and showed that the atomic number of an element is a more fundamental property than its atomic mass.
- There are 7 periods and 18 groups.
- There are total 118 elements in the modern periodic table.

Periodic trend	Across a period (from left to right)	In a group (on moving down)
Valence electrons	increases from 1 to 8	remains same
Valency	increases from 1 to 4 then decreases from 4 to 0	remains same
Atomic size (atomic radius)	decreases (except noble gases)	increases
Metallic character	decreases	increases
Nonmetallic character	increases	decreases
Electropositivity	decreases	increases
Electronegativity	increases	decreases

Chapter Assessment

[Total Marks: 25]

Q.1. (A) Answer the following. **[5]**

i. Fill in the blank.
Newlands' law of octaves was found to be applicable only up to _____.

ii. Identify the odd one out and justify.
Si, Ge, As, Ga

iii. Name the following.
The family name of the group 17 elements.

iv. Right or wrong. If wrong, write the correct sentence.
Calcium reacts with water to form calcium hydroxide and oxygen gas.

v. Match the following elements given in Column 'A' with its position in the modern periodic table given in Column 'B'.

	Column 'A'		Column 'B'
a.	Phosphorus	1.	Group 1 and period 1
b.	Helium	2.	Group 18 and period 1
		3.	Group 15 and period 2
		4.	Group 15 and period 3

(B) Choose the correct alternative. **[3]**

i. A student arranges elements in increasing order of nonmetallic character. Which of the following represents a correct order?
(A) B < N < F (B) P < Si < S (C) O < N < C (D) C < F < N

ii. The formula of chloride of metal M is MCl. The metal M belongs to _____.
(A) group 1 (B) group 2 (C) group 13 (D) group 14

iii. Suresh identifies three nonmetals with same valency using modern periodic table. Which set is the correct one?
(A) Fluorine, bromine, sulphur (B) Nitrogen, bromine, iodine
(C) Nitrogen, phosphorus, sulphur (D) Fluorine, bromine, iodine

Q.2. Answer the following (any three). **[6]**

i. Write the electronic configuration of the following elements.
a. Chlorine b. Aluminium

ii. Give the demerits of Mendeleev's periodic table.

iii. Atomic size of carbon is less than that of boron. Explain the statement with reason.

iv. 'A' and 'B' are atoms of two elements belonging to period 2. 'A' is in group 14 and 'B' is in group 17.
a. Identify elements 'A' and 'B'. b. Which one is more electronegative?

Q.3. Answer the following (any two). **[6]**

i. The atomic masses of three elements A, B and C having similar chemical properties are 7, 23 and 39 respectively.

a. Calculate the average atomic mass of element B according to Dobereiner's triads.

b. Compare the average atomic mass of B with its atomic mass.

c. What could the elements A, B and C be?

ii. The elements $_4Be$, $_{12}Mg$ and $_{20}Ca$, each having two valence electrons in their valence shells, are in periods 2, 3 and 4 respectively of the modern periodic table. Answer the following questions associated with these elements, giving reason in each case:

a. In which group should they be placed?

b. Which one of them is the least reactive?

c. Which one of them has the largest atomic size?

iii. Select the appropriate options and complete the following paragraph.
(metals, nonmetals, metalloids, four, seven, s-block, p-block, d-block, f-block)
On the basis of electronic configuration, elements in the modern periodic table are classified into _____ blocks. Groups 1 and 2 elements are included in _____ and all these elements are metals (except hydrogen). Groups 13 to 18 elements are included in _____. This block contains metals, nonmetals and metalloids. Groups 3 to 12 elements are included in _____ and all these elements are _____. Elements shown at the bottom of the periodic table i.e., lanthanides and actinides constitute _____ and all these elements are metals.

Q.4. Answer the following (any one). **[5]**

i. A part of periodic table is shown in the adjacent figure.

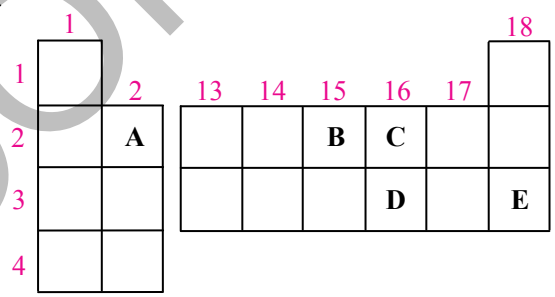
a. Write the symbol of the element 'B'.

b. Will elements 'C' and 'D' have same number of valence electrons?

c. Arrange elements 'A', 'B' and 'C' in increasing order of their metallic character.

d. What is the number of electrons in L shell of element 'E'?

e. Name any two elements that will have properties similar to that of element 'A'.



ii. Mendeleev predicted the existence of certain elements not known at that time. He named two of these elements as eka-aluminium and eka-silicon.

a. Name the elements which have taken the place of these elements.

b. Mention the group and period of these elements in the modern periodic table.

c. Which one of these two elements is a metalloid?

d. How many valence electrons are present in eka-silicon?

e. Eka-aluminium forms a chloride. What is its formula?

Answers

Q.1. (A)

i. Newlands' law of octaves was found to be applicable only up to **calcium.**

ii. Ga,
Gallium (Ga) is metal while others are metalloids.

iii. Halogens

iv. Wrong
Calcium reacts with water to form calcium hydroxide and hydrogen gas.

v.

	Column 'A'		Column 'B'
a.	Phosphorus	4.	Group 15 and period 3
b.	Helium	2.	Group 18 and period 1

(B)

i. (A) B < N < F

ii. (A) group 1

iii. (D) Fluorine, bromine, iodine

Q.2.

i.

Element	Electronic configuration
Chlorine	2, 8, 7
Aluminium	2, 8, 3

ii. *Refer Answer the following Q.10.*

iii. a. Carbon and boron belongs to the same period, with boron being placed before carbon.
b. While going from left to right in a period, the positive charge on the nucleus increases while the electrons get added in the same outermost shell.
c. This increases effective nuclear charge and the electrons are attracted much closer to the nucleus in case of carbon as compared to boron. Hence, atomic size of carbon is less than that of boron.

iv. a. Element 'A' is carbon.
Element 'B' is fluorine.
b. While going from left to right in a period, electronegativity increases. Element 'A' is placed before element 'B' in the same period. Hence, element 'B' is more electronegative than element 'A'.

Q.3.

i. a. Average atomic mass of B = $\frac{7+39}{2} = \frac{46}{2} = 23$
b. Average atomic mass of B calculated from the atomic masses of A and C is equal to the given atomic mass of B.
c. A-Lithium, B-Sodium, C-Potassium

ii. a. Given 3 elements have 2 valence electrons. Hence, they should be placed in group 2.
b. The chemical reactivity of group 2 metals increases from top to bottom in a group.
Be, Mg and Ca belong to 2nd, 3rd, and 4th period respectively. Hence, Be is the least reactive.
c. The atomic size of elements increases from top to bottom in a group and Be, Mg and Ca belong to 2nd, 3rd, and 4th period respectively. Hence, Ca has the largest atomic size.

iii. On the basis of electronic configuration, elements in the modern periodic table are classified into <u>four</u> blocks. Groups 1 and 2 elements are included in <u>s-block</u> and all these elements are metals (except hydrogen). Groups 13 to 18 elements are included in <u>p-block</u>. This block contains metals, nonmetals and metalloids. Groups 3 to 12 elements are included in <u>d-block</u> and all these elements are <u>metals</u>. Elements shown at the bottom of the periodic table i.e., lanthanides and actinides constitute <u>f-block</u> and all these elements are metals.

Q.4.

i. a. The symbol of element 'B' is $_7N$.
b. Yes, elements 'C' and 'D' belong to same group, so the number of valence electrons is same in both (i.e., 6).
c. The elements in increasing order of their metallic character is: C < B < A.
d. The electronic configuration of element 'E' is (2, 8, 8). Therefore, the number of electrons in L shell is 8.
e. Magnesium and calcium will have properties similar to that of element 'A'.

ii. a. Eka-aluminium is gallium (Ga) and eka-silicon is germanium (Ge).
b. Ga-group 13, period 4
Ge-group 14, period 4
c. Eka-silicon i.e., Germanium is a metalloid.
d. The number of valence electrons in eka-silicon is 4.
e. The valency of Ga (i.e., eka-aluminium) is 3 as it belongs to group 13. The valency of Cl is 1. Hence, the formula of chloride will be $GaCl_3$.

Std.X

AVAILABLE SUBJECTS:

- English Kumarbharati
- हिंदी लोकभारती
- हिंदी लोकवाणी
- मराठी अक्षरभारती
- आमोदः (सम्पूर्ण संस्कृतम्)
- आनन्दः (संयुक्त संस्कृतम्)
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