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(Important Questions on Periodicity)

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Sahi Prep Hai Toh Life Set Hai

Important Questions on Periodicity

1. What will be the distance between H and Cl atoms in HCl? If radius of hydrogen is 0.37 Å and the radius of chlorine is 1.67 Å - (According to the concept of co-valent radius)

A. 2.04 Å

B. 1.88 Å

C. 2.12 Å

D. 1.0 Å

2. Which of the following statement is wrong?

A. I.E.(1st) of C > I.E.(1st) of B

B. I.E.(2nd) of C > I.E.(2nd) of B

C. I.E.(1st) of Mg > I.E.(1st) of Na

D. I.E.(2nd) of Mg > I.E.(2nd) of Ca

3. A d-shell containing four unpaired electrons can exchange

A. 6
B. 16
C. 4
D. 3

4. According to the Moseley's experiment where he determined the fundamental property of an element, he found that $(\text{frequency})^x$ is directly proportional to the number of effective nuclear charge (z) of metal. What was the value of x?

A. 1/2
B.2
C. 3/4
D.1

5. The correct option respect to the Pauling electronegativity values of the elements is :

A. P > S
B. Te > Se
C. Si < Al
D. Ga < Ge

6. For heteronuclear diatomic molecule A-B having electronegativity difference ($X_a - X_b$), the bond length can be calculated as: $d_{a-b} = r_a + r_b - m(X_a - X_b)$. Then the value of 100m is:

A. 9
B. 7
C.4
D. 11

7. Which of the following is the most reactive element?

A. Na
B. K
C. Rb
D. Cs

8. The element with atomic number 35 belongs to:

A. s-block
B. p-block
C. d-block
D. f-block

9. Which of the following pairs contains elements which are chemically dissimilar?

A. Ba, Sr
B. Na, K
C. Ca, Zn
D. Zr, Hf

10. The electron affinity of a hypothetical element 'A' is 3 eV per atom. How much energy in kcal is released when 10 g of 'A' is completely converted to A^- ion in a gaseous state? (1 eV per atom = 23 kcal mol^{-1}, Molar mass of A = 30 g)

A. 46
B. 23
C. 69
D. None of the above

Answer key:

1. B
2. B
3. A
4. A
5. D
6. A
7. D
8. B
9. C
10. B

Solutions:

Solution 1.

$r_{H-Cl} = r_H + r_{Cl} - 0.09\ (x_{Cl} - x_H)$

$x \rightarrow$ electronegativity

so, $r_{HCl} = 1.67 + 0.37 - 0.09\ (4 - 2.2)$

$= 1.88$ Å

Solution 2.

Along the period, ionization energy increases, so, according to this, first ionization energy of carbon will be greater than that of boron. But second ionization energy of boron will be greater than carbon because when boron loses on electron, it will attain a stable noble gas configuration.

Solution 3.

$$n_{c_2} = 4_{c_2} = \frac{4!}{2!2!} = 6$$

Solution 4.

According to Moseley's experiment,

$\sqrt{\nu} = a(z-b)$ (where ν = frequency)

So,

$$x = \frac{1}{2}$$

Solution 5.

As we move left to Right, Electronegativity increases.

Si > Al ; S > P ; Ge > Ga.

As we move top to bottom; electronegativity decreases.

Se > Te

Solution 6.

According to Stevenson & Schomaker, bond length can be calculated as:

$d_{a-b} = r_a + r_b - 0.09(X_a - X_b)$, where m=0.09 is fixed

All values of radius should be in angstrom

So, 100m = 9

Solution 7.

Reactivity of metals increases as we go down the group. So, in case of Na, K, Cs and Rb, they are present in the same group and Cs is the last metal, so it has the lowest ionisation energy and the highest reactivity.

Solution 8.

Write the electronic configuration based on Aufbau principle.

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

The last electron is accommodated on p-energy shell.

Solution 9.

The chemical behaviour of elements depends upon the valence electrons present in them. The elements whose outer shell electronic configuration is similar are chemically similar. The outer shell electronic configuration is similar in elements belonging to the same group. Thus, elements which belong to same group are chemically similar. Hence, Ca and Zn which belong to different groups and the presence of d-orbitals in Zn but not in Ca make them chemically dissimilar.

Solution 10.

$$A + e^- \longrightarrow A^- + 3eV$$

Number of mole of $A = \frac{10}{30}$.

As 1 mole of A releases the amount of energy $= 3 \times 23 \text{ kcal}$.

$\therefore$ Energy released for conversion of $\frac{10}{30}$ mole of gaseous A into A^- ions = 23 kcal.