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Jars Education

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Time : 1 Hour 15 Minute

STD 11 Science Chemistry
Chapter Based Test

Total Marks : 40

SECTION A

*** Choose The Right Answer From The Given Options.[1 Marks Each]** **[6]**

1. Identify the electronic configuration of an element whose atomic radii is determined by taking half the internuclear distance between like atoms.

   (A) [He]$2s^2$2p5 (B) [Ar]$4s^2$

   (C) [Ne]$3s^2$ (D) [Kr]$4d^5 5s^2$

2. The oxide formed by the element on extreme right and in the left of periodic table are generally:

   (A) Acidic, amphoteric respectively. (B) Acidic, basic respectively.

   (C) Neutral, amphoteric respectively. (D) Basic, neutral respectively.

3. The alkaline earth metal which shows properties similar to aluminium is:

   (A) Ca (B) Be (C) Sr (D) Ba

4. Identify the property which does not reflect the periodicity of the elements.

   (A) Bonding behaviour (B) Electronegativity

   (C) Ionization potential (D) Neutron-proton ratio

5. Mendeleev corrected the atomic weight of:

   (A) Be (B) N (C) O (D) Cl

6. The atomic number of Uut is:

   (A) 113 (B) 114 (C) 108 (D) 115

*** Answer The Following Questions In One Sentence.[1 Marks Each]** **[5]**

7. Write the general electronic configuration of f-block elements.
8. Which of the following atoms would most likely form an anion (i) Be, (ii) Al, (iii) Ga, (iv) I?
9. What are inner transition metals? Why are they called rare earth metals?
10. Which group elements are called chalcogens?
11. Which orbitals are filled with electrons in 3rd period?

SECTION B

*** Given Section consists of questions of 2 marks each.** **[6]**

1. What is the basic difference between the terms electron gain enthalpy and electronegativity?
2. Give the name and atomic number of the inert gas tom in which total number of d-electrons is equal to difference in number of total 'p' and s-electrons.

3. Name the species that will be isoelectronic with the following atoms or ions:
   i. Na
   ii. Cl^-
   iii. Ca^{2+}
   iv. Rb^+

SECTION C

*** Given Section consists of questions of 3 marks each.** **[9]**

1. Write four characteristic properties of p-block elements.
2. Account for the following:
   i. Which is smaller Fe^{2+} or Fe^{3+}, why?
   ii. Chlorine (Cl) have more negative electron gain enthalpy than Fluorine (F).
   [Atomic no.: F = 9, Cl = 17]
   iii. Anions are bigger in size than their parent atom.
3. Explain the deviation in ionisation enthalpy of some elements from the general trend by using.

SECTION D

*** Case study based questions** **[4]**

1. There are many observable patterns in thephysical and chemical properties of elementsas we descend in a group or move across aperiod in the Periodic Table.Atomic Radius the determination of the atomic sizecannot be precise. In other words, there is no practical way by which the size of an individualatom can be measured. However, an estimateof the atomic size can be made by knowing thedistance between the atoms in the combinedstate. One practical approach to estimate thesize of an atom of a non-metallic element is tomeasure the distance between two atoms whenthey are bound together by a single bond in acovalent molecule and from this value, the“Covalent Radius” For metals, we define theterm “Metallic Radius” which is taken as halfthe internuclear distance separating the metalcores in the metallic crystal. Atomic Radius to refer to both covalent ormetallic radius depending on whether theelement is a non-metal or a metal. Atomic radiican be measured by X-ray or otherspectroscopic methods. The atomic size generallydecreases across a period. It is because within the period the outerelectrons are in the same valence shell and theeffective nuclear charge increases as the atomicnumber increases resulting in the increasedattraction of electrons to the nucleus.Note that the atomic radii of noble gasesAre not considered here. Being monoatomic,Their (non-bonded radii) values are very large.In fact radii of noble gases should be comparednot with the covalent radii but with the van derWaals radii of other elements. The removal of an electron from an atom resultsin the formation of a cation, whereas gain ofan electron leads to an anion. The ionic radiican be estimated by measuring the distancesbetween cations and anions in ionic crystals.In general, the ionic radii of elements exhibitthe same trend as the atomic radii. A cation issmaller than its parent atom because it hasfewer electrons while its nuclear charge remainsthe same. The size of an anion will be largerthan that of the parent atom because theaddition of one or more electrons would resultin increased repulsion among the electronsand a decrease in effective nuclear charge. When we find some atoms and ions whichcontain the same number of electrons, we callthem isoelectronic species. For example,O2–, F–, Na+ and Mg2+ have the same number ofelectrons (10).

Their radii would be differentbecause of their different nuclear charges.A quantitative measure of the tendency of anelement to lose electron is given by itsIonization Enthalpy. It represents the energyrequired to remove an electron from an isolatedgaseous atom (X) in its ground state. The ionization enthalpy is expressed inunits of kJ mol–1. We can define the secondionization enthalpy as the energy required toremove the second most loosely boundelectron The first ionization enthalpies of elementshaving atomic numbers up to 60 are plotted then The periodicity of the graph is quitestriking. You will find maxima at the noble gaseswhich have closed electron shells and verystable electron configurations. On the otherhand, minima occur at the alkali metals andtheir low ionization enthalpies can be correlated with their high reactivity. In addition, you willnotice two trends the first ionization enthalpygenerally increases as we go across a periodand decreases as we descend in a group. Electron Gain Enthalpy. when an electron is added to a neutral gaseousatom (x) to convert it into a negative ion, theenthalpy change accompanying the process isdefined as the electron gain enthalpy (Δegh).Electron gain enthalpy provides a measure ofthe ease with which an atom adds an electronto form anion. electron gain enthalpies have largenegative values toward the upper right of theperiodic table preceding the noble gases.The variation in electron gain enthalpies ofelements is less systematic than for ionizationenthalpies. As a general rule, electron gainenthalpy becomes more negative with increasein the atomic number across a period. Theeffective nuclear charge increases from left toright across a period and consequently it willbe easier to add an electron to a smaller atomsince the added electron on an average wouldbe closer to the positively charged nucleus. ElectronegativityA qualitative measure of the ability of an atomin a chemical compound to attract sharedelectrons to itself is called electronegativity.Unlike ionization enthalpy and electron gainenthalpy, it is not a measureable quantity.However, a number of numerical scales ofelectronegativity of elements viz., Pauling scale,Mulliken-Jaffe scale, Allred-Rochow scale havebeen developed. The one which is the most widely used is the Pauling scale. Electronegativity generallyincreases across a period from leftto right (say from lithium tofluorine) and decrease down a group(say from fluorine to astatine) inthe periodic table. Non-metallic elements have strong tendencyto gain electrons. Therefore, electronegativityis directly related to that non-metallicproperties of elements. It can be furtherextended to say that the electronegativity isinversely related to the metallic properties of elements. Thus, the increase inelectronegativities across a period isaccompanied by an increase in non-metallicproperties (or decrease in metallic properties)of elements. Similarly, the decrease inelectronegativity down a group is accompanied by a decrease in non-metallic properties (orincrease in metallic properties) of elements.

i. The atomic size generally … across a period.
   a. Increases
   b. Decreases
   c. Remains Constant
   d. None of above

ii. The ionization enthalpy is expressed in units of ….
   a. kJ mol^{-1}
   b. mole kJ^{-1}
   c. mole kJ
   d. -kJ mol^{-1}

iii. Which of the following is/are numerical scales of electronegativity of elements.
   a. Pauling scale
   b. Mulliken-Jaffe scale
   c. Allred-Rochow scale
   d. All the above

iv. The … in electronegativity down a group is accompanied by a … in non-metallic properties.
   a. Increase, Decrease
   b. Decrease, Increase
   c. Decrease, Decrease
   d. Increase , Increase

v. Electronegativity generally … across a period from left to right and … down a group in the periodic table.
   a. Increase, Decrease
   b. Decrease, Increase
   c. Decrease, Decrease
   d. Increase, Increase

SECTION E

*** Given Section consists of questions of 5 marks each.** **[10]**

1. Match the correct ionisation enthalpies and electron gain enthalpies of the following elements:

	Elements		ΔH_1	ΔH_2	$\Delta_{eg}H$
i.	Most reactive non metal	A.	419	3051	-48
ii.	Most reactive metal	B.	1681	3374	-328
iii.	Least reactive element	C.	738	1451	-40
iv.	Metal forming binary halide	D.	2372	5251	+8

2. The amount of energy released when one million of atoms of iodine in vapour state are converted to I^- ions is 4.9×10^{-13}J according to the reaction:

   $I(g) + e^- \rightarrow I^-(g)$

   Express the electron gain enthalpy of iodine in terms of kJ mol^{-1} and eV per atom.

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