

- Q1.** What is meant by classification of elements?
- Q2.** Why do Li, Na and K show resemblance on the basis of Döbereiner's law of triads?
- Q3.** State Newland's Law of Octaves.
- Q4.** A, B and C are elements of Döbereiner's triad. if the atomic mass of A is 7 and that of C is 23, what will be the atomic mass of B.
- Q5.** Classify the following elements into groups of triads
Cl, Ca, Ba, Sr, K, Li, Br, I, Na.
- Q6.** Na and K resemble in their properties, how many elements are there between them?
- Q7.** What is meant by periodicity of properties?
- Q8.** Write two reasons responsible for late discovery of noble gases.
- Q9.** State Mendeléev's Law.
- Q10.** Mendeléev classified the elements on the basis of two factors. What were these two factors?
- Q11.** Name three elements discovered after Mendeléev gave his Periodic Table.
- Q12.** What is meant by 'groups of Periodic Table'?
- Q13.** Write valency and usual number of electrons of group 18 of the periodic table.
- Q14.** How many horizontal rows are there in the Modern Periodic Table and what are they called?
- Q15.** Mention the common name given to the following elements:
Boron, Silicon, Germanium, Arsenic, Antimony.
State one property that justifies their name
- Q16.** Size of sodium atom is bigger than that of hydrogen atom. Why?
- Q17.** Elements A, B, C and D have atomic numbers 1, 8, 11 and 19 respectively. Choose the odd element and give reasons for your answer.
- Q18.** Name the element which has twice as many electrons in its second shell as in its first shell. Write its electronic configuration also.
- Q19.** State periodic law on which the Modern Periodic Table is based.
- Q20.** Name two elements whose valencies are equal to their group number.
- Q21.** What are the elements of group 1 and group 17?
- Q22.** Which one has the bigger size?
Na(11) or Cl(17), Cl(17) or F(9)
- Q23.** An Element B belongs to the second period and group 13. Give the formula of the oxide.

Q24. Calcium, magnesium and strontium have been put together in the same group of Periodic Table on the basis of their similar chemical properties.

- (a) Mention those properties. (Any two)
- (b) Out of the three elements, which one will have atoms of biggest size and why?

Q25. The elements of the third period of the periodic table are given below:

Group → Period ↓	I	II	III	IV	V	VI	VII
3	Na	Mg	Al	Si	P	S	Cl

- (a) Which is more non-metallic, S or Cl?
- (b) Which has higher atomic mass, Al or Cl?

Q26. Magnesium oxide is MgO , magnesium hydroxide is $Mg(OH)_2$ and magnesium sulphate is $MgSO_4$. What would be the formulae of barium oxide, barium hydroxide and barium sulphate if barium belongs to the same group, as magnesium?

Q27. Account for the following:

- (a) Noble gases are placed in a separate group.
- (b) All the elements of the same group have similar chemical properties.

Q28. The atomic radii of three elements *A*, *B* and *C* of the Periodic Table are 186 pm, 104 pm and 143 pm respectively. Giving a reason, arrange these elements in the increasing order of atomic numbers in the period.

Q29. An element *X* belongs to 13th group of the Periodic Table. Find its valency. What will be the formula of its sulphate?

Q30. Why is position assigned to hydrogen in the Periodic Table considered anomalous?

Q31. Some of the elements and their atomic numbers are given in the table.

- (a) How many valence electrons are there in the element *R*?
- (b) What is the valency of *P*?
- (c) Write the chemical formula of the compound formed by combining the elements *P* and *Q*.
- (d) Out of the two elements *P* and *S*, which one is larger in size?

Element	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>
Atomic number	3	17	13	11

Q32. The elements of the second period of the Periodic Table are given below:

Li Be B C N O F

- (a) Give reason to explain why atomic radii decrease from Li to F.
- (b) Identify the most (i) metallic and (ii) non-metallic element.

Q33. Give the symbol for

- (a) a metal of group 2
- (b) a metal of group 13
- (c) two non-metals of group 16
- (d) most reactive non-metal of group 17.

Q34. Why does atomic size progressively become smaller (atomic radius decreases from Na to Cl)?

Q35. Calcium is an element with atomic number 20.

- (a) Is it a metal or a non-metal?
- (b) Is it more reactive than Mg or less reactive?
- (c) What will be its valency?
- (d) What would be the formula of its chloride?

Q36. Why does silicon have valency 4 and chlorine 1?

Q37. Explain why atomic number is more important than atomic mass in determining chemical properties.

Q38. Consider the following arrangement of elements:

1	2	13	14	15	16	17	18
Lithium			Carbon		Oxygen	L	Neon
X			S		G	Q	
Y						R	
Z						T	

- (a) Which is the most reactive metal? (b) Which is the most reactive non-metal?
(c) Name the family of L, Q, R, T. (d) Name one element each from the groups 2, 13, 15.

Q39. An element with atomic number 3 combines with another element with atomic number 17. What would be the formula of the compound?

Q40. This question refers to the elements of periodic table with atomic numbers 3 to 18.

- (a) Which of them are noble gases? (b) Which of them are halogens?
(c) Which of them are alkali metals? (d) Which are the elements with valence 4?

Q41. An element A reacts with oxygen to form A_2O .

- (a) State the number of electrons in the outermost orbit of A.
(b) To which group of the periodic table does A belong?
(c) State whether A is a metal or a non-metal.

Q42. Using this Table, explain why: (a) Li and Na are considered as active metals, (b) Atomic size of Mg is less than that of Na, and (c) Fluorine is more reactive than chlorine.

Q43. Four elements P, Q, R and S have atomic numbers 12, 13, 14, and 15 respectively. Answer the following questions giving reasons:

- (a) What is the valency of Q?
(b) Classify these elements as metals and non-metals.
(c) Which of these elements will form the most basic oxide?

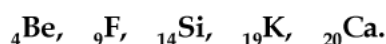
Q44. Fill in the missing elements in the following table which is a part of the Periodic Table:

	C	N			
Al		P		Cl	
Ga	Ge		Se		Kr

Q45. The elements of the second period of the Periodic Table are given below:

- (a) Give reason to explain why atomic radius decreases from Li to F.
(b) Identify the most metallic and non-metallic elements.
(c) How does valency change from Li to Ne?

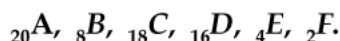
Q46. Given below are some elements of the Modern Periodic Table:



- (a) Select the element that has one electron in the outermost shell and write its electronic configuration.
(b) Select two elements that belong to the same group. Give reasons for your answer.
(c) Select two elements that belong to the same period. Which one of the two has bigger atomic size?

- Q47.** (a) How many elements are known till date?
 (b) List the triads that Döbereiner could identify?
 (c) Which scientist believed that no more elements will be discovered in future?
 (d) What was the nationality of MendeléeV? In which year was his Periodic Table published?
 (e) How many periods and groups are there in the Modern Periodic Table?
- Q48.** (a) How do we classify elements?
 (b) What were the two criteria used by MendeléeV creating his Periodic Table?
 (c) Why did MendeléeV leave some gaps in this periodic Table?
 (d) In MendeléeV's Periodic Table, why was there no mention of noble gases like helium, neon and argon?
 (e) Would you place the two isotopes of chlorine, Cl-35 and Cl-37 in different slots because of their different atomic masses or in the same slot because of their chemical properties are the same? Justify your answer.
- Q49.** (a) Why do we classify elements?
 (b) What are the two criteria used in the development of Modern Periodic Table?
 (c) State the position of (i) metals (ii) non-metals and (iii) metalloids in the Periodic Table.
 (d) Would you place two isotopes of Cl-35 and Cl-37 in different slots of the Periodic Table because of their different atomic masses or in the same slot because their chemical properties are same? Justify your answer.

Q50. Consider the following elements:



Answer the following giving reasons.

Which of the above elements you would expect to be

- (a) very stable.
 (b) in group 2 of the periodic table.
 (c) in group 16 of the periodic table.
 (d) What type of bond will be formed when the element A reacts with B? Explain.
- Q51.** (a) What is Modern Periodic Law?
 (b) Atomic masses of nickel and cobalt are respectively 58.7 and 58.9. Which of them should appear first in the Periodic Table?
 (c) In which groups of the Periodic Table are the elements germanium and strontium present?
 (d) What is meant by the Law of Octaves?
 (e) Which has the bigger size:
 (i) out of chlorine and bromine? (ii) out of sodium and magnesium?

- S1.** Arrangement of the known elements in an order so that these can be studied easily and properly is called classification.
- S2.** Atomic mass of the middle element Na is the average of sums of atomic masses of Li and K.
- S3.** If the elements are arranged in order of increasing atomic masses, the eighth elements has the similar properties as the first element.
- S4.** Atomic mass of B = $\frac{7 + 23}{2} = \frac{30}{2} = 15$.
- S5.** Cl Li Ca
Br Na Sr
I K Ba
- S6.** Eight.
- S7.** Repetition of properties after a certain interval is called periodicity of properties.
- S8.** (a) They are present in very low concentration.
(b) They have no tendency to react.
- S9.** Properties of elements are a periodic function of atomic mass.
- S10.** 1. Atomic mass.
2. Physical and chemical properties.
- S11.** Scandium, gallium and germanium.
- S12.** Vertical columns in the Periodic Table are called groups.
- S13.** Valency = 0
No. of electrons = 8.
- S14.** There are seven horizontal rows.
They are called periods.
- S15.** They are called metalloids.
They show the properties of metals as well as non-metals.
- S16.** Hydrogen atom contains one shell while sodium contains three shells. Atomic size increases with the number of shells.
- S17.** Element B is odd element.
Element A, C and D belong to group 1 because they have 1 electron in the outermost shell. Element B does not belong to this group as this has 6 electrons in the valence shell.
- S18.** The element is carbon.
It has a total number of 6 electrons, 2 in the first shell and 4 in the second shell. Electronic configuration:

K L
2 4

- S19.** Properties of an element are periodic function of atomic number.
- S20.** Na and Mg have valencies equal to their group numbers.
- S21.** Group 1: Li, Na, K, Rb, Cs, Fr
Group 17: F, Cl, Br, I, At
- S22.** Out of Na (11) and Cl (17), sodium has bigger size.
Out of Cl (17) and F (9), chlorine has bigger size.
- S23.** An element in group 13 has three electrons in the outermost shell. Thus, it has a valency of three. Therefore, the formula of the oxide is B_2O_3 .
- S24.** (a) (i) They show metallic properties. (ii) Their oxides are basic in nature.
(b) Strontium has atoms of biggest size. As we move down in the group, atomic size increases.
- S25.** (a) On moving from left to right, nuclear charge increases. The nucleus pulls the electrons with greater force and the tendency to lose the electrons decreases. In other words, tendency to gain electrons increases. Thus, non-metallic character increases. Thus, Cl is more non-metallic than S.
(b) The elements are arranged in increasing order of atomic mass from left to right in a period. Therefore, Cl has a higher atomic mass than Al.
- S26.** As barium and magnesium belong to the same group, barium has the same valency as magnesium. But the valency of magnesium is indicated to be two from the formulae of its compounds given in the question. Therefore, valency of barium is also two. The formulae of barium oxide, barium hydroxide and barium sulphate respectively are:
- $$BaO, Ba(OH)_2 \text{ and } BaSO_4.$$
- S27.** (a) Noble gases were discovered later. Therefore, without disturbing the rest of the Periodic Table, they were placed in a separate group.
(b) Properties of an element depend upon the number of valence electrons. Elements in a group possess the same number of valence electrons. Therefore, they have similar chemical properties.
- S28.** The increasing order of atomic numbers is: $A < C < B$.
As we move from left to right in the Periodic Table, the atomic number increases but the atomic radius decreases. Thus, atomic number changes inversely as the atomic radius.
- S29.** The element X belong to group 13. Therefore, valency of
 $X = 13 - 10 = 3$
Formula of sulphate: $X_2(SO_4)_3$.
- S30.** Hydrogen can lose one electron like alkali metals to form H^+ ion. It can also gain one electron like halogens to form H^- (hydride) ion. It occurs as diatomic H_2 like halogens. Thus, it shows the properties of both alkali metals and halogens. Hence, its position in the Periodic Table is anomalous.
- S31.** (a) Electronic configuration of R is: L L M
2 8 3
Thus, there are 3 valence electrons in R.
(b) Electronic configuration of P is: K L
2 1
Therefore, valency of P is one.
(c) P has one electron and Q has 7 electrons in the valence shell. Therefore, formula of the compound will be PQ.
(d) S has greater number of shells, therefore, it is larger in size than P.

- S32.** (a) As we move from left to right in a period in the Periodic Table, Nuclear charge increases. The nucleus tends to pull the electrons with a greater force, thus, decreasing the size of the atom. That is the reason the atomic size decreases in moving from Li to F.
- (b) Metallic character decreases and non-metallic character increases on moving from left to right in a period. Therefore, Li is the most metallic element and F is the most non-metallic element.
- S33.** (a) Magnesium, Mg (b) Aluminium, Al
(c) Oxygen, O and Sulphur, S (d) Fluorine, F
- S34.** This is because effective nuclear charge increases in a period. The nucleus attracts the electrons with a greater force towards itself as we move from left to right. Therefore, atomic size progressively becomes smaller.
- S35.** (a) Calcium is a metal because it lies on the left hand side of the periodic table.
(b) It is more reactive than magnesium.
(c) It has a valency of two (Electronic configuration 2, 8, 8, 2).
(d) Formula of chloride of calcium is CaCl_2 .
- S36.** Silicon has electronic configuration 2, 8, 4. As there are 4 electrons in the outermost shell, its valency is 4. Chlorine has electronic configuration 2, 8, 7. It has 7 electrons in the outermost shell. As it requires a large amount of energy to remove 7 electrons, it completes its octet by gaining 1 electron. Hence, its valency is 1.
- S37.** Chemical reactions depend upon the type of bonding in the reactants which, in turn, depends upon the number of electrons in the outermost shell. The number of electrons in the outermost shell is given by atomic number. Therefore, atomic number is more important than atomic mass in determining chemical properties.
- S38.** (a) Z is the most reactive metal. (b) L is the most reactive non-metal.
(c) Halogens. (d) Magnesium is an element of group 2.
Boron is an element of group 13.
Phosphorous is an element of group 15.
- S39.** The element with atomic number 3 has a configuration 2, 1. Thus, it has a valency of 1. The element with atomic number 17 has the electronic configuration 2, 8, 7. It will gain one electron to complete the octet. Thus, it has a valency 1, too. The elements with atomic numbers 3 and 17 are lithium and chlorine respectively. The formula of the compound formed will be LiCl.
- S40.** (a) Elements with atomic numbers 10 and 18 are noble gases.
(b) Elements with atomic numbers 9 and 17 are halogens.
(c) Elements with atomic numbers 3 and 11 are alkali metals.
(d) Elements with atomic numbers 6 and 14 have valency 4.
- S41.** (a) As the valency of oxygen is 2, the valency of A must be 1 in order to obtain the compound A_2O . Therefore, the number of electrons in the outermost orbit of A is 1.
(b) A belongs to group 1 of the periodic table. Elements of this group have 1 electron in the outermost orbit.
(c) A is a metal. Elements of group 1 having 1 electron in the outermost orbit have a tendency to lose electrons.
- S42.** (a) Li and Na have one electron in the valence shell. Both these elements have a tendency to lose this electron in order to gain stability. Hence, Li and Na are considered as active metals.
(b) As we move from left to right in a period, effective nuclear charge increases. The nucleus pulls the valence electrons with a greater force. The size of the atom, therefore, decreases on going from left to right in a period. That is why atomic size of Mg is less than that of Na.
(c) Fluorine being smaller in size can hold the electron gained more easily than chlorine. Therefore, fluorine is more reactive than chlorine.

- S43.** (a) *Q* has atomic number 13. Thus, it has electronic configuration 2, 8, 3. Therefore, its valency is 3.
 (b) Elements *P* and *Q* have 2 and 3 electrons respectively in the valence shell. They will have a tendency to lose electrons and are therefore metals. Elements *R* and *S* have 4 and 5 electrons respectively in their valence shell. They will have tendency to gain or share the electrons to complete the octet. Therefore, *R* and *S* are non-metals.
 (c) *P* will form the most basic oxide. Only the metals form basic oxide and *P* is more metallic than *Q*.

S44. The completed Table can be written as:

B	C	N	O	F	Ne
Al	Si	P	S	Cl	Ar
Ga	Ge	As	Se	Br	Kr

- S45.** (a) Nuclear charge increases as we move from Li to Ne. Increased nuclear charge pulls the electrons closer to the nucleus. Therefore, atomic radius decreases from Li to F.
 (b) As we move from left to right, the number of electrons in the outermost orbit increases. Thus, tendency to lose electrons decreases from Li to Ne. Therefore Li is most metallic and F is most non-metallic, Ne being inert.
 (c) Valency increases from 1 to 4 for Li, Be, B and C and

$$\text{Valency of N} = 8 - 5 = 3$$

$$\text{Valency of O} = 8 - 6 = 2$$

$$\text{Valency of F} = 8 - 7 = 1$$

$$\text{Valency of Ne} = 8 - 8 = 0$$

- S46.** (a) ${}_{19}\text{K}$ has one electron in the outermost shell.
 Electronic configuration 2, 8, 8, 1.
 (b) ${}_{4}\text{Be}$ and ${}_{20}\text{Ca}$ belong to the same group because both of them have two electrons in the valence shell.
 (c) ${}_{19}\text{K}$ and ${}_{20}\text{Ca}$ belong to the same period because both of them have four shells.

- S47.** (a) 114 elements are known till date
 (b) Triads identified by Dobereiner are:

Li	Ca	Cl
Na	Sr	Br
K	Ba	I

- (c) John Newlands.
 (d) Mendeleev was a Russian. His Periodic Table was published in the year 1872.
 (e) There are 7 periods and 18 groups in the Modern Periodic Table.
S48. (a) We classify elements according to their properties so that we may obtain an orderly arrangement of elements and may study such a large number of elements with ease.
 (b) Two criteria used by Mendeleev in creating his Periodic Table are: (i) Atomic mass of the element, (ii) Similarity in Physical and Chemical properties.
 (c) Mendeleev believed that certain more elements existed but were not discovered till that time. He left some gaps in his periodic table so that these could be filled with elements discovered later.
 (d) Noble gases like helium, neon and argon were not discovered till that time.
 (e) Isotopes of chlorine, Cl-35 and Cl-37 will be placed in the same slot because their chemical properties are same. Electronic configuration and atomic number of the isotopes are the same. According to the Modern Periodic Law, elements are arranged in order of their atomic numbers.

- S49.** (a) We classify elements in order to study their properties properly by grouping together elements having similar properties.
- (b) The two criteria used in the development of Modern Periodic Table are atomic number and the number of electrons in the outermost shell.
- (c) Metals are located on the left hand side of the periodic table while non-metals are located on the right hand side of the table. Metalloids are located in between the two.
- (d) The two isotopes of chlorine would be placed at the same position (slot) because the valence electrons and chemical properties are the same for the two isotopes.
- S50.** (a) ${}_2F$ and ${}_{18}C$ are very stable elements because they contain 2 (Duplet) and 8 (Octet) electrons in the outermost shell.
- (b) Elements ${}_4E$ and ${}_{20}A$ are in group 2 of the periodic table because E has the electronic configuration 2, 2 and A has electronic configuration 2, 8, 8, 2. Both have two electrons in the outermost shell.
- (c) ${}_8B$ and ${}_{16}D$ occupy group 16 of the periodic table. Both contain 6 electrons in the outermost shell.
- (d) A and B will react to form AB with an ionic bond. A will donate two electrons to B to form the compound.
- S51.** (a) Properties of an element are a periodic function of atomic number.
- (b) According to atomic mass, Ni should be placed first and Co should appear after that. But they are not placed like this.
- (c) Germanium is present in group 14.
Strontium is present in group 2.
- (d) When the elements are arranged in order of atomic masses, every eighth elements has properties similar to that of the first.
- (e) (i) Out of chlorine and bromine, bromine is bigger size. This is because chlorine has three filled shells of electrons while bromine has four shells.
- (ii) Out of Na and Mg, Na is bigger. This is because the nuclear charge on Mg is more. It pulls the electrons towards itself with a bigger force, reducing its size.