

SHORT QUESTIONS

Q.1 Why ionic radii of anions are larger than their parent atoms?

Ans. There are the following reasons:

- (a) Incoming electron is accommodated in the new shell thus increasing the orbit and therefore size increases.
- (b) There is decrease in the nuclear charge.
- (c) If the incoming electron enters the outermost orbit which has already electrons, the orbit will expand. For example atomic radius of F is 72 Pm while ionic radius of F^- is 136 Pm.

Q.2 Why ionization energy decreases down the group?

Ans. It is due to:

- (a) There is increase in the atomic size down the group, the hold of the nucleus on the electrons decreases.
- (b) Shielding effect also increases.

Q.3 Why ionization energy increases along the period?

- Ans.** (a) Along the period, there is decrease in the atomic size, hold of the nucleus on the electrons increases.
- (b) Nuclear charge increases.

Q.4 Why d and f block elements are called transition elements?

Ans. The elements of d and f block are in between s and p block elements. Their properties show a transition in systematically and they vary from left to right.

Q.5 What is law of octaves?

Ans. Newland in 1864 classified 62 elements on the basis of their increasing atomic masses. According to Newland, “every eighth element has the properties similar to the first one if they are arranged according to increasing atomic masses”.

Q.6 What is Mendeleev’s periodic law?

Ans. If the elements are arranged according to their ascending atomic masses, they show periodicity (repetition of physical and chemical properties after regular intervals) in the properties. It is called periodic law.

Q.7 What is modern periodic law?

Ans. According to Mosley (1913), if elements are arranged according to their ascending order of atomic numbers then chemical properties repeat in the periodic manner. It is called modern periodic law.

Q.8 Why the size of cation is smaller than its parent element

Ans. (a) When electron is removed from the valence shell there is increase in the nuclear charge.

(b) The size of atom reduces. For example; covalent radius of Na 157 pm ionic radius of Na^+ is 95 pm (Atomic radius of Na = 186 pm).

Q.9 Na^+ , Mg^{+2} , Al^{+3} are iso electronic in nature. Do these ions have same ionic radii?

Ans. Na^+ , Mg^{+2} , Al^{+3} all have 10 electrons in their shells but their ionic radii are not same. Ionic radii decrease due to increase in the nuclear charge from left to right. Na^+ has 11 P, Mg^{+2} has 12 P and Al^{+3} has 13 protons in it.

Q.10 Why second ionization energy is greater than first ionization energy?

Ans. The amount of energy required to remove an electron from an atom in the gaseous state to produce gaseous positive ion is called first ionization energy.

The amount of energy required to remove second electron from mono-positive ion is called second ionization energy. Second ionization energy is greater than first ionization energy due to increase in the nuclear charge. For example:



Q.11 What is the trend in the metallic character in the periodic table?

Ans. Metallic character increases down the group due to increase in the atomic radii. The metallic character decreases along the period. Elements on the left side of the periodic table are metal and on the right side are non-metals. Out of all the elements known so far 82 are metals.

Q.12 What is the trend of melting point of elements in the periodic table?

Ans. Melting point of elements decreases down the group due to increases in the atomic size. Melting point of halogens increases down the group due to increased polarizability of the molecule. I_2 has highest melting point among the halogens. Melting point of elements increases upto the middle (IV group) in the period and then decreases.

Q.13 What is the maximum oxidation state of an element?

Ans. The maximum oxidation state of an element is equal to its group number in the periodic table. For example Cl has maximum oxidation state of +7 in KClO_4 because it belongs to group VII.

Nitrogen in the V group has maximum oxidation state of +5.

O_2 and F_2 are exceptions.

Q.14 Which oxide has greater acidic character MnO or Mn_2O_7 ?

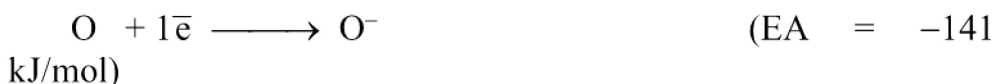
Ans. Acidic character increases by increasing the oxidation number of the metal. Oxidation number of Mn in MnO is +2 while in Mn_2O_7 it is +7.

Therefore, Mn_2O_7 is more acidic than MnO . MnO is more basic in nature.

Similarly FeO is more basic than Fe_2O_3 .

Q.15 Why second electron affinity has positive sign?

Ans. The amount of energy evolved or absorbed when an electron is added to the outermost shell of an atom in the gaseous state is called electron affinity. When an electron is added to an atom it forms negative ion. The second electron is added into the negative ion. There will be repulsion between the electrons. To overcome the repulsive force, energy will be required. Therefore, second electron affinity is always positive.

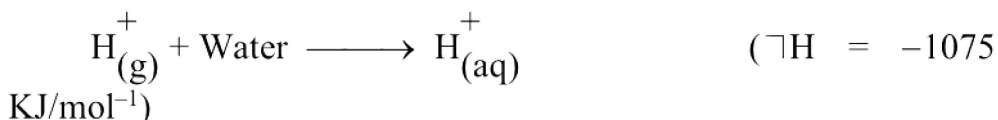


Q.16 What is the trend in ionic character of halides in the periods of the periodic table?

Ans. Along the period, ionic character decreases due to the decrease in the difference of electronegativity. For example; in the third period, NaCl and MgCl_2 are ionic, AlCl_3 is polymeric, and PCl_3 , S_2Cl_2 , SiCl_4 are covalent in nature.

Q.17 What is hydration energy?

Ans. The amount of heat evolved or absorbed when 1 mol of gaseous ions dissolve in water to give infinitely dilute solution. Its units are kJ/mol. For example:



Factors affecting Hydration Energies:

(i) **Size of Ions:** Greater the size of the ions, smaller the charge density and smaller the hydration energy.

- (ii) **Amount of Charge:** Greater the amount of the charge, greater the hydration energy.
- (iii) Hydration energy of negative ions is smaller.

Variations in the Periods and Groups:

- (i) Hydration energy increases along the period for iso electronic ions in case Na^+ , Mg^{+2} , Al^{+3} . These are iso electronic. The hydration energy increases with the increasing positive charge.
- (ii) Hydration energy decreases down the group. For example: Li^+ has greater hydration energy than Cs^+ because Li^+ has positive charge concentrated on a smaller volume relative to Cs^+ where the charge rests on a bigger volume and is more diffused.