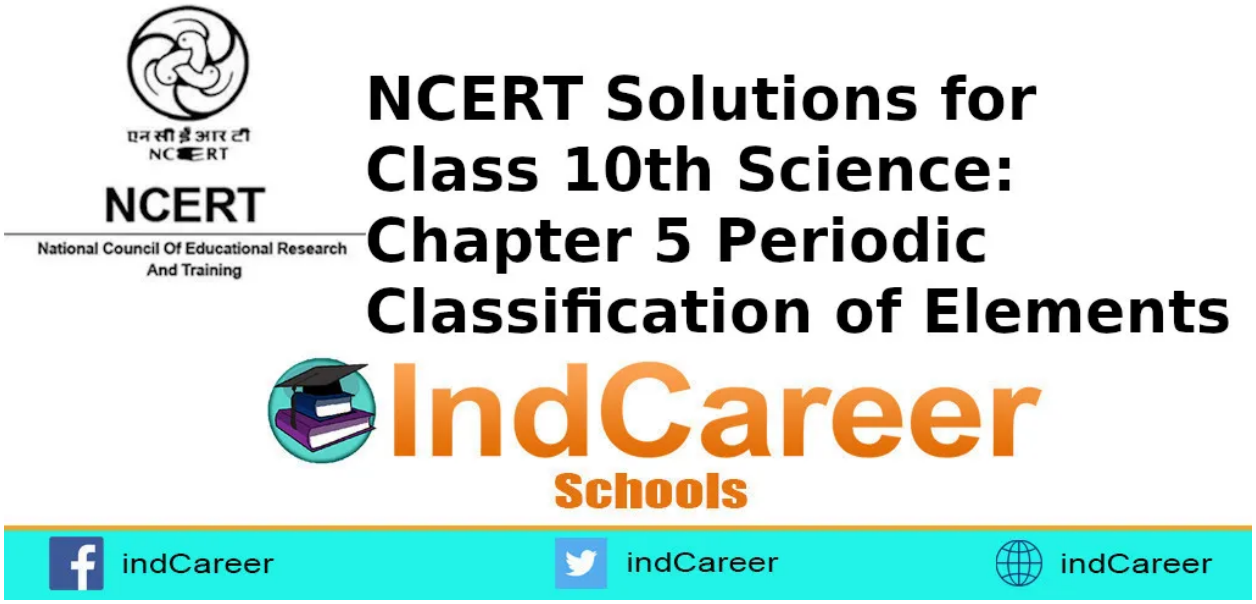

NCERT Solutions for Class 10th Science: Chapter 5 Periodic Classification of Elements

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NCERT Solutions for Class 10th Science : Chapter 5 Periodic Classification of Elements

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

Answer

Yes, Dobereiner's triads also exist in the columns of Newlands' Octaves. One such column is Li, K, Na.

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

Answer

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?

Answer

Limitations of Newlands' law of octaves:

→ 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.

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

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

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

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

Answer

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.

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

Answer

Scandium and germanium.

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

Answer

Mendeleev used atomic mass of the elements as the unique criteria of the elements. He proposed that the chemical properties of elements are the periodic function of their atomic masses. And thus, he arranged the elements in the increasing order of their atomic masses.

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

Answer

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

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

Answer

Various anomalies of Mendeleev's Periodic Table removed as follows in the Modern Periodic Table:

→ Elements are arranged in the increasing order of their atomic number in Modern Periodic Table, thus there was no need for keeping more than one element in one slot.

→ In Modern Periodic Table there was no problem of the place of isotopes, as isotopes have same atomic mass with different atomic numbers.

→ Elements having same valence electron are kept in same group.

→ Elements having same number of shells were put under the same period.

→ Position of hydrogen became clarified in as it is kept in the group with the elements of same valence electrons.

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

Answer

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.

3. 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.

Answer

(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.

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?

Answer

(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.

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

Answer

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

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

Answer

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

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Excercise

1. Which of the following statements is not a correct statement about the trends when going from left to right across the periods of periodic Table.

(a) The elements become less metallic in nature.

(b) The number of valence electrons increases.

(c) The atoms lose their electrons more easily.

(d) The oxides become more acidic.

► (c) The atoms lose their electrons more easily.

2. Element X forms a chloride with the formula XCl_2, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as

(a) Na

► (b) Mg

3. Which element has

(a) two shells, both of which are completely filled with electrons?

(b) the electronic configuration 2, 8, 2?

(c) a total of three shells, with four electrons in its valence shell?

(d) a total of two shells, with three electrons in its valence shell?

(e) twice as many electrons in its second shell as in its first shell?

Answer

(a) Neon

(b) Magnesium

(c) Silicon

(d) Boron

(e) Carbon

4. (a) What property do all elements in the same column of the Periodic Table as boron have in common?

(b) What property do all elements in the same column of the Periodic Table as fluorine have in common?

Answer

(a) Valency equal to 3.

(b) Valency equal to 1.

5. An atom has electronic configuration 2, 8, 7.

(a) What is the atomic number of this element?

(b) To which of the following elements would it be chemically similar? (Atomic numbers are given in parentheses.)

N(7) F(9) P(15) Ar(18)

Answer

(a) The atomic number of this element is 17.

(b) It would be chemically similar to F(9) with configuration as 2, 7.

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6. The position of three elements A, B and C in the Periodic Table are shown below -

Group 16	Group 17
–	–
–	A
–	–
B	C

(a) State whether A is a metal or non-metal.

(b) State whether C is more reactive or less reactive than A.

(c) Will C be larger or smaller in size than B?

(d) Which type of ion, cation or anion, will be formed by element A?

Answer

(a) A is a non-metal.

(b) C is less reactive than A, as reactivity decreases down the group in halogens.

(c) C will be smaller in size than B as moving across a period, the nuclear charge increases and therefore, electrons come closer to the nucleus.

(d) A will form an anion as it accepts an electron to complete its octet.

7. Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more electronegative? Why?

Answer

Nitrogen (7): 2, 5

Phosphorus (15): 2, 8, 5

Since, electronegativity decreases with moving from top to bottom in a group, thus Nitrogen will be more electronegative.

8. How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

Answer

In the modern periodic table, atoms with similar electronic configurations are placed in the same column. In a group, the number of valence electrons remains the same.

Elements across a period show an increase in the number of valence electrons.

9. In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21, and 38. Which of these have physical and chemical properties resembling calcium?

Answer

The element with atomic number 12 has same chemical properties as that of calcium. This is because both of them have same number of valence electrons (2).

10. Compare and contrast the arrangement of elements in Mendeleev's Periodic Table and the Modern Periodic Table.

Answer

Mendeleev's periodic table	**Modern periodic table**
Elements are arranged in the increasing order of their atomic masses.	Elements are arranged in the increasing order of their atomic numbers.
There are 8 Groups.	There are 18 Groups.
Each group are subdivided	Groups are not subdivided

into subgroup 'a' and 'b'	into sub-groups.
Groups for Noble gas was not present as noble gases were not discovered by that time.	A separate group is meant for noble gases.
There was no place for isotopes.	This problem has been rectified as slots are determined according to atomic number.

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