

# *SCIENCE*

**CLASS 10 PERIODIC CLASSIFICATION OF  
ELEMENTS SCIENCE CHAPTER 5 important  
questions WITH ANSWERS**

*CLASS 10*

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### **1. State Mendeleev's Periodic law.**

**Answer:**

Mendeleev's periodic law states that the properties of elements are periodic function of their atomic masses.

### **2. Why did Mendeleev leave some gaps in the Periodic table?**

**Answer:**

Mendeleev left some gaps in the periodic table for yet to be discovered elements. Mendeleev predicted the properties of these elements on the basis of their positions. For example, he predicted the properties of gallium (eka-aluminium) and germanium (eka-silicon) which were unknown at that time.

**3. If the letter 'R' was used to represent any of the elements in the group, then the hydride and oxide of carbon would respectively be represented as**

- (a)  $\text{RH}_4, \text{RO}$
- (b)  $\text{PH}_4, \text{RO}_2$
- (c)  $\text{RH}_2, \text{RO}_2$
- (d)  $\text{RH}_2, \text{RO}$

**Answer:**

(b)  $\text{CH}_4$  is written for hydride and  $\text{CO}_2$  is written for oxide of carbon.

#### **4. Isotopes are**

**Isotopes have same atomic number, hence similar chemical properties and different atomic masses.**

#### **5. How many metals are present in second period of periodic table?**

**Answer: Two metals (lithium and beryllium) are present in second period of periodic table.**

#### **6. On the basis of electronic configuration of ${}^9_5\text{X}$ the group number and period of the element 'X' is**

**For element X of atomic number 5, the electronic configuration is 2,3. So, it has 3 valence electrons and hence it belongs to group 13. As five electrons are filled in two shells, so it belongs to 2nd period.**

#### **7. An element 'X' with atomic number 11 forms a compound with element 'Y' with atomic number 8. The formula of the compound formed is..**

**The electronic configuration of X is 2, 8, 1. Hence, it belongs to group 1. Its valency is 1.**

**The electronic configuration of Y is 2, 6. Hence, it belongs to group 16. Its valency is 2**

#### **8. Define electro positivity.**

**Answer:**

**Electropositivity is the measure of the ability of elements (mainly metals) to donate electrons to form positive ions.**

**9. Consider the following statements about an element 'X' with number of protons 13.**

**(A) It forms amphoteric oxide.**

**(B) Its valency is three.**

**(C) The formula of its chloride is  $XCl_3$ .**

**The correct statements is/are**

**(a) only (A)**

**(b) only (B)**

**(c) (A) and (C)**

**(d) (A), (B) and (C).**

**Answer:**

**(d) The number of protons in X is 13. Hence, its atomic number is 13. The electronic configuration of X is 2, 8, 3. Hence, it is a group 13 element i.e., X is aluminium. Aluminium forms amphoteric oxide, its valency is 3 and formula of aluminium chloride is  $AlCl_3$ .**

**10. Write the number of valence electrons present in a nitrogen atom  $^{14}_7N$ .**

**The atomic number of nitrogen is 7. Its electronic configuration is 2, 5. The number of valence electrons in it is five.**

**11. Write the number of vertical columns in the Modern Periodic Table. What are these columns called?**

**Answer:**

**There are 18 vertical columns in the Modern periodic table which are called groups.**

**12. Write the number of horizontal rows in the Modern Periodic Table. What are these rows called? Answer: There are seven horizontal rows of elements in the Modern periodic table which are known as periods.**

**13. Write any one difference in the electronic configurations of group 1 and group 2 elements. (Delhi 2014)**

**Answer: Group 1 elements have one electron in their outermost shell while group 2 elements have two electrons in their outermost shell.**

**14. List any two properties of the elements belonging to the first group of the Modern Periodic Table.**

**Answer: Two properties of the elements belonging to the first group:**

**(i) As the elements belong to group 1, so they have one electron in their outermost shell hence, valency of these elements is one.**

**(ii) Alkali metals (group 1 elements) are electropositive in nature.**

**15. Write the atomic numbers of two elements 'X' and 'Y' having electronic configurations 2, 8, 2 and 2, 8, 6 respectively.**

**Answer: Electronic configuration of X = 2, 8, 2**

**∴ Atomic number =  $2 + 8 + 2 = 12$  Similarly, Electronic configuration of Y = 2, 8, 6**

**∴ Atomic number =  $2 + 8 + 6 = 16$**

**16. The atomic numbers of three elements A, B and C are 12, 18 and 20 respectively. State giving reason, which two elements will show similar properties.**

**Answer: Atomic number of A = 12**

**∴ Electronic configuration = 2, 8, 2                      Similarly, for B(18) = 2, 8, 8**

**for C(20) = 2, 8, 8, 2**

**As elements A and C contain two valence electrons in their outermost shell (group-2) they will show similar properties.**

**17. State the Modern periodic law of classification of elements.**

**Answer:**

**Modern periodic law states that the physical and chemical properties of elements are the periodic function of their atomic numbers.**

**18. Out of the three elements P, Q and R having atomic numbers 11, 17 and 19 respectively, which two elements will show similar properties and why?**

**Answer: Atomic number of P = 11 Electronic configuration of P = 2, 8, 1 Electronic configuration of Q(17) = 2, 8, 7 and for R(19) = 2, 8, 8, 1**

**Thus, from electronic configurations of P and R, it is observed that they belong to group 1 as both have one valence electron and have valency equal to 1. Thus, P and R will have similar properties.**

**19. Write the formula used to determine the maximum number of electrons which a shell in an atom can accommodate.**

**Answer:**

**The maximum number of electrons that can be accommodated in a shell, is given by the formula  $2n^2$ , where 'n' is the number of the shell.**

**20. How it can be proved that the basic structure of the Modern Periodic Table is based on the electronic configuration of atoms of different elements?**

**Answer:**

**Electronic configuration of an element decides its position in Modern periodic table.**

**Lets take an example of sodium (Na).**

**Atomic number of sodium = 11**

**Thus, electronic configuration of Na = 2, 8, 1 As Na contains 1 electron in its outermost shell, it belongs to group 1. Sodium contains 3 shells so, it belongs to period number 3.**

**Thus, we can conclude that**

**Group number = Number of valence electrons**

**(When valence electrons are 1 and 2) and group number = 10 + valence electrons**

**(When valence electrons are 3 and above) Period number = Number of shells in which electrons are filled.**

**21. The electronic configuration of an element is 2, 8, 4. State its**

**(a) group and period in the Modern Periodic Table.**

**(b) name and write its one physical property.**

**Answer:**

**(a) The element belongs to group 14 and 3rd period of the Modern Periodic Table.**

**(b) The element is silicon. It is non-lustrous.**

**22. An element X has atomic number 13 :**

**(a) Write its electronic configuration.**

**(b) State the group to which 'X' belongs?**

**(c) Is 'X' a metal or a non-metal?**

**(d) Write the formula of its bromide.**

**Answer:**

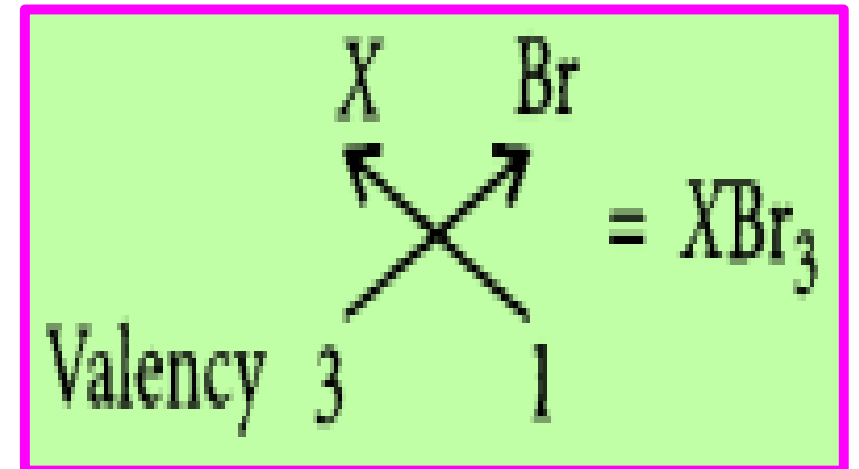
**X has atomic number = 13**

**(a) Electronic configuration of X = 2, 8, 3**

**(b) As X contains 3 valence electrons in its outermost shell, it belongs to group 13.**

**(c) X is a metal as it contains 3 valence electrons which can be lost easily.**

**(d) Formula of X with bromine will be.**





**23. How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9(nine)?**

**Answer:**

**Valency of an element is determined by the number of electrons present in its outermost shell. For elements having outermost electrons 1 to 4, valencies are equivalent to their respective valence electrons.**

**For elements having outermost electrons 5 to 8, valency is calculated as;**

**Valency = 8 – (Number of valence electrons)**

**For element having atomic number = 9**

**Electronic configuration = 2, 7**

**Valency = 8 – 7 = 1.**

**24. How does the valency of elements vary (i) in going down a group, and (ii) in going from left to right in a period of the periodic table?**

**Answer:**

**(i) When we go down the group the valency of elements remains same.**

**(ii) When we move along the period from left to right, the valency of elements first increases and then decreases.**

**25. In the periodic table, how does the tendency of atoms to lose electrons change on going from**

**(i) left to right across a period? (ii) top to bottom in a group?**

**Answer:**

**(i) Tendency of atoms to lose electrons decreases from left to right in a period due to increase in effective nuclear charge.**

**(ii) Tendency of atoms to lose electrons increases down the group due to increase in atomic radii.**

**26. What is meant by periodicity of properties of elements? Why are the properties of elements placed in the same group of the periodic table similar?**

**Answer:**

**When elements are arranged in increasing order of their atomic numbers, elements with similar chemical properties are repeated at definite intervals. This is known as periodicity of properties of elements.**

**Elements placed in the same group of the periodic table have similar properties because they have same number of outermost electrons and hence, show same valency. Thus, they all will form similar type of compounds.**

**27. Write the number of periods and groups in the Modern Periodic Table. How does the metallic character of elements vary on moving (i) from left to right in a period, and (ii) down a group? Give reason to justify your answer.**

**Answer:**

**In the Modern periodic table, there are 18 vertical columns called groups and 7 horizontal rows called periods.**

**Trend of metallic character :**

**(i) Along the period from left to right: Metallic character of elements decreases as we move from left to right in a period. Metallic character depends on the electropositive character (tendency to loose electrons) of the elements. As we go across the period from left to right, one electron is added to same shell at every stage which increases the effective nuclear charge and hence, valence electrons becomes more and more closer to the nucleus. Due to this, the tendency of atoms to loose valence electrons and form positive ions decreases. Hence, electropositive character decreases resulting in decrease of metallic character.**

**(ii) Down the group : Metallic character of elements increases on moving down the group as the electropositive character increases down the group.**

**28. Na, Mg and Al are the elements of the 3rd periods of the Modern Periodic Table having group number 1, 2 and 13 respectively. Which one of these elements has the (a) highest valency, (b) largest atomic radius, and (c) maximum chemical reactivity? Justify your answer stating the reason for each.**

**Answer: Period number of Na, Mg and Al = 3 . Group numbers of Na, Mg and Al are 1, 2 and 13 respectively. (a) Aluminium (Al) will show highest valency of +3 as it belongs to group number 13 (valency =  $13 - 10 = 3$ ). Moreover, along the period from left to right valency first increases to maximum (+4) and then decreases.**

**(b) Sodium (Na) will have the largest atomic radius because as we move along the period from left to right, the atomic radius decreases.**

**(c) Sodium (Na) will have maximum chemical reactivity because as we move along the period from left to right, chemical reactivity of metals decreases.**

**29. The atomic number of an element X is 19.**

**(a) Write its electronic configuration.**

**(b) To which period of the Modern Periodic Table does it belong and what is its valency?**

**(c) If 'X' burns in oxygen to form its oxide, what will be its nature – acidic, basic or neutral? Write balanced chemical equation for the reaction when this oxide is dissolved in water.**

**Answer: Atomic number of X = 19**

**(a) Electronic configuration of X = 2, 8, 8, 1**

**(b) X has four shells so, the period number of X = 4. Moreover, it has one electron in its outermost shell, so the valency of X will be equal to one.**

**(c) Electronic configuration of X shows that it is a metal and metals form basic oxides.**

**(d) When oxide of X is dissolved in water then its hydroxide will be formed.**



**30. How does the tendency of the elements to lose electrons change in the Modern Periodic Table in (i) a group, (ii) a period and why? (Foreign 2016)**

**Answer: (i) Tendency of the elements to lose electrons increases down the group. The reason being that at each succeeding element down a group, the number of shells increases. So, the distance of the valence shell from the nucleus increases due to which the effective nuclear charge decreases on the last shell of electrons. So, it becomes easier for the atom to lose electrons.**

**(ii) Tendency of the elements to lose electrons decreases in a period from left to right. The reason being that as the electron enters to the same shell at each successive element the effective nuclear charge on the valence shell electron increases, the attraction between the valence electrons and nucleus increases so, it becomes difficult to lose electrons.**

**31. (a) Define the following terms :**

**(i) Valency; (ii) Atomic size**

**(b) How do the valency and the atomic size of the elements vary while going from left to right along a period in the Modern Periodic Table? (Delhi 2014)**

**Answer:**

**(a) (i) Valency: It is defined as the combining capacity of the element which is determined by the number of valence electrons present in the outermost shell of its atom.**

**(ii) Atomic size : It is defined as the distance between the centre of the nucleus and the outermost shell of an isolated atom.**

**(b) On moving from left to right in the period, the valency of elements increases from 1 to 4 and then decreases to 0.**

**This is because the elements in a period do not have the same number of valence electrons hence, they do not show same valency.**

**The atomic size decreases on moving from left to right along a period due to increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom**

**32. What is meant by 'group' in the Modern Periodic Table? How do the following change on moving from top to bottom in a group?**

**(i) Number of valence electrons.**

**(ii) Number of occupied shells.**

**(iii) Size of atoms.**

**(iv) Metallic character of elements.**

**(v) Effective nuclear charge experienced by valence electrons. (AI 2014)**

**Answer: The vertical columns in the Modern periodic table are called groups. There are total 18 groups in the Modern periodic table.**

**(i) In a particular group, the number of valence electrons remains the same.**

**(ii) On moving down the group, there is addition of an extra shell successively. Hence, number of occupied shells increases.**

**(iii) Due to addition of extra shells down the group, the size of the atoms i.e., the distance between nucleus and the outermost shell also increases.**

**(iv) Down the group as atomic size increases, the outermost electron is pulled by nucleus to lesser extent and hence, tendency to lose electrons increases i.e., metallic character increases.**

**(v) Effective nuclear charge experienced by valence electrons decreases down the group due to increase in size of atoms.**

**33. The elements Be, Mg and Ca each having two electrons in their outermost shells are in periods 2, 3 and 4 respectively of the Modern Periodic Table. Answer the following questions, giving justification in each case:**

- (i) Write the group to which these elements belong.**
- (ii) Name the least reactive element.**
- (iii) Name the element having largest atomic radius.**

**Answer:**

**(i) As Be, Mg and Ca have two electrons in their outermost shell so, they all belong to group 2.**

**(ii) Be will be least reactive element, as down the group the reactivity of the metals increases. Be being smaller in size as compared to others will have less tendency to loose electrons and hence, is less reactive.**

**(iii) As we move down the group, atomic radius increases hence, calcium will have the largest atomic radius.**



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