

ASSIGNMENT - 1

AMOGH GARG - 2020 VCD 2123.

(1) Group and period of element having atomic number 21.

(Ans) Group Number is 3.
Period Number is 4.
Element is Scandium.

(2) Give an example of Dobereiner's Triads.

(Ans) An example of Dobereiner's Triad is :

Lithium (Li), Sodium (Na), Potassium (K)

Mean of atomic mass of Li and K $\Rightarrow \frac{7 + 39}{2} = 23$
23 u is the atomic mass of Sodium.

(3) State Newland's Law of Octaves.

(Ans) In 1864, Newland, an English chemist noticed that "When elements are arranged in increasing order of their atomic masses, every eighth element had properties similar to the first element". Newland called it Law of Octaves.

(4) State Modern Periodic Law.

(Ans) Modern Periodic Law states that "The chemical and physical properties of elements are a periodic function of their atomic numbers".

(5) Number of groups present in Mendeleev's periodic table and their numbers.

(Ans) There were nine groups present in Mendeleev's periodic table and are numbered from one to eight and zero (Roman Numerals). Groups I - VIII

are subdivided into A and B groups.
Groups 0 and VIII don't have any
subgroups.

(6) What are periods and groups in periodic table?

(Ans) The vertical columns present in the periodic table are called as groups.
The ~~main~~ horizontal rows present in the periodic table are called as ~~columns~~ periods.

(7) 2 main achievements of Mendeleev's periodic table.

(Ans) 2 main achievements are:

- Classification of all elements: Mendeleev's was the first classification which successfully included all the elements.
- Prediction of new elements: Mendeleev's table had some blank spaces. (These spaces were for elements yet to be discovered).
For eg.) He proposed existence of unknown element that he named eka-aluminium. The element gallium was discovered and its properties matched very closely with that of eka-aluminium.

(8) Main Defects of Mendeleev's periodic table.
Main defects are as followed:

- a) Position of Hydrogen: Hydrogen resembles alkali metals as well as halogens. \therefore It could neither be placed with alkali metals nor with halogens.

- 2) Position of isotopes : Different isotopes of same element have different atomic masses, \therefore each one of them should be placed at different position. On other hand, because they are chemically similar, they had to be given same position.
- 3) Anomalous pair of elements : At certain places, an element of higher atomic mass has been placed before an element of lower atomic mass. For eg. Argon is placed before potassium.

(9) Difference between modern periodic law and Mendeleev's periodic law.

- (Ans) • According to modern periodic law - "Physical and chemical properties of elements are a periodic function of their atomic numbers" whereas according to Mendeleev's periodic law - "Physical and chemical properties of elements are periodic function of their atomic masses".
- Mendeleev focussed on atomic mass as the criteria to classify elements, whereas Moseley focussed on atomic number. (Number of protons present in an atom).

(10) Why argon was placed before potassium? Argon was placed before potassium because argon resembled properties similar to that of Helium and Neon (i.e noble gas) and was placed ~~in~~ below them. Whereas potassium resembled Li and Na ^{in its properties} and was placed in that group (i.e group of alkali metals).

(11) Which one is bigger and why?

(a) Li and Ne : Li is bigger than neon. This is due to the lesser nuclear charge in Li because of which nucleus is unable to pull the outermost shell towards it strongly. Whereas in Neon, nuclear charge is more and \therefore size is less.

(ii) O and S : Sulphur has bigger size as compared to O because of the presence of additional shell present in S as compared to that in O.

(iii) K and K^+ : K^+ is ^{smaller} ~~bigger~~ than K. This is because K^+ contains one less electron and therefore the repulsive force between remaining electrons decreases and they come a little closer.

(iv) Br and Br^- : Br^- is bigger than Br. This is because Br^- contains one extra electron and therefore the repulsive force between remaining electrons increase and they move far apart.

(12) Define atomic radius. How does it vary in a period / group?

Ans) • It is defined as one-half the distance between the nuclei of two atoms when they are linked to each other by a single covalent bond.

• Atomic radius increases on going down the group and decreases on moving from left-right along a period.

(13) What is ionisation energy? How does it vary in a group? Give two reasons for it.

(Ans) The minimum amount of energy required to remove an electron from a gaseous atom in its ground state to form a gaseous ion is called ionization energy.

- I.E. decreases in group on moving down.

This is because:

- Force of attraction between valence electron and nucleus decreases in group from top-bottom due to increase in size.
- Also, the increase in nuclear charge is not able to compensate the increase in size.

(14) Which element (Na, Ba and Cl) has highest I.E?

Cl has the highest I.E among the following because Cl has 7 valence e^- , so it prefers to gain one electron rather than losing.

(15) Explain why IE increase from left-right but decrease from top-bottom?

- IE decreases on moving down the group because force of attraction b/w valence e^- and nucleus decreases (due to increase in size, which is more than increase in nuclear charge).
- IE increases on moving along period because the force of attraction between valence electron and nucleus increases in period from left-right (due to increase in nuclear charge) which makes it difficult to pull electron from outermost shell.