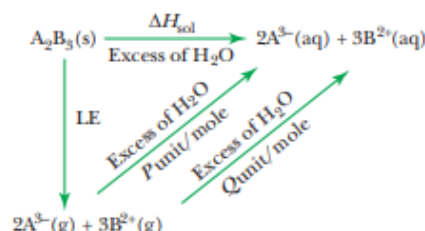


Periodic Table and Periodic properties

SINGLE CORRECT CHOICE TYPE QUESTIONS

1. From the given information of element M
 $M \rightarrow M^{2+} + 3e^- \quad \Delta H = x \text{ kJ/mole}$
 $IE_1(M) = y \text{ kJ/mole}$
 $IE_1(M^{2+}) = z \text{ kJ/mole}$
 The value of $IE_2(M)$ will be
 (A) $(x + y + z) \text{ kJ/mole}$
 (B) $(x - y - z) \text{ kJ/mole}$
 (C) $(x - y + z) \text{ kJ/mole}$
 (D) $z - (x + y) \text{ kJ/mole}$
2. In the given cycle, if P and Q are the magnitude of hydration energies ($\Delta H_{\text{hydration}}$) per mole for A^{3+} (g) and B^{2+} (g) ions, respectively. Then the value of $\left(P + \frac{3}{2}Q\right)$ will be,
 (Consider only magnitude of $\Delta H_{\text{hydration}}$ and LE is the lattice energy of ionic compound.)



- (A) $\frac{\Delta H_{\text{sol}} - LE}{2}$
 (B) $\frac{3}{2}(\Delta H_{\text{sol}} - LE)$
 (C) $\Delta H_{\text{sol}} - LE$
 (D) $\Delta H_{\text{sol}} + LE$
3. Two elements have set of quantum numbers of their last filled subshell as follows:
 $X \rightarrow n = 4; l = 1$
 $Y \rightarrow n = 5; l = 2$
 Then which statement is incorrect?
 (A) Element Y has greater atomic number than atomic number of element X.
 (B) Element X has 10 electrons in d subshell.

- (C) Element X is not a transition element.
 (D) Atomic size of element Y is equal to the atomic size of element X.
4. Which of the following elements have electron affinity greater than S?
 (A) O
 (B) Se
 (C) Te
 (D) None of these
5. Among O , O^+ , O^{2+} and O^{2-} , the species having most positive and most negative value of ΔH_{eg} are, respectively
 (A) O^+ and O
 (B) O^{2+} and O^{2-}
 (C) O and O^{2-}
 (D) O^{2-} and O^{2+}
6. Select the correct order for the property given in brackets.
 (A) $F^+(g) < Cl^+(g)$: (EA order)
 (B) $F(g) < Cl(g)$: (ΔH_{eg} order)
 (C) $O(g) > S(g)$: (ΔH_{eg} order)
 (D) $S^{2-}(g) < Cl^-(g)$: (IE order)
7. For electronic configuration $ns^2(n-2)f^{1-14}(n-1)d^{0-1}$, if $n = 7$, then the element belongs to
 (A) Lanthanoids
 (B) Actinoids
 (C) Inner transition elements
 (D) Both (B) and (C)
8. The valence shell of the element X contains 2 electrons in $5s$ subshell. Below that shell, element X has a partially filled $4d$ subshell, then what type of element is X?
 (A) Alkali metal
 (B) Alkaline earth metal
 (C) Chalcogen
 (D) None of these
9. Give the correct letter T for true and F for false for the following statements.
 (I) For Mn, the order of energy is $3s = 3p = 3d$ for shell number 3.
 (II) 32 elements are present in fifth period of long form periodic table.

(III) For Zr^{2+} ion, $\mu_m = \sqrt{8}$ BM

(IV) General valence shell electronic configuration for f -block elements is $(n-2)f^{1-14}(n-1)d^{10}ns^2$.

- (A) TTFT
(B) TTFT
(C) FFTF
(D) FTTF

10. Match the elements with their corresponding IE_1 .

Column-I	Column-II
(P) N	(1) +800
(Q) O	(2) +900
(R) Be	(3) +1300
(S) B	(4) +1400

Code:

	P	Q	R	S
(A)	2	3	1	4
(B)	1	2	3	4
(C)	4	3	2	1
(D)	1	4	2	3

11. Match the elements of given atomic number with their properties.

Column-I	Column-II
(P) (11)	(1) IE is maximum
(Q) (19)	(2) $Z_{eff} = 2.2$ (on last electron)
(R) (37)	(3) Size largest
(S) (55)	(4) Position is next to Kr

Code:

	P	Q	R	S
(A)	1	1,2	1,2	3,4
(B)	1,2	2,4	2,4	2,3
(C)	1,2	2	2,4	2,3
(D)	2,3	2	2,4	2,3

12. Match the species with their respective ionic size.

Column-I	Column-II
(P) Mg^{2+}	(1) 1.19 \AA
(Q) O^{2-}	(2) 0.72 \AA
(R) Na^+	(3) 1.16 \AA
(S) F^-	(4) 1.26 \AA

Code:

	P	Q	R	S
(A)	3	1	2	4
(B)	2	4	1	3
(C)	2	4	3	1
(D)	4	2	3	1

13. Match the electronic configuration with their respective ΔH_{eg} (kJ/mole)/value.

Column-I	Column-II
(P) $1s^2, 2s^2, 2p^6$	(1) -328
(Q) $1s^2, 2s^2, 2p^4$	(2) -122
(R) $1s^2, 2s^2, 2p^2$	(3) -141
(S) $1s^2, 2s^2, 2p^5$	(4) +116

Code:

	P	Q	R	S
(A)	3	1	2	4
(B)	2	4	1	2
(C)	2	4	3	1
(D)	4	3	2	1

14. Match the atoms/ions with their corresponding electron affinity. (eV/atom).

Column-I	Column-II
(P) F	(1) 3.4
(Q) F^+	(2) 17.4
(R) Cl	(3) 13
(S) Cl^+	(4) 3.6

Code:

	P	Q	R	S
(A)	1	3	4	2
(B)	2	1	3	4
(C)	1	2	4	3
(D)	3	1	2	4

15. Which of the following species has the highest electronegativity?

- (A) C (sp hybridized)
(B) N (sp^2 hybridized)
(C) N (sp hybridized)
(D) C (sp^3 hybridized)

16. Choose the correct order of ionic radius for the following species.

- (A) $Cl^- > I^- > Te^{2-} > Ar^+$
(B) $Te^{2-} > I^- > Cl^- > Ar^+$
(C) $I^- > Te^{2-} > Cl^- > Ar^+$
(D) $I^- > Cl^- > Ar^+ > Te^{2-}$

17. Choose the correct order of radius for the following species.

- (A) $Na^+ < Na < Na^-$
(B) $Na^- > Na^+ > Na$
(C) $Na < Na^- < Na^+$
(D) $Na > Na^+ > Na^-$

18. Choose the correct order of ionization energy for the following species.
 (A) $\text{Sc} > \text{La} > \text{Y}$
 (B) $\text{Sc} > \text{Y} \approx \text{La}$
 (C) $\text{Sc} > \text{Y} > \text{La}$
 (D) $\text{Sc} < \text{Y} > \text{La}$
19. The electronegativities of two elements A and B are χ_A and χ_B respectively and the relationship between them is given by

$$|\chi_A - \chi_B| = 0.102\sqrt{\Delta_{A-B}}$$
 where Δ_{A-B} is the resonance energy expressed in kJ mol^{-1} . If Δ_{A-B} is zero, then which of the following statements is true?
 (A) $\chi_A > \chi_B$
 (B) $\chi_A < \chi_B$
 (C) $\chi_A = \chi_B$
 (D) Cannot be predicted.
20. Choose the incorrect order for acidic strength.
 (A) $\text{CO}_2 > \text{CO}$
 (B) $\text{SO}_2 < \text{SO}_3$
 (C) $\text{HClO}_2 > \text{HOCl}$
 (D) $\text{SiO}_2 > \text{CO}_2$
21. Which of the following processes is endothermic?
 (A) $\text{S} \rightarrow \text{S}^-$
 (B) $\text{S}^- \rightarrow \text{S}^{2-}$
 (C) $\text{Na} \rightarrow \text{Na}^-$
 (D) $\text{P} \rightarrow \text{P}^-$
22. Which of the following processes is exothermic?
 (A) $\text{N}^- \rightarrow \text{N}$
 (B) $\text{N} \rightarrow \text{N}^+$
 (C) $\text{N} \rightarrow \text{N}^-$
 (D) $\text{N}^+ \rightarrow \text{N}^{2+}$
23. Which of the following statements is incorrect?
 (A) With the decrease in electronegativity in a group the metallic character increases.
 (B) Smaller ionization energy value indicates that electropositive character is more.
 (C) Electronegativity does not depend upon $Z_{\text{effective}}$.
 (D) Successive ionization energies always increase for an element.
24. Write the period number, group number and block of the element having atomic number 42.
 (A) 5, 5, *d*
 (B) 5, 6, *d*
 (C) 5, 2, *d*
 (D) 5, 15, *p*
25. The atomic numbers of two elements A and B are 17 and 20 respectively. The formula of an ionic compound made by A and B is (where the cation is conventionally written first)
 (A) AB
 (B) A_2B
 (C) AB_2
 (D) BA_2
26. The successive ionization energies (IE) for an element A are as follows

$$\text{A} \xrightarrow{\text{IE}_1} \text{A}^+ \xrightarrow{\text{IE}_2} \text{A}^{2+} \xrightarrow{\text{IE}_3} \text{A}^{3+} \rightarrow \dots$$
 If the IE_1 and IE_3 values are 27 kJ mol^{-1} and 51 kJ mol^{-1} respectively, then the value of IE_2 is _____ kJ mol^{-1} .
 (A) 21
 (B) 33
 (C) 59
 (D) 63
27. Consider three hypothetical ionic compounds AB, A_2B and A_3B_2 where in all the compounds B is in -2 oxidation state and A has a variable oxidation state. What is the correct order of lattice energy of these compounds?
 (A) $\text{A}_2\text{B} > \text{AB} > \text{A}_3\text{B}_2$
 (B) $\text{A}_2\text{B}_3 > \text{AB} > \text{A}_2\text{B}$
 (C) $\text{AB} > \text{A}_2\text{B} > \text{A}_3\text{B}_2$
 (D) $\text{A}_2\text{B}_3 > \text{A}_2\text{B} > \text{AB}$
28. Choose the correct order of the property given below:
 (A) $\text{N}^{3-} < \text{O}^{2-}$: Ionic radius
 (B) $\text{N} > \text{O}$: First ionization energy
 (C) $\text{N} > \text{O}$: Second ionization energy
 (D) $\text{N} > \text{O}$: Electron affinity order
29. The ionization energies for B, Tl and In are x , y and z kcal mol^{-1} respectively. Choose the correct relationship between them.
 (A) $z > x \approx y$
 (B) $x > y > z$
 (C) $x > y > \approx z$
 (D) $x < y > z$
30. The smallest size cation and anion that can exist are respectively
 (A) H^+ and H^-
 (B) H^+ and F^-
 (C) Li^+ and F^-
 (D) Li^+ and H^-
31. If the atomic number of an inert gas element is Z , then an element with which of the following atomic numbers will have the highest electronegativity according to Pauling scale?

- (A) $Z - 2$
 (B) $Z + 1$
 (C) $Z + 1$
 (D) $Z + 2$
32. For an element the successive ionisation energy values (in eV atom^{-1}) are given below 12.32, 26.84, 44.56, 65.73, 203.9, 251.12, 308.4.
 The element that satisfies the above values is
 (A) Si
 (B) Ca
 (C) Al
 (D) S
33. What is the atomic number of the element which belongs to fifth period and Group 16?
 (A) 50
 (B) 34
 (C) 52
 (D) 53
34. Which of the following valence shell electronic configuration is correct for d -block elements?
 (A) ns^2np^{1-6}
 (B) ns^{1-2}
 (C) $ns^{0-2}(n-1)d^{1-10}$
 (D) None of these.
35. Identify the block to which an element with electronic configuration: $[\text{Kr}]4d^{10}4f^{14}5s^25p^65d^16s^2$ belongs to
 (A) s -block
 (B) p -block
 (C) d -block
 (D) f -block
36. Find the electronic configuration of the element that is placed just below the element with atomic number 25 in the same group.
 (A) $1s^22s^22p^63s^23p^64s^23d^5$
 (B) $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^5$
 (C) $1s^22s^22p^63s^23p^64s^13d^6$
 (D) $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^14d^5$
37. If an element X forms the highest oxide of the formula XO_3 , then it belongs to Group
 (A) 14
 (B) 15
 (C) 16
 (D) 17
38. The group number for the inner transition element is
 (A) 3
 (B) 6
 (C) 4
 (D) 8

MULTIPLE CORRECT CHOICE TYPE QUESTIONS

1. Choose the correct statement among the following.
 (A) $\text{IE}_1(\text{Na}) < \text{IE}_1(\text{Mg})$
 (B) $\text{IE}_3(\text{Mg}) > \text{IE}_3(\text{Al})$
 (C) $\text{IE}_1(\text{Al}) < \text{IE}_1(\text{Mg})$
 (D) $\text{IE}_2(\text{N}) > \text{IE}_2(\text{O})$
2. If electronegativity of elements P, Q, R and S are respectively 0.8, 1.2, 1.8 and 2.5, then choose the hydroxides which are basic in nature.
 (A) POH
 (B) QOH
 (C) ROH
 (D) SOH
3. Which of the following ions have radius greater than F^- ?
 (A) H^-
 (B) Cl^-
 (C) Br^-
 (D) I^-
4. Consider two cations X and Y which have 8 and 18 electrons respectively in their outermost shell (both belong to $3d$ -series). Select the correct statement among the following.
 (A) Cation X and Y both have 8 electrons in their penultimate shell.
 (B) Difference between total number of electrons of X and Y is 10.
 (C) Cation Y may be of element Ni.
 (D) Cation X may be of element Sc.
5. An element has maximum values of quantum numbers as
 Maximum value of $n = 4$,
 Maximum value of $l = 2$,
 Maximum value of $m = +2$,
 Maximum value of $s = +1/2$
 (Subshells having at least one electron are considered only.) Then select the incorrect statements.
 (A) Element belongs to $5d$ series.
 (B) Element must belong to p -block.
 (C) Element must have at least 4 electrons in d -subshell.
 (D) Element belongs to fourth period.
6. If two elements of p -block have difference of group number = 4, then difference of their valence shell electrons will not be
 (A) 2
 (B) 3
 (C) 4
 (D) 6
7. Which of the following is/are correct order of ionization energy?
 (A) $\text{Ag} > \text{Cu} > \text{Au}$
 (B) $\text{Sc} > \text{Y} > \text{La}$
 (C) $\text{Pd} < \text{Pt} < \text{Ni}$
 (D) $\text{Al} \leq \text{Ga} < \text{B}$

8. Which of the following elements have electron affinity greater than O?
 (A) F (B) S
 (C) Se (D) Cl
9. An element with atomic number 48 ($Z = 48$) of the periodic table will
 (A) belong to p -block.
 (B) be placed in group number 12.
 (C) be called a transition element.
 (D) have twenty electrons with $l = 2$.
10. Identify the correct statements among the following.
 (A) $IE_{Zn} (Z = 30) < IE_{Ga} (Z = 31)$.
 (B) The Mulliken's scale of electronegativity = $(EA + IE)/2$, where EA and IE can be expressed in any energy unit.
 (C) On Pauling's scale, electronegativity of F is maximum.
 (D) $\chi_{Ga} < \chi_{K}$ (where χ is the electronegativity).
11. In which period or group of periodic table (long form) transition elements are not present?
 (A) Third group (B) Third period
 (C) Twelfth group (D) Thirteenth group
12. Choose the correct ionization energy order for the given species:
 (A) $O > S > S^- > O^-$
 (B) $F > F^- > Cl^- > Cl$
 (C) $O > O^- > S^- > S$
 (D) $F > Cl > Cl^- > F^-$
13. Which of the following statements are correct?
 (A) The electron affinity of Si is greater than that of C.
 (B) BeO is amphoteric while B_2O_3 is acidic.
 (C) The ionization energy of Tl is less than that of Al.
 (D) The ionization energy of elements of Cu-group is less than that of the respective elements of Zn-group.
14. Choose the incorrect statements from the following:
 (A) Ionization energy of atom may be negative.
 (B) Ionization energy of an ion may be negative.
 (C) Ionization energy is inversely proportional to radius.
 (D) Electron present in p orbital is in need of less energy for its removal as compared to electron present in d orbital having the same principal quantum number.
15. Among the elements with the following atomic numbers, which are d -block elements?
 (A) 29 (B) 81
 (C) 46 (D) 58
16. In which of the following processes the energy is being absorbed?
 (A) $Na(g) \rightarrow Na^-(g)$
 (B) $Na^+ \rightarrow Na^+(aq)$
 (C) $A^+(g) + B^-(g) \rightarrow AB(s)$
 (D) $N(g) \rightarrow N^+(g)$
17. The formation of the oxide ion $O^{2-}(g)$ requires first an exothermic and then an endothermic step as shown below:
 $O(g) + e^- \rightarrow O^-(g); \Delta H^\circ = -142 \text{ kJ mol}^{-1}$
 $O^-(g) + e^- \rightarrow O^{2-}(g); \Delta H^\circ = +844 \text{ kJ mol}^{-1}$
 Which is not the cause of the above fact?
 (A) Oxygen is more electronegative.
 (B) Oxygen has high electron affinity.
 (C) O^- ion has comparatively larger size than oxygen atom.
 (D) O^- ion will tend to resist the addition of electron.
18. IE_1 of an element is lower than that of IE_2 because
 (A) it is difficult to remove an electron from cation compared to from the same element.
 (B) the ionisation process is endothermic.
 (C) the size of cation is smaller than its atom.
 (D) all of the above.
19. In which of the following statements is the correct order with respect to the given property?:
 (A) $Fe^{3+}(aq) > Fe^{2+}(aq)$: Ionic mobility order.
 (B) $Br^-(aq) < Cl^-(aq) < F^-(aq)$: Hydrated radius order.
 (C) $SbH_3 > AsH_3 > PH_3$: $M - H$ bond polarity order.
 (D) $S > C > H > B$: Electronegativity order.

COMPREHENSION TYPE QUESTIONS

Passage 1: For Questions 1–2

Along the period, atomic/ionic radius and metallic character generally decreases, while IE, EN and nonmetallic character and oxidizing power increases.

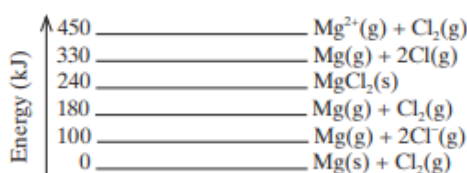
1. If the value of electron gain enthalpy (ΔH_{eg}) of 4 elements are given below, then the element which may behave as strongest oxidizing agent is

Element	ΔH_{eg}
P	-153 kJ/mole
Q	-90 kJ/mole
R	86 kJ/mole
S	-209 kJ/mole
(A) Q	(B) P
(C) S	(D) R

2. If the ionic radius of M^+ and X^- are about 135 and 209 pm respectively, then the expected values of atomic radius of M and X may be respectively (in pm)
 (M and X are metal and non-metal, respectively of same period.)
 (A) 180, 90
 (B) 135, 209
 (C) 90, 180
 (D) same radius which is average of 135 and 209 pm.

Passage 2: For Questions 3–4

Born Haber cycle is used to calculate enthalpy of formation of ionic compounds. It is based on Hess's law which states that enthalpy of reaction does not depend upon the method followed by the reaction. Energy of some systems is given below:



Using the given data, answer the following questions.

- The enthalpy of formation (in kJ) of MgCl₂(s) is
(A) 510 (B) 320
(C) 180 (D) 240
- Electron affinity (in kJ/mole) of chlorine is
(A) 170 (B) 115
(C) 230 (D) 105

Passage 3: For Questions 5–6

X, Y and Z are three consecutive elements. X on addition of one electron and Y on addition of two electrons become isoelectronic with element Z.

- Element Y will have following property:
(A) Atomic number of Y is higher than atomic number of Z.
(B) Atomic number of Y is higher than atomic number of X.
(C) Element Y is placed in periodic table at left side of element X if both are in same period.
(D) None of these
- Select correct statement:
(A) Difference between atomic number of X and Y is 3.
(B) Difference between total number of protons of X and Y is 2.
(C) Both (A) and (B).
(D) Difference between atomic number of X and Z is 1.

Passage 4: For Questions 7–8

Electronegativity is the property of a bonded atom. The tendency of an atom to attract the shared pair of electrons towards itself is called electronegativity. Different scales of electronegativity have been proposed by different scientists, some of them being Pauling's scale, Mulliken's scale and Allred Rochow scale.

The ionization potential of two atoms A and B are 14 eV/atom and 10.8 eV/atom respectively and their electron affinities are 8.4 eV/atom and 6 eV/atom respectively.

With respect to the above given information answer the following questions.

- If atoms A and B form a covalent bond, then what is the percent covalent character in the bond?
(A) 19.5 (B) 50
(C) 80.5 (D) 25
- If A is an atom of the periodic table, then the value of $(n+1)$ for the unpaired electron in A is
(A) 4 (B) 2
(C) 1 (D) 3

Passage 5: For Questions 9–11

Isoelectronic species have the same number of electrons. This property is not only restricted to atoms but also observed in molecules and ions.

- Choose the correct order of radius.

- (A) $O^{2-} > F^-$
(B) $Al^{3+} < Na^+$
(C) $Na^+ < N^{3-}$
(D) All of these.

- Which of the following statements is correct for the following isoelectronic series?



- (A) The size of the ions initially increases then decreases.
(B) The first ionization energy decreases from left to right.
(C) The first ionization energy increases from left to right.
(D) None of these.

- Which of the following sets of isoelectronic species does not have the same shape?

- (A) H₂S and HCl
(B) NO₃⁻ and CO₃²⁻
(C) ClO₄⁻ and SO₄²⁻
(D) NO₂⁺ and CO₂

Passage 6: For Questions 12–14

The electronegativities of four elements A, B, C, D are 4, 3, 1.7, 0.7 and 2.85 respectively and the electronegativities of hydrogen (H) and oxygen (O) atoms are 2.1 and 3.5 respectively.

- Which of the following bonds is most polar?

- (A) B–C (B) A–D
(C) B–D (D) C–D

- Which of the following bonds is least polar?

- (A) O–H (B) O–C
(C) A–C (D) H–D

- Which of the following compounds does not act as acid?

- (A) H–O–A (B) H–O–B
(C) H–O–C (D) H–O–D

Passage 7: For Questions 15–17

The electron affinity is an inherent property of the atom and it depends upon several factors.

- The correct electron affinity order is

- (A) F > Cl
(B) Cl > F
(C) S < P
(D) N > O

16. Which of the following is an incorrect statement?
 (A) The first ionization energy of A^- is equal to the electron affinity of A.
 (B) The second electron affinity is always greater than the first electron affinity for an element.
 (C) The process $O \rightarrow O^{2-}$ is endothermic
 (D) The process $Li \rightarrow Li^+$ is endothermic.
17. Which of the following reactions would not proceed in the forward direction spontaneously?
 (A) $Xe + He^+ \rightarrow Xe^+ + He$
 (B) $Si + Cl^+ \rightarrow Si^+ + Cl$
 (C) $F^- + I \rightarrow F + I^-$
 (D) $Be^- + B \rightarrow Be + B^+$

Passage 8: For Questions 18–19

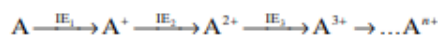
Ionization potential is the minimum amount of energy needed to remove the outermost electron from the gaseous isolated atom. Its unit is $eV \text{ atom}^{-1}$ or $kJ \text{ mol}^{-1}$. Successive ionization energy is the amount of energy needed to remove electron successively from a gaseous ion, it may be termed as IE_1, IE_2, \dots . The difference in the values of IE_1, IE_2, \dots helps to determine electronic configuration of the elements.

Element	IE_1	IE_2	IE_3 (kcal/mol)
P	497	947	1500
Q	98	735	1100
R	176	347	1850
S	296	530	2050

18. Which of the element (X) can make MX type compound (where X is the halogen and M is alkali metal)?
 (A) P (B) Q
 (C) R (D) S
19. The order of ionic mobility in aqueous solution of the following ions will be
 (A) $R^{2+}_{(aq)} > S^{2+}_{(aq)}$
 (B) $S^{2+}_{(aq)} > R^{2+}_{(aq)}$
 (C) $S^{2+}_{(aq)} = R^{2+}_{(aq)}$
 (D) cannot be correlated.

Passage 9: For Questions 20–21

Successive ionisation energies of an element is represented as follows



20. Which of the following statement is correct?
 (A) In some of the elements IE_2 values may be negative.
 (B) IE_1 of $A^{3+} = IE_2$ of A^+ .

- (C) Successive electron affinity of A^{n+} is gradually decreasing.
 (D) None of these is correct.
21. If A has the electronic configuration of $1s^2 2s^2 2p^3$, then which of the following statement is correct?
 (A) IE_1 of A^+ is negative.
 (B) IE_1 of A is less than that of A^- .
 (C) $IE_2 = IE_3$ for above element.
 (D) All of the above statements are correct.

Passage 10: for Questions 22–24

Ionization energy is always positive for an element and successive ionization energies always gradually increase.

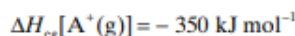
22. The successive ionization energy for an element is given below in kJ/mol .
 0.7865, 1.5771, 3.2316, 4.3555, 16.091, 19.785, 23.786, 29252

Predict the number of valence shell electrons in the given element.

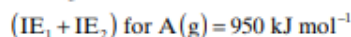
- (A) 1
 (B) 2
 (C) 3
 (D) 4
23. For an element having only one valence shell electron, which of the following difference will have the maximum value.
 (A) $IE_2 - IE_1$
 (B) $IE_3 - IE_2$
 (C) $IE_3 - IE_1$
 (D) cannot be predicted
24. Choose the incorrect ionization energy order
 (A) $Al > Ga$
 (B) $Tl > In$
 (C) $Pb > Sn$
 (D) $Y < Sc$

Passage 11: For Questions 25–27

Given the following information



where ΔH_{eg} is electron gain enthalpy.



25. The value of ΔH_{eg} of $A^{2+}(g)$ in $kJ \text{ mol}^{-1}$ is
 (A) +600 (B) -600 (C) -500 (D) +500
26. The value of IE_1 of A^- in $kJ \text{ mol}^{-1}$ is
 (A) +450 (B) +350 (C) +600 (D) +250
27. The $\Delta H_{hydration}$ of $A^{2+}(g)$ in $kJ \text{ mol}^{-1}$ is
 (A) +250 (B) -350 (C) -250 (D) -300

ASSERTION-REASONING TYPE QUESTIONS

In the following set of questions, a Statement I is given and a corresponding Statement II is given below it. Mark the correct answer as:

- (A) If both Statement I and Statement II are true and Statement II is the correct explanation of Statement I.
 (B) If both Statement I and Statement II are true but Statement II is not the correct explanation for Statement I.
 (C) If Statement I is true but Statement II is false.
 (D) If Statement I is false but Statement II is true.

1. **Statement I:** Acetylene forms salts with metals like Ca and Ba more easily as compared to C_2H_4 .

Statement II: The polarity of C–H bond in C_2H_2 is more than that in C_2H_4 .

2. **Statement I:** Ti^{3+} has higher electronegativity as compared to Ti^+ .

Statement II: The oxidation state of Ti in TiI_3 is not +3.

3. **Statement I:** $CH_3I + OH^- \rightarrow CH_3OH + I^-$ and $CF_3I + OH^- \rightarrow CF_3OH + I^-$

Statement II: Both these reactions are nucleophilic substitution reactions.

4. **Statement I:** The size H^- is greater than that of F^- .

Statement II: The e/p ratio in H^- is 2 while that in F^- is $10/9$.

5. **Statement I:** The inner transition elements are placed in Group 3 B.

Statement II: The most stable oxidation state in case of the inner transition elements is +3.

6. **Statement I:** The actinide contraction is more as compared to the lanthanide contraction.

Statement II: $5f$ electrons have much lower shielding effect as compared to $4f$ electrons because $5f$ orbitals are more diffused than $4f$ orbitals.

7. **Statement I:** For elements in the lanthanide series, the atomic radius decreases gradually from left to right with the exception of Eu ($Z = 63$) and Yb ($Z = 70$).

Statement II: Only two electrons are involved in the metallic bonding of Eu and Yb and three electrons are involved in case of other elements of the lanthanide series.

8. **Statement I:** The ionization energy of Na^{2+} is less than that of Na^+ .

Statement II: Na^+ has an inert gas configuration.

9. **Statement I:** The electron affinity of P is less than that of Si.

Statement II: Z_{eff} increases in a period from left to right.

10. **Statement I:** The acidic strength of $H-O-X$ decreases from $X = Cl$ to $X = I$.

Statement II: The electronegativity decreases from Cl to I.

11. **Statement I:** H^- is a stronger reducing agent as compared to H atom.

Statement II: The electronic configuration of H and H^- is $1s^1$ and $1s^2$, respectively.

INTEGER ANSWER TYPE QUESTIONS

The answer to each of the following questions is a non-negative integer.

1. How many of the following options are incorrect in accordance with the mentioned properties?

(I) IP_1 of ion $M^{2+} > EA_1$ of M^{3+} .

(IP = ionization potential, and EA = electron affinity)

(II) $S > Se > Te > O$ (order of EA)

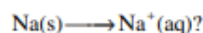
(III) $Li < Be < B < C$ (order of electronegativity)

(IV) $Mn^{4+} < Mg^{2+} < Na < F^-$ (order of ionic size)

(V) $Li^+ > Na^+ < K^+$ (order of hydrated size)

(VI) $NaCl > MgCl_2 > AlCl_3$ (order of lattice energy)

2. How many of the following energies are involved in the transformation of



$IE, \Delta H_{sub}, \Delta H_{diss}, \Delta H_{hydration}, \Delta H_{LE}$

3. Which of the following elements form amphoteric oxides?

Be, B, Al, Ga, Sn, Zn, Ge, Cu, Mn

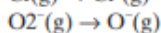
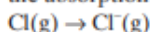
4. Calculate the ionization energy (in eV/atom) of fluorine if its electronegativity on Pauling's scale is 4 and its electron gain enthalpy is -3.4 eV/atom. (Add the digits till you get single digit answer.)

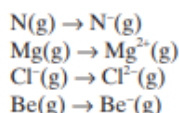
5. Successive ionization energies data (in eV/atom) of an element of second period is

$IE_1 \quad IE_2 \quad IE_3 \quad IE_4 \quad IE_5 \quad IE_6$
 120 133 167 719 797 850

Find the group number of element according to long form periodic table (1 – 18 convention)

6. How many of the following reactions proceed with the absorption of energy?





7. The number of elements among the following, which have lower electronegativity than oxygen atom, based on Pauling scale, is _____.

F, Cl, Br, I, H, S, P, K, Ca

8. The first four successive ionization energies for an element are 6.113, 11.871, 50.908 and 6701 (in eV) respectively. The number of valence shell electrons is _____.

9. The number of species among the following, having inert gas configuration is _____.

K^{2+} , Ca^{2+} , S^- , S^{2-} , Br^- , Se^{2-} , H^+ , H^- , Mn^{2+}

10. The number of elements among the following atomic numbers that are *p* block elements is _____.
83, 79, 42, 64, 37, 54, 34

11. The difference in the electronegativity of two atoms, when the percentage ionic character is 19.5%, is _____.

12. Bond length of A–A bond is 124 pm and bond length of B–B bond is 174 pm. The bond length (in pm) of A–B bond in AB molecule if percent ionic character of A–B bond is 19.5% is _____.

13. The number of pairs, in which electron affinity of the second element is more than that of the first element is _____.
(F, Cl) (C, N) (O, N) (F, Ne) (B, C), (O, S)

14. The number of species having higher first ionization energy than Ca from the following is _____.
Ga, Ge, Br, Se, Kr, As, K

MATRIX-MATCH TYPE QUESTIONS

In each of the following questions, statements are given in two columns, which have to be matched. The statements in Column I are labelled as (A), (B), (C) and (D), while those in Column II are labelled as (P), (Q), (R), (S) and (T). Any given statement in Column I can have correct matching with *one or more* statements in Column II.

1. Match the processes with the characteristic changes.

Column I	Column II
(A) $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$	(P) Exothermic in nature
(B) $\text{F} \rightarrow \text{F}^-$	(Q) Endothermic in nature
(C) $\text{H} \rightarrow \text{H}^-$	(R) Becomes diamagnetic
(D) $\text{N}^+ \rightarrow \text{N}^-$	(S) The magnetic moment undergoes a change

2. Match the properties with the parameters that they are dependent on.

Column I	Column II
(A) Electron affinity	(P) Radius
(B) Ionization potential	(Q) Z_{eff}

Column I	Column II
(C) Electronegativity	(R) Half-filled or fully filled configuration
	(S) Screening constant

3. Match the ionic species with their characteristics.

Column I	Column II
(A) Mn^{2+}	(P) Has the highest ionization energy
(B) Mn^{4+}	(Q) Has the highest ionic radius
(C) Mn^{3+}	(R) Has the highest magnetic moment
(D) Mn^{7+}	(S) Paramagnetic
	(T) Diamagnetic

4. Match the elements with their properties.

Column I	Column II
(A) K	(P) One electron in the <i>s</i> orbital of valence shell
(B) Cu	(Q) Transition element
(C) La	(R) One unpaired electron
(D) Au	(S) Member of the 4th period

ANSWERS

Single Correct Choice Type Questions

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (B) | 3. (D) | 5. (D) | 7. (D) | 9. (C) |
| 2. (A) | 4. (D) | 6. (B) | 8. (D) | 10. (C) |
| 11. (C) | 17. (A) | 23. (C) | 29. (B) | 35. (D) |
| 12. (C) | 18. (C) | 24. (B) | 30. (B) | 36. (B) |
| 13. (D) | 19. (C) | 25. (D) | 31. (B) | 37. (C) |
| 14. (C) | 20. (D) | 26. (B) | 32. (A) | 38. (A) |
| 15. (C) | 21. (B) | 27. (B) | 33. (C) | |
| 16. (B) | 22. (A) | 28. (B) | 34. (C) | |

Multiple Correct Choice Type Questions

- | | | | | |
|-----------------------|-----------------------|-------------------|-------------------|-------------------|
| 1. (A), (B), (C), (D) | 5. (A), (B), (C) | 9. (B), (D) | 13. (A), (B), (D) | 17. (A), (B), (C) |
| 2. (A), (B), (C) | 6. (A), (B), (D) | 10. (C), (D) | 14. (A), (D) | 18. (A), (C) |
| 3. (A), (B), (C), (D) | 7. (B), (D) | 11. (B), (C), (D) | 15. (A), (C) | 19. (B), (C), (D) |
| 4. (A), (B), (D) | 8. (A), (B), (C), (D) | 12. (A), (D) | 16. (A), (B), (C) | |

Comprehension Type Questions

- | | | | | |
|--------|---------|---------|---------|---------|
| 1. (C) | 7. (C) | 13. (D) | 19. (A) | 25. (B) |
| 2. (A) | 8. (D) | 14. (C) | 20. (A) | 26. (A) |
| 3. (D) | 9. (D) | 15. (B) | 21. (A) | 27. (C) |
| 4. (B) | 10. (C) | 16. (B) | 22. (D) | |
| 5. (C) | 11. (A) | 17. (C) | 23. (C) | |
| 6. (D) | 12. (A) | 18. (A) | 24. (A) | |

Assertion-Reasoning Type Questions

- | | | | |
|--------|--------|--------|---------|
| 1. (A) | 4. (A) | 7. (A) | 10. (A) |
| 2. (B) | 5. (A) | 8. (D) | 11. (B) |
| 3. (D) | 6. (A) | 9. (B) | |

Integer Answer Type Questions

- | | | | | |
|------|-------|------|-------|-------|
| 1. 2 | 4. 19 | 7. 8 | 10. 3 | 13. 3 |
| 2. 3 | 5. 13 | 8. 2 | 11. 1 | 14. 5 |
| 3. 6 | 6. 4 | 9. 5 | 12. 5 | |

Matrix-Match Type Questions

- | | |
|--|---|
| 1. (A) \rightarrow (Q), (S)
(B) \rightarrow (P), (R), (S)
(C) \rightarrow (P), (R), (S)
(D) \rightarrow (P) | 3. (A) \rightarrow (Q), (R), (S)
(B) \rightarrow (S)
(C) \rightarrow (S)
(D) \rightarrow (P), (T) |
| 2. (A) \rightarrow (P), (Q), (R), (S)
(B) \rightarrow (P), (Q), (R), (S)
(C) \rightarrow (P), (Q), (R), (S) | 4. (A) \rightarrow (P), (R), (S)
(B) \rightarrow (P), (Q), (R), (S)
(C) \rightarrow (Q), (R)
(D) \rightarrow (P), (Q), (R) |

