PERIODIC TABLE

CLASS – IX

Exercise – 5(A)

1. What is the need for classification of elements ?

Answer :- a) It helps in studying the elements in an organised manner.

b) It helps in correlating the properties of elements with the fundamental properties of all states of matter.

c) It helps in defining the relationship of one element with another.

2. What was the basis of the earliest attempts made for classification and grouping of elements ?

Answer :- The basis of the earliest attempts was depending upon some of the physical properties like – i) density ii) ductility iii) malleability, etc. and also on the factors that the elements are metals or non-metals.

3. (a) A, B and C are the elements of a Dobereiner's triad. If atomic mass of A is 7 and that of C is 39, what should be the mass of B?

Answer :- As we know, according to Dobereiner's triad, the atomic mass of the middle element of a triad was approximately equal to the airthmetic mean of the atomic masses of the other two elements. So, here,

$$\text{Atomic mass of B} = \frac{7+39}{2} = \frac{46}{2} = 23$$

b) Why was Dobereiner's triad discarded ?

Answer :- a) Dobereiner failed to arrange all the then known elements in the form of triads.

b) The law didnot fully apply even within the same family.

4. Explain Newland's Law of Octaves. Why was the law discarded?

Answer :- 'Newland's law of Octaves' states that when the elements are arranged by increasing atomic mass, the properties of the every eighth element starting from any

any element are a repetition of the properties of the starting element.

'Newland's law of octaves' was discarded because -

a) The classification didnot work with heavier elements.

b) Some dissimilar elements were grouped together.

Eg:- He kept Co and Ni in the same slot with halogens, although they have very different properties.

c) Some similar elements were grouped seperately.

Eg:- Iron and cobalt and nickel have similar properties but iron was placed seperately from nickel and cobalt.

5. Did Dobereiner's triads also exist in the columns of Newland's octaves? Compare and find out.

Answer:- Yes, Dobereiner's triads also exist in the columns of Newland's octaves.

Eg:- The second column of Newlands classification has the elements lithium (Li), Sodium (Na) and Potassium (K), which constitute a Dobereiner's triad.

Atomic mass of Li = 7

Atomic mass of K = 39

So, atomic mass of Na = $\frac{7+39}{2} = \frac{46}{2} = 23$.

6. (a) Lithium, sodium and potassium elements were put in one group on the basis of their similar properties. what are those similar properties?

Answer:- The three elements have the following similarities:-

a) All are metals.

b) All of them has valency 1.

c) All of them are good reducing agents.

d) All of them form basic oxides with oxygen.

e) All of them form hydrides with hydrogen.

f) All of them are very reactive and thus mainly found in the combined state.

(b) The elements calcium, strontium and barium were put in one group on the basis of their similar properties. What were those similar properties ? (3)

Answer :- i) All are metals
ii) All of them has valency 2
iii) All of them form oxide which is alkaline in nature.
iv) All of them reacts with water to produce hydrogen.

7(a) What was Mendeleev's basis for classification of elements ?

Answer :- Mendeleev's basis for classification of elements was the atomic mass of the elements. According to him, all the elements if arranged in the increasing order of their atomic masses shows similar properties after regular intervals

(b) Mendeleev's contributions to the concept of periodic table laid the foundation for the Modern Periodic Table. Give reasons.

Answer :- i) Mendeleev was the first to classify periodic table in the form of groups and periods, i.e., he arranged the elements in a tabular form.
ii) He was the first to keep gaps for the undiscovered elements in the periodic table.
iii) He showed that elements resemble similar properties after regular intervals when arranged according to their atomic masses.

After this only, scientists found that the properties are the periodic function of the atomic number of the elements. Hence, its concept laid the foundation of Modern Periodic Table.

8. State Mendeleev's Periodic Law.

"Physical and chemical properties of elements are a periodic function of their atomic masses."

9. Use Mendeleev's Periodic Table to predict the formulae of
(a) Hydrides of carbon and silicon

Answer :- Hydride of Carbon = CH_4
Hydride of Silicon = SiH_4

(b) oxides of potassium, aluminium and barium

Answer :- Oxide of potassium = K_2O
Oxide of aluminium = Al_2O_3
Oxide of barium = BaO

10. Which group of elements was missing from Mendeleev's original periodic table ?

Answer :- Noble or inert gases.

11. State the merits of Mendeleev's classification of elements

Answer :- i) By grouping the elements into 8 groups he generalised the study of the elements.

ii) He left some gaps in his periodic table for the undiscovered elements.

iii) He was able to correct the values of atomic mass of some elements like gold and platinum by strictly placing them on the similar properties.

12. Why did Mendeleev leave some gaps in his periodic table ? Explain with example.

Answer :- Mendeleev strictly arranged all the known elements at that time on the basis of their similar properties. So, he left some gaps in his periodic table whenever any appropiate element was not found to fit in a particular group.

Eg :- i) Eka aluminium was discovered later as gallium and was having quite similar properties (atomic mass and chemical properties).

ii) Eka silicon was discovered later as germanium.

13. The atomic number of an element is more important to the chemist than its relative atomic mass. Why ?

Answer :- Atomic number is the number of protons in the nucleus of an element. So, it is the identity of the element as no two elements can have the same atomic number. Moreover, most of the chemical properties depend upon the valence electrons and its electronic configuration.

So, atomic no. is more important than atomic mass.

14. Consider the following elements : (5)

Be, Li, Ca, Na, K

Name the elements of :- (a) same group

Answer :- Li, Na, K (Group 1)

Be, Ca (Group 2)

(b) same period

Answer :- Li, Be (Period 2)

Na (Period 3)

K, Ca (Period 4)

15 (a) Name an element whose properties were predicted on the basis of its position in Mendeleev's periodic table.

Answer :- Eka aluminium or gallium.

(b) Name two elements whose atomic weights were corrected on the basis of their positions in Mendeleev's periodic table.

Answer :- Gold and Platinum

(c) How many elements were known at the time of Mendeleev's classification of elements ?

Answer :- 63 elements

EXERCISE - 5(B)

1(a) State Modern Periodic Law

Answer :- "Physical and chemical properties of elements are a periodic function of their atomic numbers."

(b) How many periods and groups are there in the modern periodic table?

Groups = 18

Periods = 7

2. What is the main characteristic of the last elements in the periods of a periodic table? What is the general name of such elements?

Answer :- Main characteristic features of the last elements in the period of a periodic table are :-

i) They have eight electrons in their outermost orbits (except Helium)
ii) They are very unreactive in nature.
iii) They are monoatomic because of their stable electronic configuration.

Their general name is 'inert' or 'noble' gases.

3. What is meant in the periodic table by :

a) a group :- Vertical columns in the periodic table.
b) a period :- Horizontal rows in the periodic table.

In the modern periodic table there are 18 vertical columns and 7 horizontal rows.

4. From the standpoint of atomic structure, what determines which element will be first and which will be last in the periodic table?

Answer :- No of valence shell or electronic configuration determines which element will be first and which will be last in the periodic table.

5. What are the following groups known as -

i) Group 1 ii) Group 17 iii) Group 18

Name two elements of each group.

Answer :- i) Group 1

Alkali Metals, eg, Lithium (Li), Sodium (Na)

ii) Group 17

Halogens; eg, Fluorine (F), chlorine (Cl)

iii) Group 18

Inert or Noble Gases, eg, Helium (He), Neon (Ne)

6. What is the no of elements in the 1st and 3rd period of the modern periodic table?

Answer :- 1st Period = 2 elements

3rd Period = 8 elements

7. How does number of i) valence electrons ii) valency; vary on moving from left to right, in the 2nd and in the 3rd period of the periodic table.

Answer :- (i) Valence electrons :- No of valence electrons increases gradually from one to eight in the 2nd and 3rd period on moving from left to right of the periodic table.

(ii) Valency :- Valency of the elements increases arithmetically from 1 to 4 and then again decreases back to 1 in the 2nd and the 3rd period on moving from left to right of the periodic table.

8. How do atomic structures (electron arrangements) change in a period with increase in atomic numbers moving left to right?

Answer :- The atomic number increases by a factor 1 as we move from left to right across a period and elements in the same period involve filling of electrons in the same valence shell.

So, in a period the electronic configuration mainly involve changes in the number of valence electrons.

Eg:- 2nd Period :-

Element	Li	Be	B	C	N	O	F	Ne
Electron arrangements	2,1	2,2	2,3	2,4	2,5	2,6	2,7	2,8

9. This question refers to the elements of the periodic table with atomic numbers from 3 to 18. (8)

3	4	5	6	7	8	9	10
A	B	C	D	E	F	G	H
11	12	13	14	15	16	17	18
I	J	K	L	M	N	O	P

a) Which of these is :-

(i) a noble gas

Element H and P

H = 10 = 2, 8

P = 18 = 2, 8, 8

Noble gases are the ones with 8 electrons in the valence shell.

(ii) a halogen

Element G and O

G = 9 = 2, 7

O = 17 = 2, 8, 7

Halogens are the ones with 7 electrons in the valence shell.

(iii) an alkali metal

Element A and I

A = 3 = 2, 1

I = 11 = 2, 8, 1

Alkali metals have 1 electron in their valence shell.

(iv) an element with valency 4

Element D and L

D = 6 = 2, 4

L = 14 = 2, 8, 4

b) If A combines with F, what would be the formulae of the resulting compound?

A = 3 = 2, 1

F = 8 = 2, 6

So, compound = A_2F

c) What is the electronic configuration of G?

G = 9 = 2, 7

10. Sodium and aluminium have atomic numbers 11 and 13 and they are seperated by one element in the periodic table, and have valencies 1 and 3 respectively.
Chlorine and potassium are also seperated by one element in the periodic table (at no - 17 and 19), yet both have valency 1. Explain.

Answer :- Valency is the combining capacity of an element, i.e., it is the number of electrons needed to gain or lose to attain the nearest noble gas configuration.
So, valency of an element is determined by its electronic configuration and to which group it belongs.

Sodium, atomic no = 11 = 2, 8, 1
Aluminium, atomic no = 13 = 2, 8, 3
Chlorine, atomic no = 17 = 2, 8, 7
Potassium, atomic no = 19 = 2, 8, 8, 1 - and potassium

Depending upon the valence electrons sodium has valency 1 as it loses one electron to attain stability, chlorine has valency 1 as it gains one electron to attain stability and aluminium has valency 3 as it loses 3 electrons to attain stability.

11. Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

Answer :- Helium (He) and Neon (Ne) both have their outermost shell filled, so, both of them have zero valency and they tend to remain in unbound state and donot react with other elements.

12. In which part of a group would you seperately expect the elements to have :

a) the greatest metallic character =

At the bottom of a group the elements shows greatest metallic character.
As we move down a group, metallic character increases, as atomic size increases and hence tendency to lose electrons from the outermost shell increases.

b) largest atomic size

At the bottom of the group because there the elements will have highest no of shells.

13. What happens to the number of valence electrons in atoms of elements as we go down a group of the periodic table

Ans:- No of valence electrons remains the same.

14.

Group 1	Group 2	Group 17	Group 18.
-	-	-	D
-	B	C	-
A	-	-	E

The position of the elements are shown.

a) State which are metals, non-metals and noble gas

Answer:- Metal = A, B

Non-metal = C

Noble gas = D, E

b) State which is most reactive i) metal = A is more reactive

ii) non-metal = C

c) Which type of ion will be formed by element A, B and C?

A and B will form positive ion;

A^+ and B^{2+}

C will form negative ion, C^-

d) Which is larger in size :-

i) D or E :- E is larger in size

ii) B or C :- B is larger in size.

15. Element $_{17}T^{35}$, write the electronic configuration = 2, 8, 7

a) What is the group no of T = 17

b) What is the period no of T = 3

c) How many valence electrons are there = 7

d) What is the valency = 1

e) Is it metal or non-metal = Non-metal

f) State the no of protons and neutrons ⇒ Protons = 17

Neutrons = 18