

CBSE Class 11 Chemistry
Important Questions
Chapter 3
Classification of Elements and Periodicity in Properties

1 Marks Questions

1. How many elements are known at present?

Ans. There are about 114 elements known at present.

2. Who was the first scientist to classify elements according to their properties?

Ans. The German Chemist, Johann Dobereiner in early 1829 was the first to consider the idea of trends among properties of element.

3. What is the basis of triad formation of elements?

Ans. The middle element of each of the triads had an atomic weight about half way between the atomic weights of the other two. Also the properties of the middle element were in between those of the other two members. Dobereiner's relationship is known as the law of triads.

4. State the modern 'Periodic law'?

Ans. The physical and chemical properties of the elements are periodic functions of their atomic numbers.

5. Define and state Mendeleev's periodic law.

Ans. Mendeleev's Periodic law states that

'The properties of the elements are periodic function of their atomic weights'.

6. Give the general characteristics of the long form of Modern periodic table?



Ans. General characteristics of the long form of Periodic table :-

(i) There are in all 18 vertical columns i.e. 18 groups in the long form periodic table.

(ii) There are groups numbered from 1 to 18 from the left.

(iii) There are seven horizontal rows called periods.

(iv) The elements of groups 1, 2 and 13 to 17 are called main group elements.

(v) The elements of group 3 to 12 are called transition elements.

7. In short give the features of the seven periods.

Ans. First period contains 2 elements, ${}_1\text{H}$ and ${}_2\text{He}$ and it is the shortest period.

Second and third periods contain 8 elements each namely ${}_3\text{Li}$ to ${}_{10}\text{Ne}$ and ${}_{10}\text{Na}$ to ${}_{18}\text{Ar}$ and is a short period.

Fourth and fifth period contains 18 elements each namely ${}_{19}\text{K}$ to ${}_{36}\text{Kr}$ and ${}_{37}\text{Rb}$ to ${}_{54}\text{Xe}$ and is a long period.

Sixth period contains 32 elements namely ${}_{55}\text{Cs}$ to ${}_{86}\text{Rn}$ and is the longest period.

Seventh period is incomplete. It has all other elements starting with ${}_{87}\text{Fr}$ onwards. Elements from 93 onwards are purely synthetic and are called trans-uranium elements and is incomplete period.

8. Define electronic configuration.

Ans. The distribution of electrons into orbitals of an atom is electronic configuration.

9. What is the electronic configuration when elements are classified group wise?

Ans. Elements in the same vertical column or group have similar valence shell electronic



configurations, the same number of electrons in the outer orbitals, and similar properties.

10. Predict the position of the element in the periodic table satisfying the electronic configuration $(n-1) d^1 ns^2$ for $n=4$,

Ans. $(n-1) d^1 ns^2 = (4-1) d^1 4s^2$
 $= 3d^1 4s^2$

It lies in fourth period and III B group.

11. How does atomic size change in a group?

Ans. it increases from top bottom in a group.

12. Why Li and Mg show resemblance in chemical behaviour?

Ans. Due to diagonal relationship, since their atomic size, electro negativity and ionisation potential are almost the same.

13. The atomic radius of elements decreases along the period but Neon has highest size among III period element? Why

Ans. Ne is the only element in III period element which has Van der Waals radius whereas the rest has covalent radius. And it is known fact that Van der Waals radius is always greater than covalent radius.

14. Define valency.

Ans. The combining capacity of an element is known as valency.

15. How does valency vary in a group and period in the periodic table?

Ans. In a group, the valency of an element remains constant while in a period it increases from left to right.

16.What is the valency of noble gases?

Ans. Noble gases on the extreme right are zero valent.

17.How do metals react in a period?

Ans.The tendency of an element to lose electrons decreases in going from left to right in a period. Thus the reactivity of metals goes on decreasing in a period from left right.

18.How do metals react in a group?

Ans. the tendency to lose electrons increases as we go down a group so the reactivity of metals increases down the group.

19.What is an amphoteric oxide?

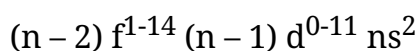
Ans. Oxides which behave as acids with bases and as a base with an acid are called amphoteric oxide.

20.Define a neutral oxide

Ans.Neutral oxides have no acidic or basic properties.

21.What is the general outer electronic configuration of f – block elements?

Ans.The general outer electronic configuration of f – block element is



22.Why do Na and K have similar properties?

Ans. Na and K have similar physical and chemical properties because they have same number of valence electrons.

23.Arrange the following elements in the increasing order of metallic character: Si, Be, Mg, Na, P.

Ans. $P < Si < Be < Mg < Na$



CBSE Class 12 Chemistry
Important Questions
Chapter 3
Classification of Elements and Periodicity in Properties

2 Marks Questions

1. How did Mendeleev arrange the elements?

Ans. Mendeleev arranged elements in horizontal rows and vertical columns of a table in order of their increasing atomic weights in such a way that the elements with similar properties occupied the same vertical column or group.

2. Name the two elements whose existence and properties were predicted by Mendeleev though they did not exist then.

Ans. Mendeleev predicted not only the existence of gallium and germanium, but also described some of their general physical properties.

3. Give the main features of s-block elements.

Ans. s – block elements :- The elements in which the last electron enters the s – orbital of their outer most energy level are called s – block elements. It has elements of groups 1 and 2. The general electronic configuration of s – block elements is ns^{1-2} .

4. Give the main features of p-block elements.

Ans. p – block elements : The elements in which the last electron enters the p – orbital of their outermost energy level are called p – block elements. It contains elements of group 13, 14, 15, 16, 17 and 18 of the periodic table. General electronic configuration of p – block elements is $ns^2 np^{1-6}$.

5. Give the main features of d-block elements.



Ans. d – block elements :- The elements in which the last electron enters the d – orbitals of their last but one energy level constitute d – block elements. There block consists of the elements lying between s and p block starting from 4th period and onwards. They constitute groups 3 to 12 in the periodic table. General electronic configuration is $(n - 1) d^{1-10} ns^{1-2}$.

6. Give the main features of f-block elements.

Ans. f – block elements : The elements in which the last electron enters the f – orbital of their atoms are called f – block elements. In these elements the last electron is added to the third to the outermost energy level. These consist of two series of elements placed at the bottom of the periodic table known as Lanthanoid and actinoid series. General electronic configuration is $(n-2)f^{1-14} (n-1)d^{0-1} ns^2$.

7. Explain why cations are smaller and anions are larger in radii than their parent atom?

Ans. The radius of cation is smaller than the parent atom. Cation is formed by the loss of one or more electron from the gaseous atom, but the nuclear charge remains the same. As a result, the nuclear hold on the remaining electrons increases because of the increases in the effective nuclear charge per electron resulting in decrease in size.

Whereas anion is formed by the gain of one or more electrons by the gaseous atom but the nuclear charge is same though the number of electrons has increased. The effective nuclear charge per electron decrease in the anion and the cloud is held less tightly by the nucleus. This causes increase in size.

8. Define ionization enthalpy and electron gain enthalpy?

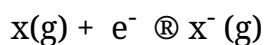
Ans. Ionization enthalpy – It represents the energy required to remove an electron from an isolated gaseous atom (x) in ground state resulting in the formation of a positive ion.



Electron gain enthalpy – When an electron is added to a neutral gaseous atom (x) to convert



it into a negative ion, the enthalpy change accompanying the process is defined as the electron gain enthalpy.



9. How does metallic character change in a group?

Ans. It increases from top to bottom in a group

10. The size of an atom can be expressed by three radii. Name them. Which of these given the highest, and the lowest value of the atomic radius of an element?

Ans. The atomic size are generally expressed in terms of the following radii covalent radius, metallic radius and Van der waal's radius.

Van der waal's radius > Metallic radius > covalent radius.

11. Among the elements B, Al, C and Si

(a) Which has the highest first ionization enthalpy?

(b) Which has the largest atomic radius?

Ans.

(a) Carbon has the highest first ionization enthalpy.

(b) Aluminum has the largest atomic radius.

12. Na^+ has higher value of ionization enthalpy than Ne, though both have same electronic configuration.

Ans. Na^+ and Ne both has 10 electrons but Na^+ having, 11 protons in its nucleus (Ne has 10 protons) exert higher effective nuclear charge and thus removal of electron from Na^+ requires more energy.



13. How does the reactivity of non-metals change in a period and group?

Ans. The reactivity of non-metals is measured in terms of its tendency to gain electrons to form an ion. The reactivity of non-metals increases from left to right in a period whereas reactivity decreases in a group as we go down the group because the tendency to accept electrons decreases down the group.

14. Give the properties of the oxides in a particular period.

Ans. Elements on two extremes of a period easily combine with oxygen to form oxides. The normal oxide formed by the element on extreme left is the most basic (eg. Na_2O) whereas that formed by the element on extreme right is the most acidic (eg. Cl_2O_7). Oxides at the centre are however amphoteric (eg. Al_2O_3) or neutral (eg. CO).

15. Why does lithium form covalent bond unlike other alkali which forms ionic bond?

Ans. Lithium forms covalent bond which is different from its group members because of its anomalous behaviour. Li is small in size, large charge / radius ratio and has high electronegativity value. Also it has only $1s^2 2s^1$ orbital for bonding.

16. The atomic number of an element is 16. Determine its position in accordance to its electronic configuration.

Ans. The atomic number of the element is 16.

The electronic configuration of the element is $1s^2 2s^2 2p^6 3s^2 3p^4$

Thus the element belongs to 'p-block' and is placed in third period and 16th group of the periodic table.

17. Why are elements at the extreme left and extreme right the most reactive?

Ans. The maximum chemical reactivity at the extreme left (among alkali metals) is exhibited due to the loss of an electron leading to the formation of a cation due to low ionization



enthalpy and at the extreme right (among halogens) shown by the gain of an electron forming an anion. Due to high electron affinity.

18. Why does the ionization enthalpy gradually decreases in a group?

Ans. In a group, the increase in atomic and ionic radii with increase in atomic number generally results in a gradual decrease in ionization enthalpies.

19. Why does electronegativity value increases across a period and decreases down period?

Ans. The attraction between the outer electrons and the nucleus increases as the atomic radius decreases in a period. The electronegativity also increases. On the same account electronegativity value decreases with the increase in atomic radii down a group.

20. How does electronegativity and non – metallic character related to each other?

Ans. Electronegativity is directly related to the non – metallic character of elements. Electronegativity is inversely related to the metallic properties of elements. Thus the increase in electronegativities across a period is accompanied by an increase in non – metallic properties of elements. Similarly, the decrease in electronegativity down a group is accompanied by a decrease in non – metallic properties of elements.

21. Describe the main features of Mendeleev's periodic table?

Ans. (i) In Mendeleev table, the elements were arranged in vertical columns, and horizontal rows. The vertical columns were called groups and the horizontal rows were called periods.

(ii) There were in all eight groups. Group I to VIII. The group numbers were indicated by Roman numerals. Group VIII occupy three triads of the elements each i.e. in all nine elements.

(iii) There were seven periods to accommodate more elements the period 4, 5, 6 and 7 were divided into two halves. The first half of the elements were placed in the upper left corner and the second half in the lower right corner of each box.

