Periodic Table

SOLUTIONS

Exercise – I (JEE-Main Pattern)

SECTION-A

1. Ans. (2)

In Dobereiner triad, atomic weight of middle element is nearly equal to the average atomic weight of first and third element when they are in arranged in increasing order of atomic weight and this triad rule is applicable for those elements which belong to same group (not a same period).

Some Dobereiner triads are : (H, F, Cl), (P, As, Sb) (S, Se, Te) (Cl, Br, I) (Li, Na, K) (Ca, Sr, Ba)

I.e. (N, O, F) is not a Dobereiner triad because of N, O and F belongs to same period.

2. Ans. (4)

(1), (2) and (3) all factors reflect the periodicity of element.

(1) Bonding behaviour

(2) Electronegativity

(3) Ionisation potential

(4) $\frac{\text{neutron}}{\text{proton}}$ ratio does not reflect the periodicity of element because any element can have different no of neutrons in their isotopes.

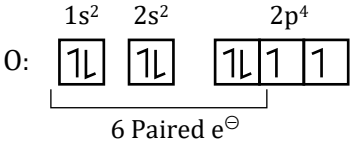
For example $_6C^{12}$ $_6C^{13}$ $_6C^{14}$

n = 6 n = 7 n = 8

p = 6 p = 6 p = 6

3. Ans. (1)

Electronic configuration of Oxygen $\Rightarrow 1s^2\ 2s^2\ 2p^4$



4. Ans. (2)

Atomic No. is the base of :

(c) Modern periodic table

(e) Long form of periodic table

5. Ans. (4)

Quantum numbers of last e^- enters an element

$\ell = 3, \quad m = -2, \quad s = +\frac{1}{2}$

$\ell = 3$ means f subshell. So, last electron enters in f subshell So, element belongs to f-block.

6. Ans. (4)

Lowest anion to cation size ratio

CsF

Because $Cs^{\oplus}$ cation is bigger than

$Na^{\oplus}$ and $Li^{\oplus}$

& $F^{\ominus}$ is smaller than $I^{\ominus}$ ($\because$ size $\propto$ shell no.)

7. **Ans. (2)**

First Ionisation energy.

(3^{rd} period elements) : Na Mg Al Si

Last $e^{\ominus}$ configuration: $\boxed{3s^1}$ $3s^2$ $3s^23p^1$ $3s^23p^2$

↑

Stable configuration

Generally Left to right in a period I.E. increases but I.E. of stable configuration is higher than nearest elements

Correct order of first I.E. = Si > Mg > Al > Na

8. **Ans. (2)**

$$\text{E.N. (Mulliken scale)} = \frac{\text{I.P.+E.A.(eV)}}{2}$$

$$\text{E.N. (Pauling scale)} = \frac{\text{E.N.(Mulliken)}}{2.8}$$

$$\text{E.N. (Pauling scale)} = \frac{\text{I.P.+E.A.(eV)}}{5.6}$$

$$\text{E.N.} = \frac{17.42+3.42}{5.6}$$

E.N. = 3.726

9. **Ans. (2)**

For Mg

$IP_1 = 178 \text{ kcal mol}^{-1}$ ($Mg \rightarrow Mg^{\oplus} + e^{\ominus}$)

$IP_2 = 348 \text{ kcal mol}^{-1}$ ($Mg^{\oplus} \rightarrow Mg^{2\oplus} + e^{\ominus}$)

$Mg \rightarrow Mg^{2\oplus} + 2e^{\ominus}$

$\Delta H = IP_1 + IP_2 = (178 + 348) = +526 \text{ kcal mol}^{-1}$

10. **Ans. (3)**

Given ionic radii $K^{\oplus} \approx F^{\ominus}$ (nearly same) = 1.34Å

Atomic radii of K > $K^{\oplus}$ $\Longrightarrow$ K > 1.34Å

Atomic radii of F < $F^{\ominus}$ $\Longrightarrow$ F < 1.34Å

$\left[\text{size} \propto \frac{1}{Z_{eff}},\ Z_{eff} \propto \frac{\text{+ve charge}}{\text{−ve charge}}\right]$

In option (3) atomic radii of K and F are respectively 1.96Å and 0.72Å.

11. **Ans. (1)**

CO → Neutral oxide

$\left.\begin{matrix}SnO_2\\ ZnO\end{matrix}\right\}$ → Amphoteric oxide

SiO_2 → Acidic Oxide

12. **Ans. (3)**

In f-block Actinide series is from atomic no. 90 to 103

IUPAC name of atomic no. (z) 104 is **Unnilquadium** that is element Rutherfordium (Rf)

13. Ans. (4)

Process is

$X_{(g)} + e^{\ominus} \rightarrow X^{\ominus}_{(g)}$

Amount of energy released for this process means electron affinity.

This process has maximum electron affinity for Cl and minimum electron affinity for N (Nitrogen has stable electronic configuration $1s^2 2s^2 2p^3$)

14. Ans. (3)

(1) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^1$ $\Rightarrow Cr_{24}$ d- block element

(2) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^1$ $\Rightarrow Cu_{29}$ d-block element

(3) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1$ $\Rightarrow K_{19}$ s-block element

15. Ans. (3)

(1) Mg < Ar < Na (2^{nd} I.E.) or $Mg^{\oplus} < Ar^{\oplus} < Na^{\oplus}$ (1st I.E.) Correct Order

(2) Be < F < Cl ($|\Delta H_{eg}|$: Electron Gain Enthalpy) Correct Order

(3) Rb < Na < K > Ca (atomic radius) Incorrect order

Rb > K > Ca > Na (atomic radius) Correct Order

because atomic radius of Rb is larger than that of Na.

(4) P < S < N (EN: Electronegativity) Correct Order

16. Ans. (1)

EN of the element (A) is E_1 and IP is E_2

E.A. of element According to Mullikan scale:- $\chi_M = \frac{EA + IP}{2}$

$E_1 = \frac{EA + E_2}{2}$

Hence $EA = 2E_1 - E_2$

17. Ans. (1)

Generally, in periodic table, when we move across the period, atomic radius decreases due to increase in Z_{eff}.

Hence, according to question Moving from right to left in a period, the atomic size is increased.

18. Ans. (3)

Element = K (19)

Atomic Weight = 39 ; neutrons = 20

(A)High value of IE INCORRECT

(B) Transition element INCORRECT

(C) Isotone with $_{18}Ar^{38}$ CORRECT $\rightarrow$ same no of neutrons = 20

19. Ans. (4)

$Size \propto \frac{1}{z_{eff}}$

Z_{eff} order $\Rightarrow Ca^{2\oplus} > K^{\oplus} > Cl^{\ominus} > S^{2\ominus}$

Size order $\Rightarrow Ca^{2\oplus} < K^{\oplus} < Cl^{\ominus} < S^{2\ominus}$

20. Ans. (3)

Second electron gain enthalpy of any element is endothermic (energy absorb) in nature due to electronic repulsion.

$O \xrightarrow[\text{Exothermic}]{\Delta Heg_1} O^{\ominus} \xrightarrow[\text{Endothermic}]{\Delta Heg_2} O^{2\ominus}$

SECTION-B

1. Ans. (6)

Unnilpentium — atomic number = 105

↓ ↓ ↓ — sum of digits = 1+ 0 + 5 = 6

1 0 5

2. Ans. (3)

No. of transition metals = 3(Mo, Rh, Fe)

3. Ans. (8)

IE_1 of He is largest in the periodic table. Upto argon total elements = 18('He' is also included in this)

So, number of elements which have lower I.E. than He upto argon = 17.

Answer 1 + 7 = 8

4. Ans. (3)

No. of elements of p-block having atleast three valence electrons.

Element	**Valance $e^{\ominus}$**
Cl	7
Se	6
B	3

5. Ans. (1)

$CaO \rightarrow$ Basic oxide

$Al_2O_3 \rightarrow$ Amphoteric oxide

P_2O_5, SO_2, Cl_2O_7 } acidic oxide

$P_2O_5 < SO_2 < Cl_2O_7$ (Acidic strength order)

6. Ans. (4)

(i) $N^{3\ominus} < P^{3\ominus}$ (ii) $O^{2\ominus} > F^{\ominus}$

(iii) $Ca^{2\oplus} < Sr^{2\oplus}$ (iv) $S^{\ominus} < S^{2\ominus}$

(v) $S^{2\ominus} > O^{\ominus}$ (vi) $Na^{\oplus} < F^{\ominus}$

7. Ans. (7)

Most acidic oxide = Cl_2O_7

For oxides of a same element, O.N. of central atom↑, E.N.↑ acidic nature of oxide ↑

8. Ans. (5)

Amphoteric oxide $\Rightarrow$ BeO, Al_2O_3, SnO_2, PbO_2, Sb_2O_3

9. Ans. (0)

Order of size: $H^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$

Among the following species all have atomic size less than $H^{\ominus}$.

10. Ans. (2)

➢ Atomic mass $\Rightarrow$ F < Cl

➢ Covalent radius $\Rightarrow$ F < Cl

➢ Ionic radius ($X^{\ominus}$) $\Rightarrow$ $F^{\ominus} < Cl^{\ominus}$

➢ Ionization energy $\Rightarrow$ F > Cl

➢ Electron affinity $\Rightarrow$ F < Cl

➢ Electronegativity $\Rightarrow$ F> Cl

Exercise – II (JEE-Main PYQs)

1. **Ans. (4)**

Correct order of atomic radii

C ↓ 2nd period Cs ↓ Largest 6th period Al ↓ 3rd period S ↓ 3rd period

Order: C < S < Al < Cs

2. **Ans. (1)**

Correct order for Pauling electronegativity is :

Electronegativity increases along the period and decreases down the group.

1. Ga < Ge → correct, 3. P > S → incorrect

2. Si < Al → incorrect, 4. Te > Se → incorrect

3. **Ans. (4)**

Ununennium (Uue)

1 1 9

Un un enn → Ununennium

(Uue) → Symbol

4. **Ans. (4)**

The ions having same number of electrons are isoelectronic.

(1) $N^{3\ominus}$, $Li^{\oplus}$, $Mg^{2\oplus}$ and $O^{2\ominus}$ ×
10 2 10 10

(2) $Li^{\oplus}$, $Na^{\oplus}$, $O^{2\ominus}$ and $F^{\ominus}$ ×
2 10 10 10

(3) $F^{\ominus}$, $Li^{\oplus}$, $Na^{\oplus}$ and $Mg^{2\oplus}$ ×
10 2 10 10

(4) $N^{3\ominus}$, $O^{2\ominus}$, $F^{\ominus}$ and $Na^{\oplus}$ ✓
10 10 10 10

5. **Ans. (4)**

Electronegativity of aluminium is similar to beryllium due to diagonal relationship.

6. **Ans. (1)**

First ionization energy of: Na, Mg, Al and Si respectively are

$IE \propto \frac{1}{size}$

as size Na > Mg > Al > Si

Also, for half filled and fully filled configuration, I.E. is higher than neighbour. So,

IE of Mg > Al.

Order Na < Al < Mg < Si
496 577 737 786

7. **Ans. (4)**

Acidic, basic and amphoteric, respectively are:

(1) $\underbrace{MgO}_{Basic}, Cl_2O, Al_2O_3$ ×

(2) $Cl_2O, CaO, \underbrace{P_4O_{10}}_{Acidic}$ ×

(3) $\underbrace{Na_2O}_{Basic}, SO_3, Al_2O_3$ ×

(4) $\underbrace{N_2O_3}_{Acid}, \underbrace{Li_2O}_{Base}, \underbrace{Al_2O_3}_{Amphoteric}$ ✓ correct order.

8. **Ans. (2)**

Electronic configuration of

Eu = [Xe] $6s^2$ $4f^7$ $5d^0$

Ce = [Xe] $6s^2$ $4f^1$ $5d^1$

To make bivalent europium and trivalent cerium electrons will be removed from the outermost shell.

Bivalent europium ($Eu^{2\oplus}$) = [Xe]$4f^7$ ~~$6s^2$~~

Trivalent Cerium ($Ce^{3\oplus}$) = [Xe]$4f^1$ ~~$5d^1$ $6s^2$~~

9. **Ans. (1)**

For group 17, the order of electron gain anthalpy is:

Cl > F > Br > I

So, value, –333 , –349 , –325 and –296

↓ ↓ ↓ ↓

F Cl Br I

10. **Ans.** (3)

(i) Electron affinity of second period p-block element is less than third period due to small size

So, E.A. order : F < Cl

(ii) Down the group EA decreases as size increases.

EA. order : S > Se

Li > Na

So, Cl, S and Li.

11. **Ans. (4)**

Along the period: Z_{eff} increases, So, electronegativity increases

Electron gain enthalpy increases

Ionisation enthalpy increases

Atomic radius decreases → opposite trend.

12. **Ans. (3)**

X Y and Z → 3rd period

Oxides basic amphoteric acidic

Along the period, basicity of oxides decreases and acidity increases (atomic number of atom also increases)

∴ X < Y < Z (acidic character)

X < Y < Z (atomic number)

13. Ans. (1)

(I) Correct: Atomic radius: Be < Mg
Down the group size increases

(II) Correct: I.E. of Be > Al because Be has full, filled stable e^- configuration

(III) Incorrect: Charge / Radius ratio of Be is less than that of Al. Instead, they have same $\left(\frac{\text{charge}}{\text{radius}}\right)$ ratio due to diagonal relationship.

(IV) Correct: Be and Al mainly form covalent compounds due to their small size and high polarising power.

Correct → I, II and IV

14. Ans. (4)

If the given elements are arranged according to their position in periodic table

Atomic radius order will be -

(a) (b) (c)
C > O > F
∧
Cl (d)
∧
Br (e)

Br > Cl > C > O > F

So, Order c < b < a < d < e

15. Ans. (1)

For oxygen family the order of E.G.E. is S > Se > Te > Po > O.

It's because O has very small radius and thus have high electron density as compared to S, Se, Te and Po, thus adding an electron is easier in S, Se, Te and Po.

16. Ans. (2)

Melting point

Al → 933 K Ga → 303 K In → 430 K Se → 490 K

17. Ans. (1)

Across a period metallic character decrease

18. Ans. (4)

Assertion & Reason are correct and Reason is correct explanation.

∵ Successive I.E. always increases.

19. Ans. (3)

Element	$\Delta_{eg}H$[KJ/mol]
He	+ 48
Ne	+ 116
Kr	+ 96
Xe	+ 77

From NCERT

So, order is Ne > Kr >Xe> He

20. Ans. (4)

In isoelectronic species size $\propto \frac{1}{Z}$

Ca^{2+} < K^+ < Cl^- < S^{2-} : size

Z : 20 19 17 18

EXERCISE - III (JEE Advanced Pattern)

SECTION–I

1. Ans. (D)

Second IE can be calculated from:

i.e. $M^{\oplus}(g) \longrightarrow M^{2\oplus}(g) + e^{\ominus}$

$M(g) \longrightarrow M^{2\oplus}(g) + 2e^{\ominus}$ 5

$M(g) \longrightarrow M^{\oplus}(g) + e^{\ominus}$ 3

$M^{\oplus}(g) \longrightarrow M^{2\oplus}(g) + e^{\ominus}$ $\boxed{5-3}$

2. Ans. (C)

$\boxed{Na^{\oplus}}$, $Mg^{2\oplus}$, $O^{2\ominus}$ and $\boxed{N^{3\ominus}}$

↓ ↓

Maximum IP Minimum IP

as IP $\propto$ positive charge $\propto \frac{1}{\text{Negativecharge}}$

Correct option is (C) = $N^{3\ominus}$, $Mg^{2\oplus}$

3. Ans. (D)

Stability orders :

$Al^{1\oplus}$	$Al^{2\oplus}$	$Al^{3\oplus}$
$[Ne]3s^2$	$[Ne]3s^1$	[Ne]
↓		↓
Stable fully filled configuration in s-subshell		Noble gas configuration ↓ most stable

Order: $Al^{3\oplus} > Al^{\oplus} > Al^{2\oplus}$

4. Ans. (C)

Wrong order is:

A → Correct → Electronegativity decreases down the group and increases along the period

So, P < N < O < F

B → Correct → IP increases along the period and the IP of fully filled / half filled configuration is more than its next neighbour

So, B < Be < O < N

↓ ↓

Fully filled Half filled

C → Wrong → Down the group basic character increases

So, CaO > MgO

D → Correct → Down the group reactivity of metals increases and along the period it decreases.

So, Be < Li < K < Cs

SECTION-II

5. Ans. (A,B,D)

(A),(B) are general fact of periodic table.

(C) $Cl^{\ominus} < S^{2\ominus}$ size

(D) $X \rightarrow X^{\oplus} + e^{\ominus}$ EA or EGE of $X^{\oplus}$

Since both the process are opposite of each other, hence the magnitude of enthalpy change IE1 of X = EGE of $X^{\oplus}$

6. Ans. (A,B)

(A)Ionisation energy $\Rightarrow$ I < Br < Cl < F

(B) Electronegativity $\Rightarrow$ I < Br < Cl < F

(C) Bond length $\Rightarrow I_2 > Br_2 > Cl_2 > F_2$

(D) Electron affinity $\Rightarrow$ I < Br < F < Cl

7. Ans. (A, B)

A → Correct : Atomic size → increases down the group and decreases along the period.

So, O < C < S < Se

B → Correct: 1st IP → Increases along the period. Also fully / half filled configuration has more I.P. than next neighbour.

So, Na < Al < Mg < Si

C → Incorrect : Basic character → Increases down the group.

So, $Cs_2O > K_2O$

D → Incorrect : Acidic character is higher for higher oxidation state.

So, $P_4O_{10} < SO_3 < Cl_2O_7$ → correct order.

+5 +6 +7

SECTION–III

8. Ans. (A)

(A) Highest density	(Q) Osmium
(B) Metallic character	(P) Lithium (Q) Osmium (R)Mercury
(C) Lightest Metal	(P) Lithium
(D) Liquid at room temperature	(R) Mercury (S) Bromine

9. Ans. (B)

(A)R ; (B)R ; (C)Q ; (D)S

(a) K(19) → $1s^2,2s^2,2p^6,3s^2,3p^6,3d^1$ last electron in d–subshell $\Rightarrow$ d–block element

(b) Fe(26) → $1s^2,2s^2,2p^6,3s^2,3p^6,3d^8$ last electron in d–subshell $\Rightarrow$ d–block element

(c) Ga(31) → $1s^2,2s^2,2p^6,3s^2,3p^6,3d^{10},4s^1$ last electron in s–subshell $\Rightarrow$ s–block element

(d) Sn(50) → $1s^2,2s^2,2p^6,3s^2,3p^6,3d^{10},4s^2,4p^6,4d^{10}, 4f^4$ last electron in d–subshell $\Rightarrow$ f–block element

10. Ans. (D)

(Electronegativity on Pauling scale)

A. Carbon	2.5 – 3
B. Nitrogen	3.0 – 4
C. Aluminium	1.6 – 2
D. Cesium	0.8 – 1

A	B	C	D
3	4	2	1

11. Ans. (B)

Atomic number	E.C.	Block
(A) 24	$[Ar]4s^1 3d^5$	d - 4
(B) 38	$[Kr]5s^2$	s - 3
(C) 49	$[Kr]5s^2 4d^{10} 5p^1$	p - 1
(D) 59	$[Xe]6s^2 4f^3$	f – 2

A	B	C	D
4	3	1	2

12. Ans. (C)

(A) → (r), (B) → (s), (C) → (t), (D) → (q), (E) → (p)

Along the period atomic radius decreases, so atomic radius of Be > B > C > N > O

So, Be = 111, B = 88, C = 77, N = 74, O = 66

13. Ans. (A)

(i)–B, (ii)–A, (iii)–D, (iv)–C

(i) Most reactive non-metal = highest ΔH_{eg}

(ii) Most reactive metal = lowest ionisation enthalpy

(iii) Least reactive element = highest I.E. and positive ΔegH.

(iv) Metal forming binary halide = that can lose$2e^{\ominus}$ means no large difference between ΔH_1, and ΔH_2 .

14. Ans. (B)

(A) Q,R ; (B) P,S ; (C) S ; (D) Q,R

(A) O (g) + $e^{\ominus}$ → $O^{\ominus}$ (g) (Q) Negative electron gain enthalpy
Reason : electron gain enthalpy of oxygen is –ve

(B) $O^{\ominus}$ (g) + $e^{\ominus}$ → $O^{2\ominus}$ (g) (P) Positive electron gain enthalpy
Reason : second electron gain enthalpy of oxygen is +ve

(C) $Na^{\ominus}$(g) → Na(g) + $e^{\ominus}$ (S) Endothermic
Reason: IE_1 of Na- ,
Reverse process of electron gain enthalpy of Na, hence removal of electron from Na- endothermic process

(D) $Mg^{\oplus}$ (g) + $e^{\ominus}$ → Mg (g) (P) Positive electron gain enthalpy (R)Exothermic
Reason: electron gain in Mg+ ion
Reverse process of ionization of Mg (g) and Ionization of Mg is endothermic hence given process is exothermic

SECTION–IV

15. Ans. (D)

Inert gases shows +ive ΔH_{eg}

In above data table element V shows +ive ΔH_{eg} hence element V is an inert gas.

16. Ans. (C)

Negative electron gain enthalpy ↑ Non–metallic character ↑

Hence element III shows most negative electron gain enthalpy hence element III is most non metallic among all given elements.

SECTION–V

17. Ans. (5)

Successive I.E. (eV / Atom)

14.534, 29.601, 47.448, 77.472, 97.888, 552.057

↓

Very large jump for the removal of sixth electron.

It means after removal of 5 electrons, noble gas configuration is achieved. Hence, valence $e^{\ominus}$ = [5]

18. Ans. (3)

Aluminium has total 3 properties higher as compared to Gallium are covalent radius, electron affinity and electronegativity.

19. Ans. (3)

Number of correct orders:

(a) Acidic strength decreases down the group. So, incorrect.

(b) Correct ⇒ Basic strength increases down the group.

(c) Correct ⇒ Electronegativity increases along the period and decreases down the group.
So, order : I < Br < N < O < F

(d) Correct ⇒ EA increases along the period, also fully half / filled configuration have lowest E.A,
So, order : Mg < Na < Si < S < Cl

(e) Incorrect : As electronegativity difference increases, percent ionic character increases.
So, Correct order : F — H > O — H > N — H

20. Ans. (3)

Size of 1^{st} > Size of 2^{nd}

× × ✓ ✓ × ✓ × ×

(O < S) (He < Ne) , (Kr > Ne), (Na > $Na^{\oplus}$), (Cl < $Cl^{\ominus}$), ($I^{\ominus}$> $Cl^{\ominus}$), (Li< Na), ($Li^{\oplus}$< $Na^{\oplus}$)

Total : 3

EXERCISE - IV (JEE Advanced PYQs)

1. Ans. (C)

Statement (1) is true.

F atom has a less negative electron gain enthalpy than Cl atom.

Reason: Addition of electron is repelled more efficiently by 2p electron in 'F' atom than by 3p electron in Cl atom because size of F < Cl and charge density is greater in F.

Statement (2) is False.

2. Ans. (B)

(A) Be > B > N $\left[\text{size} \propto \frac{1}{Z_{eff}} \propto \text{number of shell}\right]$

(B) $F^{\ominus} < O^{2\ominus} < N^{3\ominus}$ $\left[\begin{matrix}\text{Isoelectronic} \\ Z_{eff} \propto \frac{1}{\text{negative charge}} \\ \text{Size} \propto \frac{1}{Z_{eff}}\end{matrix}\right]$

(C) Li < Na < K [Size ∝ number of Shell]

(D) $Fe^{2\oplus} > Fe^{3\oplus} > Fe^{4\oplus}$ $\left[\text{size} \propto \frac{1}{Z_{eff}}\right]$

$[Z_{eff} \propto +\text{ve charge}]$

3. **Ans. (T)**

Given: Be > B (IE_1 order)

This statement is true because in Be electronic configuration is stable ($1s^2 2s^2$)

This causes more penetration effect due to which removal of $e^{\ominus}$ requires more energy.

4. **Ans. (B)**

IP order

(A) Li > Na > K $\left[\text{I. P.} \propto \frac{1}{\text{no.ofshell}}\right]$

(B) Be > Mg > Ca $\left[\text{I. P.} \propto \frac{1}{\text{no.ofshell}}\right]$

(C) B < C < N [In a period I.P. generally increases]

(D) C > Si > Fe [$\because$ Fe is metal]

5. **Ans. (B)**

Because of stable configuration of Be: $1s^2 2s^2$ (more penetration effect)

Addition of $e^{\ominus}$ ($Be^{\ominus}$) is require more energy. That's why $Be^{\ominus}$ is least stable.

6. **Ans. (B)**

Correct order of atomic radii for 13^{th} group elements:

Ga < Al < In < Tl

In general top to bottom in a group, 'n' increases so atomic radius increases.

Ga < Al (d contraction or Scandide contraction).

7. **Ans. (C, D)**

(A) Cr_2O_3, CrO, SnO, PbO Among all, CrO is basic oxide

(B) NO, B_2O_3, PbO, SnO_2 Among all, NO is neutral oxide

(C) Cr_2O_3, BeO, SnO, SnO_2 all are Amphoteric oxides.

(D) ZnO, Al_2O_3, PbO, PbO_2 all are Amphoteric oxides.

8. **Ans. (9)**

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 $I_2 >> I_1$.

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), $I_3 >> I_2$.

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.