CBSE Test Paper 03

Chapter 05 Periodic Classification of Elements

1. Which of the following elements has maximum metallic character? **(1)**

   a. Li
   b. N
   c. P
   d. Na

2. Which of following statements is not true about hydrogen? **(1)**

   A. Oxides of hydrogen is neutral
   B. it is placed in group 1 and Period 1
   C. It is a metal
   D. It has 1 electron, Proton and neutron

   a. C and D
   b. All of these
   c. B and C
   d. A and C

3. Which one has the bigger size? **(1)**

   a. K
   b. F
   c. Cl
   d. Na

4. Match the following with correct response. **(1)**

Column A	**Column B**
(1) Alkali metals	(A) Magnesium
(2) Alkaline earth metal	(B) Krypton
(3) Halogen	(C) Chlorine

(4) Inert gas	(D) Sodium

a. 1-C, 2-B, 3-D, 4-A
b. 1-A, 2-C, 3-B, 4-D
c. 1-D, 2-A, 3-C, 4-B
d. 1-B, 2-D, 3-A, 4-C

5. Which of the following has maximum atomic size? **(1)**

   a. K
   b. Al
   c. P
   d. Ca

6. Out of Na, Al, Si, P which element exhibits maximum number of valence electrons? **(1)**

7. Which is the first member of noble gas family? **(1)**

8. What is meant by periodicity in properties of elements with reference to periodic table? **(1)**

9. Where are lanthanides and actinides placed in the Modern Periodic table? **(1)**

10. What were the limitations of Newland's law of octaves? **(3)**

11. What is a period? How many periods are present on the Long Form of Periodic Table? **(3)**

12. A salt, when dissolved in water, dissociates into cations and anions as follows:

    $$AB \underset{-H_2O}{\overset{+H_2O}{\rightleftharpoons}} A^+ + B^-$$

    If both the ions consist same number of electrons and the molecular weight of salt is 74.5, then identify the position of A and B in the periodic table. **(3)**

13. Two elements P and Q belong to the 3rd period of the modern periodic table and are in group 1 and group 2, respectively. Compare their following characteristics in

tabular form: **(3)**

i. The number of electrons in their atoms
ii. The sizes of their atoms
iii. Their metallic character
iv. Their tendencies to lose electrons
v. The formula of their oxides
vi. The formula of their chlorides

14. Point out the major defects in the Mendeleev's Periodic Table. **(5)**

15. With reference to the first three periods of the modern periodic table, answer the questions given below. **(5)**

i. Write the formula of the sulphate of the element with atomic number 13.
ii. Consider the following elements:
    Ca, O, Ar, S, Be and He
    Which of the above elements would you expect to be
    a. in group IIA of the periodic table?
    b. in group VIA of the periodic table?
iii. How many electrons are present in the valence shell of the element with atomic number 18?
iv. What is the electronic configuration of the element in the third period which gain one electron to change into an anion?
v. What type of bonding will be present in the oxide of the element with atomic number 1?

CBSE Test Paper 03

Chapter 05 Periodic Classification of Elements

Answers

1. d. Na

   Explanation: Of all the elements given, Na is at the extreme left of the periodic table and as we move down in a group the metallic character of elements is maximum.

2. a. C and D

   Explanation: Hydrogen has an anomalous behaviour, it can behave as a metal as well as a non-metal.

   It has 1 electron and 1 proton but no neutrons.

3. a. K

   Explanation: The elements on the extreme left of the periodic table have the largest size.

   K, being on the extreme left of all the elements given have the largest size as on moving from left to right in a period, the size of atoms decreases.

4. c. 1-D, 2-A, 3-C, 4-B

   Explanation: Sodium is a group 1 element and all the elements of group 1 are commonly called as Alkali metals.

   Magnesium is a group 2 element and all the elements of group 2 are commonly called as Alkaline earth metals.

   Chlorine is a group 17 element and all the elements of group 17 are commonly called as Halogens.

   Krypton is a group 18 element and all the elements of group 18 are commonly called as inert gases.

5. a. K

   Explanation: On moving from left to right in a period of the periodic table, the size of atoms decreases. Therefore, of all the options K is at the extreme left side so it has the maximum atomic radii.

6.

Element	Na	Al	Si	P
Atomic number	11	13	14	15
Electronic configuration	2,8,1	2,8,3	2,8,4	2,8,5

Therefore, P contains maximum valence electrons i.e.5.

7. Helium (He) is the first member of the noble gas family. All members of the noble gas family have completely filled valence orbitals and are generally stable and chemically inert under normal conditions.

8. The repetition of similar properties after a definite interval is called periodicity in properties.

9. Lanthanides and actinides are placed separately at the bottom of the periodic table. Lanthanides and actinides are in periods 6 and 7, respectively. Generally, they are placed underneath the periodic table. The lanthanides are between Barium and Hafnium. The actinides are between Radium and Rutherfordium.

10. i. It is applicable upto calcium only.
    ii. Sometimes two elements were put in the same slot.
    iii. After the discovery of noble gas, law of octave is not valid.
    iv. This classification was good with a few elements only, and was not applicable to all elements. It was not valid for elements having atomic masses higher than Ca.
    v. Newland's octave law gave a very important term of periodicity which was repeated in further classifications.

11. Horizontal rows in the periodic table are called periods and vertical columns in the table are called groups. Elements in the modern periodic table are arranged in 7 periods and 18 groups.

12. The given salt AB is completely ionised to give A^+ and B^- ions. Ionic bond is present between the ions. Since, both the ions, i.e. cation and anion contain of same number of electrons and has +1 and -1 charges, hence the ions should belong to group IA and group VIIA. Same number of electrons indicates that their electronic configuration is same as that of a noble gas whose atomic number lies between that of the two

elements A and B. Dividing the molecular weight (which is sum of atomic masses of A and B) by 2, we get the rough idea about the atomic mass of the noble gas which is $\frac{74.5}{2}$ = 37.25, i.e., nearest to argon (Ar = 40).

Hence, A is Potassium (group IA, 4^{th} period) and element B is Chlorine (group VII A, 3^{rd} period).

13. Suppose P and Q the first two elements of 3rd period. We can guess the electronic cofiguration and name of the element based on its position in the periodic table. The element P is sodium (Na) with atomic number 11 and electronic configuration 2,8,1 and element Q is magnesium (Mg) with atomic number 12 and electronic configuration 2,8,2.

    Then comparison of their characteristics is as follows:

Characteristics	P	Q
(i) The number of electrons	11	12
(ii) Sizes of atoms	larger	Smaller
(iii) Metallic character	Higher	Lesser
(iv) Tendencies to lose electrons	Higher	Lower
(v) Formula of their oxides	P_2O	QO
(vi) Formula of their chlorides	PCI	QCl_2

14. **Defects in Mendeleev's Periodic Table**

    The Mendeleev's periodic table was quite helpful in the classification of the elements. But it had certain defects also. These are discussed as follows:

    i. **Position of hydrogen:** Hydrogen was placed at the top of group IA. It is a non-metal where all other elements included in the group are metals.
    ii. **Position of isotopes:** The periodic table is based on the basis of the atomic masses of the elements. This means that the elements with different atomic masses must be given separate place in the table. If this is correct, all the isotopes of an element must be allotted separate positions. For example, there are three

isotopes for hydrogen and they must be given three separate places in the table. But only one position for hydrogen has been given.

iii. **Wrong order of atomic masses of some elements:** In the table, the elements are arranged in order of increasing atomic masses. This means that the element with higher atomic mass must be placed after the element with the lower atomic mass. But in the table, there are some anomalies. For example, Co (Cobalt) with atomic mass 58.9 should be placed after Ni (Nickel) with atomic mass 58.7. But it has been placed before nickel.

iv. **Elements with similar properties placed in different groups:** In the periodic table, it has been found that the elements with similar properties are placed in different groups. For example, copper and mercury have many common properties. But copper has been placed in group I B and mercury in group II B.

v. **No similarity in the elements placed in sub-groups:** The elements present in different sub-groups of the same group are expected to have common properties. But these are quite different. For example, elements in group 1 A are very soft and reactive metals but element in group I B are hard and less reactive in nature.

vi. **No explanation for the cause of periodicity**: Mendeleev was not in a position to explain why the elements included in a group show similar properties.

vii. **Position of lanthanides and actinides**: Both these families have fourteen elements each, but they could not find proper positions in the main set up of the Mendeleef's periodic table. Instead, these elements have been placed in two separate rows at the bottom of periodic table without assigning a proper reason.

15. i. Element with atomic number 13 is Al. The electronic configuration of Al is 2,8,3. Its valency is 3. It will form Al^{3+}. The formula of sulphate is SO_4^{2-}.
Therefore, Formula of sulphate of Al is $Al_2(SO_4)_3$

ii.

Element	Ca	O	Ar	S	Be	He
At. No.	20	8	18	16	4	2
Electronic configuration	2,8,8,2	2,6	2,8,8	2,8,6	2,2	2

It is clear from above table that Ca and Be has 2 valence electrons (Helium is

exception because it attains stable electronic configuration). So, Ca and Be belongs to group IIA (a). On the other hand, O and S has 6 valence electrons, So they belong to group VIA (b) O and S

iii. The element with atomic number 18 is Argon (Ar). The electronic configuration of Ar is 2,8,8. Therefore, it has 8 valence electrons.

iv. According to question, The element belongs to 3rd period which gain one electron to change into an anion is Cl. The electronic configuration of Cl is 2, 8, 7.

v. Element with Atomic number 1 is Hydrogen. It has only one electron in valence shell. The atomic number of oxygen is 8 having electronic configuration 2,6. Oxygen will share its 2 electrons with 2 hydrogen atoms to form water H_2O molecule. The oxide of hydrogen is Covalent bonding.