

Chemistry Study Materials for Class 10 (Based on: Periodic Classification of Elements)

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NCERT SOLUTIONS FOR CHAPTER 5 (INTEXT QUESTIONS)

Page Number: 81

Q1. Did Dobereiner's triads also exist in the columns of Newlands' Octaves?

Compare and find out.

A1. Yes, Dobereiner's triads also existed in the columns of Newland's Octaves. For example, Li, Na, K. If we consider lithium (Li) as the first element, then sodium (Na) is eighth element. If we consider sodium as the first element, then potassium is the eighth element.

Q 2. What were the limitations of Dobereiner's classification?

A2. It failed to arrange all the then known elements in the form of triads of elements having similar chemical properties. Dobereiner could identify only three triads from the elements known that time.

Q 3. What were the limitations of Newlands' law of octaves?

A3. (i) Newlands law of octaves was applicable to the classification of elements upto calcium only. After calcium every eighth element did not possess the properties similar to that of the first element.

(ii) Newlands assumed that only 56 elements existed in nature and no more elements would be discovered in the future. But later on, several new elements were discovered whose properties did not fit into Newlands' law of Octaves.

(iii) In order to fit elements into his table, Newlands put even two elements together in one slot and that too in the column of unlike elements having very different properties.

For example, the two elements cobalt (Co) and nickel (Ni) were put together in just one slot and that too in the column of elements like fluorine, chlorine and bromine which have very different properties from these elements.

(iv) Iron (Fe) element which resembles elements like cobalt and nickel in properties, was placed far away from these elements.

Page Number: 85

Q1. Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements: K, C, Al, Si, Ba

A1. K_2O , CO_2 , Al_2O_3 , SiO_2 , BaO .

Q2. Besides gallium, which other elements have since been discovered that were left by Mendeleev in his periodic table? (any two)

A2. Scandium and Germanium.

Q3. What were the criteria used by Mendeleev in creating his Periodic Table?

A2. Mendeleev used the relationship between the atomic masses of the elements and their physical and chemical properties. He used similarity in physical properties, similarity in the formation of hydrides and oxides of element.

Q4. Why do you think the noble gases are placed in a separate group ?

A4. Noble gases are chemically inert and are present in atmosphere in extremely low concentrations. Therefore, owing to their similar inert behaviour and similar electronic configuration, they are justified to be placed in a separate group.

Page Number: 90

Q1. How could the modern periodic table remove various anomalies of Mendeleev's periodic Table?

- A1. (i) The modern periodic table is based on atomic number, while Mendeleev's periodic table was based on atomic mass.
- (ii) The isotopes of an element have same number of protons (or atomic number). So they are allotted the same position in modern periodic table.
- (iii) Cobalt and nickel are placed at 9th and 10th position respectively.
- (iv) Hydrogen has been allotted special position, i.e., it is placed at the top of alkali metals in the first group.

Q 2. Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

A2. Beryllium (Be) and Calcium (Ca).

Both Be (atomic number 4) and Ca (atomic number 20) have similar electronic configuration, i.e. two electrons in outermost shells.

Be 2,2

Ca 2, 8, 8, 2

Both Be and Ca react with oxygen to give basic oxides, BeO and MgO.

Q3. Name :

(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 outer most shells.

A3. (a) Lithium : Atomic number – 3(2, 1); Sodium : Atomic number – 11(2, 8, 1);
Potassium : Atomic number – 19(2, 8, 8, 1).

(b) Beryllium : Atomic number – 4(2, 2); Calcium : Atomic number – 20
(2, 8, 8, 2)

(c) Helium : Atomic number – 2(2); Neon : Atomic number – 10(2, 8); Argon :
Atomic number – 18(2, 8, 8).

Q 4. (a) Lithium, sodium, 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 unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

A4. (a) Lithium, sodium and potassium all belong to the same group. The atoms of lithium, sodium and potassium all have only one electron in their outermost shells and all of these are metals. All of these react with water to form alkalies.

(b) The atoms of helium and neon have their outermost shells completely filled. Helium has its first shell completely filled, while neon has its first and second shells (K and L) completely filled.

Q 5. In the modern periodic table, which are the metals among the first ten elements?

A5. The first ten elements in modern periodic table are hydrogen, helium, lithium, beryllium, boron, carbon, nitrogen, oxygen, fluorine and neon. Out of these, lithium, beryllium and boron are metals, because they have 1, 2 and 3 electrons respectively in their outermost shells.

Q6. By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristics?

Ga, Ge, As, Se, Be

A6. Beryllium (Be). In the periodic table, the elements placed on the left show maximum metallic characteristics. Since beryllium occupies the most left position in comparison to other elements, hence it shows maximum metallic characteristics.
