Classification of Elements and Periodicity in Properties

CHAPTER 3

TRY YOURSELF — ANSWERS

1. Mendeleev's periodic law states that, "the physical and chemical properties of elements are the periodic function of their atomic weights, *i.e.*, when the elements are arranged in order of their increasing atomic weights, elements with similar properties are repeated after a certain regular intervals."

2. Defects of the Mendeleev's periodic table :

(i) Position of hydrogen could not made clear.

(ii) In Mendeleev's periodic table, position of isotopes was not fixed.

(iii) Some elements with higher atomic weight are placed before the elements with lower atomic weight. For example, Ar (atomic weight = 39.9) preceeds K(atomic weight = 39.1), Co(atomic weight - 58.9) preceeds Ni(atomic weight = 58.7) and Te(atomic weight = 127.6) preceeds I(atomic weight = 126.9).

(iv) Position of lanthanoids and actinoids is also anomalous in Mendeleev's periodic table.

3. Atomic mass of Y $= \frac{\text{Atomic mass of } X + \text{Atomic mass of } Z}{2} = \frac{7+39}{2} = 23$

4.

Atomic number	Name	Symbol
122	Unbibium	Ubb
135	Untripentium	Utp
150	Unpentnilium	Upn

5. Lanthanides and actinides have been placed separately at the bottom of the periodic table for convenience. If they are placed within the body of the periodic table, the periodic table will become extremely long and cumbersome.

6. Ce ($Z = 58$), Lu ($Z = 71$)

7.

Atomic number	IUPAC name	Symbol	Outermost shell electronic configuration	Group
119	Ununennium	Uue	$8s^1$	1st (alkali metal)
120	Unbinilium	Ubn	$8s^2$	2nd (alkaline earth metal)

8. Electronic configuration of the element with atomic number 50 is [Kr] $4d^{10}\ 5s^2\ 5p^2$. Hence, it is a *p*-block element. Electronic configuration of the element with atomic number 75 is [Xe] $4f^{14}\ 5d^5\ 6s^2$. Hence, it is a *d*-block element.

9. Transition elements : Re, Ir, Pt, Os, Hf
Inner transition elements : Sm, Bk, Nd, Dy, Tm

10. The electronic configuration of the element $Z = 113$ is [Rn] $7s^2\ 5f^{14}\ 6d^{10}\ 7p^1$
$\therefore$ Period number = 7
Group number = 3 + 10 = 13

11. Elements which contain 1 to 3 electrons in their outermost shell are metals while elements containing 4 to 7 electrons in their outermost shell are non-metals.

12. Metals : Na, Ca, Cs, Fr
Non-metals : Br, F, O, C
Metalloids : Si, As, Sb

13. The general electronic configuration of alkali metals is ns^1. By losing one electron, they acquire stable noble gas configuration. It is very difficult to remove an electron from stable noble gas configuration, thus a large amount of energy is required. Therefore, second *I.E.* of alkali metals have higher values.

14. Given, mass of chlorine = 7.1 g

No. of moles of chlorine $= \frac{7.1}{35.5} = 0.2\,\text{mol}$

Now, energy produced on conversion of 0.2 mole of $Cl_{(g)}$ to Cl^- = 3.7 × 96.48 × 0.2 = 71.4 kJ

(1 eV = 96.48 kJ/mol)

15. Electronegativity increases along a period and decreases down a group. Hence, the increasing order of electronegativity is Si < P < C < N

16. Cl^- has 18 electrons. So, its isoelectronic species are K^+, Ar, Ca^{2+}, P^{3-}, S^{2-}.
Mg^{2+} has 10 electrons. So, its isoelectronic species are, Na^+, Al^{3+}, F^-, O^{2-} and N^{3-}.

17. Lithium is larger in size than fluorine because it has smaller effective nuclear charge than fluorine. On moving from left to right in a period, atomic size decreases.

18. Due to high negative electron gain enthalpy, halogens act as good oxidising agents as they can gain electrons easily.

19. Metallic character (i) increases down a group and (ii) decreases along a period.

20. Electropositive character indicates the tendency of an atom to give an electron to form cation. It varies directly with atomic radii. Thus, the decreasing order of electropositive character is Ca > Mg > Be.

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