

INORGANIC CHEMISTRY

PERIODIC TABLE

1. The 1st, 2nd and the 3rd ionization enthalpies I_1 , I_2 and I_3 , of four atoms with atomic numbers n , $n+1$, $n+2$ and $n+3$, where $n < 10$, are tabulated below. What is the value of n ? [JEE(Advanced) 2020]

Atomic number	Ionization Enthalpy (kJ/mol)		
	I_1	I_2	I_3
n	1681	3374	6050
$n + 1$	2081	3952	6122
$n + 2$	496	4562	6910
$n + 3$	738	1451	7733

2. The option(s) with only amphoteric oxides is (are): [JEE(Advanced) 2017]
 (A) Cr_2O_3 , CrO , SnO , PbO (B) NO , B_2O_3 , PbO , SnO_2
 (C) Cr_2O_3 , BeO , SnO , SnO_2 (D) ZnO , Al_2O_3 , PbO , PbO_2
3. The increasing order of atomic radii of the following group 13 elements is [JEE(Advanced) 2016]
 (A) $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$ (B) $\text{Ga} < \text{Al} < \text{In} < \text{Tl}$
 (C) $\text{Al} < \text{In} < \text{Ga} < \text{Tl}$ (D) $\text{Al} < \text{Ga} < \text{Tl} < \text{In}$

SOLUTIONS

1. Ans. (9)

Sol.

Atomic number	Ionization Enthalpy (kJ/mol)		
	I_1	I_2	I_3
n	1681	3374	6050
n + 1	2081	3952	6122
n + 2	496	4562	6910
n + 3	738	1451	7733

By observing the values of I_1 , I_2 & I_3 for atomic number (n+2), it is observed that $I_2 \gg I_1$.

This indicates that number of valence shell electrons is 1 and atomic number (n+2) should be an alkali metal.

Also for atomic number (n+3), $I_3 \gg I_2$.

This indicates that it will be an alkaline earth metal which suggests that atomic number (n+1) should be a noble gas & atomic number (n) should belong to Halogen family. Since $n < 10$; hence $n = 9$ (F atom)

Note : $n = 1$ (H atom) cannot be the answer because it does not have I_2 & I_3 values.

2. Ans. (C, D)

Sol. (C) Cr_2O_3 , BeO, SnO, SnO_2

all are amphoteric oxides

(D) ZnO, Al_2O_3 , PbO, PbO_2

all are amphoteric oxides

3. Ans. (B)

Sol. The order of radius of 13th group elements is $\text{Ga} < \text{Al} < \text{In} < \text{Tl}$.

Reason \Rightarrow Due to poor shielding effect of d-orbital, radius of Ga is smaller than Al.