

Board – CBSE

Class – 10<sup>th</sup>

Topic – Periodic Classification of Element

1. Did Dobereiner's triads also exist in the columns of Newlands' Octaves? Compare and find out.

**Ans.** Only one triad of Dobereiner's triads exists in the columns of Newlands' octaves. The triad formed by the elements Li, Na, and K of Dobereiner's triads also occurred in the columns of Newlands' octaves.

Dobereiner's triads

Li Ca Cl

Na Sr Br

K Ba I

Newlands' octaves

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	-	-

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

**Ans.** Limitation of Dobereiner's classification-

All known elements could not be classified into groups of triads on the basis of their properties.

3. What were the limitations of Newlands' Law of Octaves?

**Ans.** Limitations of Newlands' law of octaves-

(i) It was not applicable throughout the arrangements. It was applicable up to calcium only. The properties of the elements listed after calcium showed no resemblance to the properties of the elements above them.

(ii) Those elements that were discovered after Newlands' octaves did not follow the law of octaves.

(iii) The position of cobalt and nickel in the group of the elements (F, Cl) of different properties could not be explained.

(iv) Placing of iron far away from cobalt and nickel, which have similar properties as iron, could also not be explained.

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

**Ans.** K is in group 1. Therefore, the oxide will be  $K_2O$ .

C is in group 4. Therefore, the oxide will be  $CO_2$ .

Al is in group 3. Therefore, the oxide will be  $Al_2O_3$ .

Si is in group 4. Therefore, the oxide will be  $SiO_2$ .

Ba is in group 2. Therefore, the oxide will be  $BaO$ .

**5.** Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table? (any two)

**Ans.** Scandium and germanium.

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

**Ans.** Mendeleev's periodic table was based on the observation that the properties of elements are a periodic function of their atomic masses. This means that if elements are arranged in the increasing order of their atomic masses, then their properties get repeated after regular intervals.

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

**Ans.** Noble gases are inert elements. Their properties are different from the all other elements. Therefore, the noble gases are placed in a separate group.

**8.** How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?

**Ans.** Mendeleev was unable to give fixed position to hydrogen and isotopes in the periodic table. In Mendeleev's periodic table, the increasing manner of atomic mass of the elements is not always regular from one to its next. It was believed that a more fundamental property than atomic mass could explain periodic properties in a better manner.

It was Henry Moseley who demonstrated that atomic number of an element could explain periodic properties in a better way than atomic mass of an element and arranged the elements

in increasing order of their atomic numbers. Then it was found that the various anomalies of Mendeleev's periodic table were removed by the modern periodic table.

**9.** Name two elements you would expect to show chemical reactions similar to magnesium.

What is the basis for your choice?

**Ans.** Calcium (Ca) and strontium (Sr) are expected to show chemical reactions similar to magnesium (Mg). This is because the number of valence electrons (2) is same in all these three elements. And since chemical properties are due to valence electrons, they show same chemical reactions.

**10.** 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 outermost shells.

**Ans.** (a) Lithium (Li), sodium (Na), and potassium (K) have a single electron in their outermost shells.

(b) Magnesium (Mg) and calcium (Ca) have two electrons in their outermost shells.

(c) Neon (Ne), argon (Ar), and xenon (Xe) have filled outermost shells.

**11.** (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?

**Ans.** (a) Yes. The atoms of all the three elements lithium, sodium, and potassium have one electron in their outermost shells.

(b) Both helium (He) and neon (Ne) have filled outermost shells. Helium has a duplet in its K shell, while neon has an octet in its L shell.

**12.** In the Modern Periodic Table, which are the metals among the first ten elements?

**Ans.** Among the first ten elements, lithium (Li) and beryllium (Be) are metals.

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

**Ga Ge As Se Be**

**Ans.** Since Be lies to the extreme left-hand side of the periodic table, Be is the most metallic among the given elements.