QB365 Question Bank Software Study Materials

Periodic Classification of Elements Important 2 Marks Questions With Answers (Book Back and Creative)

11th Standard

Chemistry

Total Marks : 60

2 Marks

30 x 2 = 60

1) What are isoelectronic ions? Give examples.

Answer : Ions of different elements having the same number of electrons are called iso electronic ions.

Ions of different elements	Na^{+}	Mg^{+2}	Al^{+3}	F^{-}	O^{2-}	N^{3-}
No. of electrons	10	10	10	10	10	10

2) What is effective nuclear charge?

Answer : The net nuclear charge experienced by valence electrons in the outermost shell is called the effective nuclear charge.

Z_{eff}=Z-S

Where Z is the atomic number and 'S' is the screening constant.

3) Is the definition given below for ionisation enthalpy correct?

"Ionisation enthalpy is defined as the energy required to remove the most loosely bound electron from the valence shell of an atom.

Answer : No the above definition is incorrect. The correct definition is Ionization energy is defined as the minimum amount of energy required to remove the most loosely bound electron from the valence shell of the isolated neutral gaseous atom in its ground state.

4) Magnesium loses electrons successively to form Mg^{+}, Mg^{2+} and Mg^{3+} ions. Which step will have the highest ionisation energy and why?

Answer : $Mg + I.E_1 \longrightarrow Mg^{+} + 1e^{-}$ .....(i)

$Mg^{+} + I.E_2 \longrightarrow Mg^{2+} + 1e^{-}$ ....(ii)

$Mg^{2+} + I.E_3 \longrightarrow Mg^{3+} + 1e^{-}$ ....(iii)

(i) The step (iii) which involves the formation of Mg^{3+} requires higher ionisation energy.

(ii) Mg^{2+} consist of 10 electrons (2, 8) attaining the stable noble gas configuration of argon (Z = 10).

(iii) Since the valence orbital is completely filled, more energy will be required to remove electrons.

5) Define electro negativity.

Answer : It is defined as the relative tendency of an element present in a covalently bonded molecule, to attract the shared pair of electrons towards itself.

6) How would you explain the fact that the second ionisation potential is always higher than first ionisation potential?

Answer : The total number of electrons are less in the cation than the neutral atom while the nuclear charge remains the same. Therefore the effective nuclear charge of the cation is higher than the corresponding neutral atom. Thus the successive ionisation energies, always increase in the following order

$IE_1 < IE_2 < IE_3 < .....$

7) Give the general electronic configuration of lanthanides and actinides.

Answer : Lanthanides: $[_{54}Xe]\ 4f^{1-14}\ 5d^{1}\ 6s^{2}$

Actinides : $[_{86}Rn]\ 5f^{0-14}6d^{0-2}\ 7s^{2}$

8) What is the basic difference in approach between Mendeleev's periodic table and modern periodic table?

Answer : The main basic difference between Mendeleev's periodic table and modem periodic table is that first one is constructed on the basis of atomic weight and the later is constructed on the basis of atomic number.

9) The element with atomic number 120 has not been discovered so far. What would be the IUPAC name and the symbol for this element? Predict the possible electronic configuration of this element.

Answer : Atomic number: 120

IUPAC temporary symbol: Unbinilium

IUPAC temporary symbol: Ubn

Possible electronic configuration :[Og] $8s^2$

10) Predict the position of the element in periodic table satisfying the electronic configuration $(n-1)d^2$, ns^2 where n =5

Answer : Electronic Configuration: $(n - 1)d^2\ ns^2$

for n = 5, the electronic configuration is,

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 4d^2\ 5s^2$

Atomic number: 40

4^{th} group 5^{th} period (d block element) = Zirconium

11) The first ionisation energy (lE_1) and second ionisation energy (lE_2) of elements X, Y and Z are given below.

Element	IE_1(kJ mol^{-1})	IE_2(kJ mol^{-1})
X	2370	5250
Y	522	7298
Z	1680	3381

Which one of the above elements is the most reactive metal, the least reactive metal and a noble gas?

Answer : **Noble gases**: Ioniation energy ranging from 2372 $KJmol^{-1}$ to 1037 kJ mol^{-1}.

For element X, the IE_1 value is in the range of noble gas, moreover for this element both IE_1 and IE_2 are higher and hence X is the noble gas.

For Y, the first ionisation energy is low and second ionisation energy is very high and hence Y is most reactive metal. For Z, both IE_1 and IE_2 are higher and hence it is least reactive.

12) The electron gain enthalpy of chlorine is 348 kJ mol^{-1}. How much energy in kJ is released when 17.5 g of chlorine is completely converted into Cl^- ions in the gaseous state?

Answer : $Cl(g) + e^- \longrightarrow Cl^-(g)$ AH = 348 kJ mol^{-1}

For one mole (35.5g) 348 kJ is released.

$\therefore$ For 17.5 g chlorine, $\frac{348\ kJ}{35.5\ \not{g}} \times 17.75\ \not{g}$ energy leased.

$\therefore$ The amount of energy released $= \frac{348}{2} = 174$ kJ

13) Define modern periodic law.

Answer : The modem periodic law states that, "the physical and chemical properties of the elements are periodic functions of their atomic numbers."

14) Explain how will you find the atomic number of an element from the frequency of X-rays emitted by an element.

Answer : Mosley's relationship is given as $\sqrt{v}$ = a (Z - b) where v is the frequency of X-rays emitted by an element of atomic number Z.

The plot of IV against Z gives a straight line. Using. this relationship, we can determine the atomic number of an unknown (new) element from the frequency of X-ray emitted.

15) Mention the characteristics of 's' block elements.

Answer : These are soft metals and possess low melting and boiling points with low ionisation enthalpies. They are highly reactive and form ionic compounds. They are highly electropositive in nature and most of the elements imparts colour to the flame.

16) Mention the characteristics of 'd' block elements.

Answer : These elements also show more than one oxidation state and form ionic, covalent and coordination compounds. They can form interstitial compounds and alloys which can also act as catalysts. These elements have high melting points and are good conductors of heat and electricity

17) How does ionisation energy vary in a group?

Answer : The ionisation energy decreases down a group. Down a group, the valence electron occupies new shells, the distance between the nucleus and the valence electron increases. So, the nucleat forces of attraction on valence electron decreases and hence ionisation energy also decreases. down a group.

18) Explain Pauling method of determining electronegativity of element.

Answer : Pauling, assigned arbitrary value of electronegativities for hydrogen and fluorine as 2.2 and 4.0 respectively. Based 'on this the electronegativity values for other elements can be calculated using the following expression $(x_A - x_B) = 0.182$

$\sqrt{E}_{AB} - (E_{AA} * E_{BB})$

Where E_{AB}, $E_{AA}$and E_{BB} are the bond dissociation energies of AB, A_2 and B_2 molecules respectively.

19) Explain the term valence or oxidation state. How does it vary in a period and in group?

Answer : The valence of an atom primarily depends on the number of electrons in the valence shell. As the number of valence electrons remains same for the elements in same group, the maximum valence also remains the same. However, in a period the number of valence electrons increases, hence the valence also increases.

20) Account for the difference in size of Na +(95 pm) and Mg^{+2}(65pm) both of which have the same noble gas configuration

Answer : The nuclear charge in Mg^{+2} is more than Na+ and therefore electrons are drawn more closely, and hence size decreases

21) Which of the following will have the most electron gain enthalpy and which the least electro negative? P, S, CI, F Explain your answer

Answer : Electron gain enthalpy becomes more negative down a period. CI > S > P. Electron gain enthalpy becomes less negative down a group. However, adding an electron to 2p orbital leads to greater repulsion due to high electron density than adding an electron to a larger 3p orbital. Hence, chlorine is more negative electron gain enthalpy than fluorine. Therefore, phosphorous has least electron gain enthalpy and chlorine has the most electron gain enthalpy.

22) Give the IUPAC names and symbols of the following elements with atomic numbers 123, 126, 134, 148, 150

Answer :

ATOMIC NUMBER	NAME	SYMBOL
123	Unbitrium	Ubt
126	Unbihexicum	ubh
134	Untriquadium	Utq
148	Unquadoctium	Uqo
150	Unpentnilium	Upn

23) Calculate the screening constant in Zinc for

(i) 4s electron

(ii) for a 3d electron.

The electronic configuration of Zinc (30) is $(ls)^2$ $(2s, 2p)^8$ $(3s,3p)^8$ $(3d^{10})$ $(4s)^2$

Answer : (i) σ = 1 x 0.35 + 18 x 0.85 + 10 x 1 = 25.65

(ii) σ = 9 x 0.35 +18 x 1.0 = 21.15

24) What are periodic properties? Give example

Answer : The term periodicity of properties indicates that the elements with similar properties reappear at certain regular intervals of atomic number in the periodic table.

Example:

(i) Atomic radius

(ii) Ionisation energy

(iii) Electron affinity

iv) Electronegativity.

25) Explain about the period variation of electronegativity along a group.

Answer : As we move down from top to bottom in a group, electronegativity decreases due to increased atomic radius. Fluorine has the highest value of electronegativity among all the elements.

26) Define valency. How is it determined?

Answer : The valency of an element may be defined as the combining capacities of elements. The electrons present in the outermost shell are called valence electrons and these electrons determine the valency of the atom.

27) Would you expect the first ionization enthalpies of two isotopes of the same element to be the same or different? Justify your answer.

Answer : Ionization enthalpy, among other things, depends upon the electronic configuration (number of electrons) and nuclear charge (number of protons). Since isotopes of an element have the same electronic configuration and same nuclear charge, they have same ionization enthalpy.

28) ln each period halogen has high EA. Why?

Answer : Halogens having the general electronic configuration of ns^2, np^5 readily accept an electron to get the stable noble gas electronic configuration ($ns^{2,}$ np^6), and therefore in each period the halogen has high electron affinity. (high negative values).

29) Compare the IE and metallic nature of the elements located in the lower left portion and the top right portion of the periodic table?

Answer : The ionisation energy is directly related to the metallic character and the elements located in the lower left portion of the periodic table have less ionisation energy and therefore show metallic character. On the other hand the elements located in the top right portion have very high ionisation energy and are non-metallic in nature.

30) How does the EA vary down a group? Why?

Answer : As we move down a group, generally the electron affinity decreases. It is due to increase in atomic size and the shielding effect of inner shell electrons.