

CBSE Class 10 Science
Important Questions
Chapter 5
Periodic Classification of Elements

3 Marks Questions

1. Calcium is an element with $Z = 20$

(a) Is it a metal or a non-metal?

(b) Will its size be bigger or smaller than that of potassium?

(c) write the formula of its chloride

Ans. $Z = 20$ is 2, 8, 8, 2

(i) It is a metal which has two valence electrons it is present in group 2

(ii) Both potassium (K) and calcium (Ca) are present in fourth period. Since atomic size decreases along a period calcium is smaller in size.

(iii) The valency of calcium is 2 and its formula.

2. (a) Name the elements present in the third period and classify them into metals and non-metals.

(b) On which side of the table do you find the metals?

(c) On which side of the table do you find the non-metals?

Ans. (a) The elements are

Na, Mg, Al, Si, P, S, Cl, Ar

(b) The metals are placed mostly on the left side of the table.

(c) The non-metals are placed on the right side of the table.

3. Table is a part of periodic table

H							He
Li	BE	B	C	N	O	F	Ne
Na	MG	Al	Si	P	S	Cl	Ar

Use this table and explain why

(a) Li and Na are considered as active metals

(b) Atomic size of Mg is less Than that of Na

(c) Fluorine is more reactive than chlorine.

Ans. (a) Both Li and Na are active elements since their atoms have only one electron in their valence shells. They readily lose this electron to have the configuration of the nearest noble gas element.

(b) Mg is placed after Na is the same period (third). As the atomic size decreases along a period, the size decreases along a period. The size of Mg is less than that of Na.

(c) Both F and Cl belong to Group 17. Since fluorine is more electronegative than chlorine, it is therefore more reactive also.

4. Write two major shortcomings of Mendeleev's periodic table? How have these been removed in the modern periodic table?

Ans. The two major short comings of Mendeleev's periodic table were

(i) It could not justify the position of hydrogen is the periodic table

(ii) It could not assign proper position to the different isotopes of the same element

The main reason for these short comings was the basis of the Mendeleev's periodic table. It regarded atomic masses of the elements as the basis of classification. The modern periodic table regards atomic numbers of the elements as the basis of classifying the elements. It removed both the short comings from the table.

5. How would tendency to gain electrons change as you go down in a group?

Ans. It is expected to decrease since atomic size increases down the group and the tendency of the element to gain electron decreases.

6. Two elements X and Y belong to Group 1 and Group 2 respectively in the same period. Compare them with respect to:

(a) The number of valence electrons

(b) Valency

(c) metallic character

(d) Size of the atoms

(e) Formulae of their oxides and chlorides.

Ans. (a) The valence electrons present in element X (group 1) and element Y (group 2) are 1 and 2 respectively.

(b) The valency of the element X is one while that of the element Y is two.

(c) Metallic character decreases along a period. This means that element X is more metallic as compared to element Y.

(d) Atomic size decreases along a period. As a result, the element Y has a smaller size than the element X.

(e) For element X Oxide (X_2O), chloride (XCl)

For element Y Oxide (YO) and chloride (YCl_2)

7. The following table shows the position of six elements A, B, C, D, E and F in the period table.

Groups Periods	1	2	3 to 12	13	14	15	16	17	18
2	A					B		C	
3		D			E			F	

Using the table answer the following

(a) Which element will form only covalent compounds?

(b) Which element is a metal with valency 2.

(c) Which element is a non-metal with valency 3.

(d) Out of D and E which has bigger atomic radius and why?

(e) Write a common name for the family of elements C and F

Ans. (a) Element (E) and its name is silicon

(b) Element D and name is magnesium (Mg) if exhibits valency 2

(c) Element B is non-metal and name is nitrogen (N) and exhibits valency 3.

(d) Element D has bigger atomic radius than E as size decreases along a period.

(e) Element C and f are noble gases.

8. What were the limitations of Newland's law of octaves?

Ans. The limitations of Newlands' Law of Octaves:

(a) it was found that Law of Octaves was applicable only upto calcium.

After calcium eighth element did not possess properties similar to that of first.

(b) Newlands' assumed that only 56 elements existed in nature and no more elements would be discovered in future.

(c) To fit the element into his table, Newlands adjusted two elements in the same slot but also put some unlike elements under the same note.

9. What were the criteria used by Mendeleev in creating his Periodic table?

Ans. Mendeleev created his Periodic Table on the basis of their fundamental property the atomic mass and also on the similarities of chemical properties. Among chemical properties he concentrated on the compounds formed by elements with oxygen and hydrogen.

(a) Three elements that have a single electron in their outermost shells.

(b) Two elements that have two electrons in their outermost shells.

(c) Three elements with filled outermost shells.

Ans. (a) Lithium, sodium and potassium have a single electron in their outermost shells.

(b) Magnesium and calcium have two electrons in their outermost shells.

(c) Helium, neon and argon have filled outermost shells.

11. (a) Lithium, sodium and potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(b) Helium is an un-reactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

Ans. (a) Lithium, sodium and potassium have same number of electrons in the outermost shell.

(b) Helium and argon have completed outermost shell, 2 electrons in case of helium and 8 electrons in case of argon.

12. By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristic?

Ga, Ge, As, Se, Be

Ans. Metallic character of an element increases down a group and decreases from left to right in period. On this basis Be is expected to have maximum metallic character.

13. Which element has

(a) two cells, both of which are completely filled with electrons?

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(b) the electronic configuration 2, 8, 2?

(c) a total of three shells, with four electrons in its valance shell?

(d) twice as many electrons in its second shell as in its first shell?

Ans. (a) Neon

(b) Magnesium

(c) Silicon

(d) Carbon

14. The position of three elements A, B and C in the Periodic Table are shown below:

Group 16	Group 17
-----	-----
-----	A
-----	-----
B	C

(a) State whether A is a metal or non-metal.

(b) State whether C is more reactive than A

(c) Will C be larger or smaller in size than B?

(d) Which type of ion, cation or anion, will be formed by element A?

Ans. (a) A is a non-metal.

(b) C is less reactive than A.

(c) C will be smaller than B.

(d) A will form anion.

15. How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

Ans. Group number on an element can be predicted from the number of electrons in the

osbin outermost shell.

Period number of an element can be predicted from the number of shells with filled electrons.

Knowing the electronic configuration, we can find the number of electrons in the outermost shell and the number of shells with filled electrons. This can help to relate its position in the Periodic Table.

16. Compare and contrast the arrangement of elements in Mendeleev's Periodic Table and the Modern Periodic Table.

Ans.

Similarities	Dissimilarities
a. In both tables, physical and chemical properties has been taken basis for classification and kept in same group.	a. While Mendeleev's Table was based on the atomic mass but modern Periodic table is based on atomic number.
b. The formulae of the oxide and hydrides formed by an element were treated as one of the criteria for classification of elements.	b. Mendeleev's Table contain 6 periods and 8 groups but modern periodic table contain 7 periods and 18 groups.
	c. Transition elements have been placed at the end of Mendeleev's periodic table but in modern periodic table they are placed in the middle.

17. The following is Newland's Octave Table. Observe it and answer the following questions:

Sa(do)	Re(re)	Ga(mi)	Ma(fa)	Pa(so)	Da(la)	Ni(ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	-	-

(a) Which of the element in 1st column has different properties from rest of the

(b) Which of the elements resemble with each other in second column?

(c) Pick up odd element in second last column.

(d) Pick up elements which have similar properties in last column.

Ans. (a) Co & Ni

(b) Li, Na, K

(c) Mn

(d) O, S Se

18. In the Periodic Table given below, Lithium, carbon, oxygen and neon are placed in their correct positions and the positions of nine other elements are represented by letters. These letters are not the symbols for the elements?

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

By reference to the table, answer the following questions:

(a) Give the letter of the most reactive metal.

(b) Give the letter of the most reactive non-metal.

(c) Name the family of elements represented by L, Q, L and T.

(d) Name one element in each case occurring in groups 2, 13 and 15

Ans. (a) Z

(b) L,

(c) Halogen family,

19. Two elements X and Y have atomic numbers 12 and 16 respectively. Write the electronic configuration for these elements. To which period of the modern periodic table do these two elements belong? What type of bond will be formed between them and why?

Ans. X(Z=12): 2, 8, 2 Y (Z16): 2, 8, 6

Both these elements are present in third period. An ionic bond is formed between X & Y as a result of transfer of two electrons from X to Y

20. An element X (2,8,2) combines separately with NO and (SO₄)²⁻, (PO₄)³⁻ radicals. Write the formulae of the three compounds so formed. To which group of the periodic table does the element 'X' belong? Will it form covalent or ionic compound? Why?

Ans. $X(NO_3)_2$: XSO_4 $X_3(PO_4)_2$

X belong to second group X forms ionic compound because by losing two electrons X achieve the electronic configuration of Noble gas element Neon.

21. The following table shows the position of six elements A, B, C, D, E and F in the periodic table.

Groups/ periods	1	2	3 to 12	13	14	15	16	17	18
2.	A					B			C
3.		D			E				F

Using the above table answer the following questions:

(a) Which element will form only covalent compounds?

(b) Which element is a metal with valency 2?

(c) Which element is a non-metal with valency of 3?

(d) Out of D and B, which one has a bigger atomic radius and why?

osbinose.com (e) Write a common name for the family of elements C and F.

Ans. (a) E,

(b) D,

(c) B,

(d) D, because the atomic size decreases along a period,

(e) Noble Gases.

22. The diagram below shows part of the Periodic Table

1	2	3												4	5	6	7
Na																Cl	Ar

The position of three elements in the Periodic Table is shown:

i Write the atomic numbers of the elements.

ii Give the electronic distribution of the elements

iii Using these three elements as examples, describe the trend in chemical properties across the third period of the Periodic Table.

Ans. (a) Na = 11

Cl = 17

Ar = 18

(b) Na(2,8,1) Cl(2,8,7) Ar(2,8,8)

(c) Metallic and reducing character decreases.

Group	I	II	III	IV	V	VI	VII	VIII
Oxide	R ₂ O	RO	R ₂ O ₃	RO ₂	R ₂ O ₅	RO ₃	R ₂ O ₇	RO ₄
Hydride	RH	RH ₂	RH ₃	RH ₄	RH ₃	RH ₂	RH	
Periods	A B	A B	A B	A B	A B	A B	A B	
1	H							
2	Li	Be	B	C	N	O	F	
3	Na	Mg	Al	Si	P	S	Cl	
4. First Series:	K	Ca	Sc	Ti	V	Cr	Mn	Fe Co Ni
Second Series:	Cu	Zn	Ga	Ge	As	Se	Br	
5 First Series:	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru Rh Pd
Second Series:	Ag	Cd	In	Sn	Sb	Te 127.90	I 126.90	
6 First Series:	Cs	Ba	La	Hf	Ta	W		Os Ir Pt
Second Series:	Au	Hg	Tl	Pb	Bi			

(a) Write the formula of hydride and oxide of silicon

(b) Name the elements which is in

(i) II group and 4th period

(ii) VI group and 3rd period.

(c) Name the elements in group I which do not resemble with alkali metals

(d) In group VI why does Te with atomic mass 127.60 comes before I with atomic mass 126.90

Ans. (a) SiO₂, SiH₄

(b) (i) Ca, Zn

(ii) S

(c) H

(d) The sequence was inverted so that elements with similar properties could be grouped together.