Chapter

4

Periodic Table

Single Correct Option Type Questions

Q.1 In which block will copper be placed if the Aufbau principle is not followed and the filling of electrons takes place in the following sequence, 1s, 2s, 2p, 3s, 3p, 3d, 4s, 4p, 4d, 4f ... ?
(A) s (B) p (C) d (D) f

Q.2 What is the atomic number of the element which belongs to the 5^{th} period and Group 16 ?
(A) 50 (B) 34 (C) 52 (D) 53

Q.3 Which of the following valence shell electronic configuration is correct for d-block element ?
(A) $ns^2\ np^{1-6}$ (B) ns^{1-2} (C) $ns^{0-2}\ (n-1)\ d^{1-10}$ (D) none of these

Q.4 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) 2

Q.5 The set representing the correct order of ionic radius is
(A) $Na^+ > Mg^{2+} > Al^{3+} > Li^+ > Be^{2+}$ (B) $Na^+ > Li^+ > Mg^{2+} > Al^{3+} > Be^{2+}$
(C) $Na^+ > Mg^{2+} > Li^+ > Al^{3+} > Be^{2+}$ (D) $Na^+ > Mg^{2+} > Li^+ > Be^{2+}$

Q.6 The electronic configuration of four elements are
(I) $[Kr]\ 5s^1$ (II) $[Rn]\ 5f^{14}\ 6d^1\ 7s^2$ (III) $[Ar]\ 3d^{10}\ 4s^2\ 4p^5$ (IV) $[Ar]\ 3d^6\ 4s^2$
Consider the following statements
(i) I shows variable oxidation state
(ii) II is a d-block element
(iii) The compound formed between I and III is covalent
(iv) IV shows single oxidation state.
Which statement is True (T) or False (F).
(A) FTFF (B) FTFT (C) FFTF (D) FFFF

Q.7 Which of the following statement is correct regarding following process.
(i) $Cl \xrightarrow{E.A.} Cl^-$ (ii) $Cl^- \xrightarrow{I.E.} Cl$ (iii) $Cl \xrightarrow{I.E.} Cl^+$ (iv) $Cl^+ \xrightarrow{I.E.} Cl^{2+}$
(A) | I.E. of process (ii) | = | E.A. of process (i) |
(B) | I.E. of process (iii) | = | I.E. of process (ii) |
(C) | I.E. of process (iv) | = | E.A. of process (i) |
(D) | I.E. of process (iv) | = | I.E. of process (iii) |

Q.8 Select the incorrect statement :
(A) IE_1 of nitrogen atom is less than IE_1 of oxygen atom
(B) Negative value of electron gain enthalpy of oxygen is less than selenium
(C) Electronegativity of Mullikan scale is 2.8 times than electronegativity on Pauling scale
(D) Positive values of electron gain enthalpies of berrylium and magnesium are nearly same

Q.9 Which of the following statement is/are incorrect ?
(1) On moving in a period electron gain enthalpy decreases.
(2) On moving top to bottom in a group usually ionization energy decreases.
(3) As atomic number increases atomic radius decreases.
(4) Size of ions change as $C^{-4} < N^{-3} < O^{-2} < F^-$
(5) Electron affinity for addition of electron in different orbitals of 4^{th} shell in order of 4s > 4p > 4d > 4f.
(6) Polarising power of cation in a 1^{st} group from top to bottom decreases.
(A) 3 and 6 (B) 3, 5 and 6 (C) 2 and 6 (D) 1, 3 and 4

Q.10 In which choice are the sodium halides listed in order of increasing lattice energy ?
(Consider magnitude of lattice energy only)
(A) NaF, NaCl, NaBr (B) NaBr, NaCl, NaF
(C) NaCl, NaF, NaBr (D) NaCl, NaBr, NaF

Q.11 The incorrect order among the following is
(A) Cl > F > Br > I (Electron affinity) (B) $O^{-2} > F^- > Na^+ > Mg^{2+}$ (Ionic size)
(C) N > O > B > Be (1^{st} ionization energy, IE_1) (D) F > O > N > Br (Electronegativity)

Q.12 Which of the following sequence given below is correct regarding ionization potential?
(A) N > F > S > P (B) F > N > S > P (C) F > N > P > S (D) F > S > P > N

Statement Based Questions

Q.13 **Statement-1:** In Lother Meyer Curve the alkali elements occupy maxima of the curve.
Statement-2: Alkali elements have largest volume in a period.
(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1.
(C) Statement-1 is True, Statement-2 is False.
(D) Statement-1 is False, Statement-2 is True.

Multiple Correct Option Type Questions

Q.14 Choose the correct ionization energy order for the given species -
(A) O > S > S^- (B) F > F^- > Cl^- > Cl (C) O > O^- > S^- > S (D) F > Cl > Cl^-

Q.15 Which of the following statements are correct ?
(A) The electron affinity of Si is greater than that of C
(B) BeO is amophoteric 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

Q.16 Choose the incorrect statements from the following -
(A) Ionization energy of atom may be negative
(B) Ionization energy of an ion may be positive
(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

Q.17 Select the correct order of periodic properties of species

(A) $Fe^{2+} < Fe^{3+}$: ionic radii (B) N < O : second ionisation energy

(C) Cu < Zn : Atomic Radius (D) In < Tℓ : first ionisation energy

Q.18 CORRECT match is/are :

(A) AlN > MgO > MgF_2 : Lattice energy

(B) $N_2 > N > O > O_2$: Ionisation energy

(C) $SF_6 > PF_5 > SiF_4$: Lewis acidic character

(D) $SiCl_4 > SiBr_4 > SiI_4$: Electronegativity of Si

Q.19 Which of the following statement is are correct ?

(A) The electron Affinity of Si in greater than that of C

(B) BeO is amphotaric while B_2O_3 is acidic

(C) The I.E. of Tl is less than that of Al

(D) The ionisation energy (I.E.) of elements of Cu group is less that of the respective elements of Zn group

Q.20 The formation of the oxide ion $O^{2-}(g)$ require first an exothermic and then an endothermic step as shown below

$O_{(g)} + e^- \longrightarrow O^-_{(g)}$ $\Delta H° = -142$ kJ/mole

$O^-(g) + e^- \longrightarrow O^{2-}(g)$ $\Delta H° = +844$ kJ/mole

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 due to 2p-2p repulsion

Q.21 In which of the following statements in the correct order with respect to the given property ?

(A) $\underline{Fe}^{+3}(aq) > Fe^{+2}(aq)$ Ionic mobility order

(B) $Ba^-_{(aq)} < Cl^-_{(aq)} < F^-_{(aq)}$ Hydrated radius order

(C) $SbH_3 > AsH_3 > PH_3$ M–H bond polarity order

(D) S > C > H > B Electronegativity order

Q.22 Select the correct statements

(A) The value of electron gain enthalpy of an element can be negative or positive

(B) In the periodic table, metallic character of the elements increases down the group the and decreases across the period

(C) Ionization enthalpy of an atom is equal to electron gain enthalpy of cation

(D) The Cl^- and S^{2-} are isoelectronic species but first one is bigger in size than the second

Q.23 Which of the following is/are the effect of f-orbital contraction effect ?

(A) Similarity in the size of Zr, Hf

(B) High electron affinities among the post lanthanides

(C) High I.E. of Hg as compare to Tl

(D) High I.E. of Tl as compare to In

Q.24 22.44 kJ energy is required to convert 8 gm of gaseous atom of metal M to $M^+_{(g)}$ if $I.E._1$ of metal M = 374 kJ/mole.

Select correct for above metal M.

(A) 0.6 mole gaseous ion (M^+) are formed

(B) Same energy can convert all $M^+_{(g)}$ to $M^{2+}_{(g)}$

(C) Atomic mass of metal = 133.33

(D) 3.613×10^{22} atoms of M are converted to $M^+_{(g)}$

Q.25 Identify the correct statement (s) among the following

(A) The electronegativity of an element is the tendency of an isolated atom to attract an electron

(B) The second ionization potential of boron is greater than carbon

(C) Nitrogen has almost zero electron gain enthalpy

(D) The first electron affinity of fluorine is greater than that of chlorine

Passage Based Questions

Passage # 1 (Ques. 26 - 27)

The $I.E._1$ and the $I.E._2$ in kJ mol^{-1} of a few elements designated by P, Q, R, S are shown below :

Atom	$I.E._1$	$I.E._2$
P	2372	5251
Q	520	7300
R	900	1760
S	1680	3380

Based on the above information, answer the following questions :

Q.26 Which of the element is likely to be reactive metal ?

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

Q.27 Which of the elements is likely to be reactive non-metal ?

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

Passage # 2 (Ques. 28 - 30)

The electronegatives of four elements A, B, C, D are 4, 3.17, 0.7 and 2.85 respectively and the electronegatives of hydrogen (H) and oxygen (O) atoms are 2.1 and 3.5 respectively.

Q.28 Which of the following bonds in most polar ?

(A) B – C (B) A – D (C) B – D (D) C – D

Q.29 Which of the following bonds is least polar ?

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

Q.30 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 # 3 (Ques. 31 - 32)

Pauling gave method to calculate univalent ion radii by assuming that

(i) In ionic crystals (let M^+X^-) cations and anions are in contact with each other and sum of their radii is equal to interionic distance,

$$\text{i.e. } d_{(M^+-X^-)} = r_{(M^+)} + r_{(X^-)}$$

(ii) The radius of an ion having noble gas configuration is inversely proportional to the effective nuclear charge left at the periphery of the ion i.e.

$$r_{(M^+)} = \frac{C}{Z_{eff}(M^+)} \text{ and } r_{(X^-)} = \frac{C}{Z_{eff}(X^-)}$$

Here C is constant of proportionally whose value depends on electronic configuration of ion,

Thus,

$$d_{(M^+-X^-)} = \left(\frac{C}{Z_{eff}(M^+)} + \frac{C}{Z_{eff}(X^-)}\right) pm$$

Z_{eff} is the effective nuclear charge whose value can be calculated by the formula : $Z_{eff}\ Z - \sigma$. Here σ is shielding constant and for neon, the value of σ when calculate by Slater's rule is found to be 4.5.

Q.31 The value of constant C for NaF crystal is (given that interionic distance of NaF = 231 pm)

(A) 231 (B) 115.5 (C) 614.5 (D) 307.25

Q.32 The value of univalent radii for F^- as calculated using Pauling method is (given that interionic distance of NaF = 231 pm)

(A) 94.5 pm (B) 136.5 pm (C) 111.68 pm (D) 115.5 pm

Column Matching Type Questions

Q.33 Match the column :

Column -I	Column-II
(A) Energy released	(P) $S \rightarrow S^-$
(B) Energy absorbed	(Q) $O^- \rightarrow O^{2-}$
(C) Inert gas configuration is a achieved	(R) $Sr \rightarrow Sr^{2+}$
(D) Half filled configuration is achieved	(S) $N \rightarrow N^-$
	(T) $Ge \rightarrow Ge^-$

Q.34 Most elements form oxides and hydroxides and often regular periodic trends of characteristics of oxides and hydroxides are observed.

Match the following :

Column-I (Solvent)		Column-II (Solubility)
(P)	BeO	1. Acidic
(Q)	B_2O_3	2. Basic
(R)	Al_2O_3	3. Amphoteric
(S)	Tl_2O_3	4. Neutral

Codes:

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

Numeric Response Type Questions

Q.35 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

Q.36 The first four successive ionization energies for an element are 6.113, 11.871, 50.908, 67.01 (in eV) respectively. The number of valence shell electron is ..... .

Q.37 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+}

Q.38 How many elements of the 3d-series have ionisation energy more than V ?

Q.39 A metal has electronic configuration [Ar] $3d^7\ 4s^2$. On the basis of this electronic configuration, find out the group member.

Q.40 Consider the following order

(i) $HF > HCl > HBr > HI \rightarrow$ Lewis basic character

(ii) $CH_4 > CCl_4 > CF_4 \rightarrow$ electronegativity of central C-atom

(iii) $Mg^{+2} < K^+ < S^{-2} < Se^{-2} \rightarrow$ ionic radius

(iv) $Ni > Pd > Pt \rightarrow$ Ionisation energy

(v) $As^{+5} > Sb^{+5} > Bi^{+5} \rightarrow$ stable oxidation state

(vi) $LiF > NaF > KF > RbF \rightarrow$ lattice energy

(vii) $F^-_{(aq)} > Cl^-_{(aq)} > Br^-_{(aq)} > I^-_{(aq)} \rightarrow$ electrical conductance

(viii) $Li^+ < Mg^{+2} < Al^{+3} \rightarrow$ hydration energy

(ix) $Cl > Br > F > I \rightarrow$ electron affinity

(x) $BeCl_2 < AlCl_3 < SiCl_4 \rightarrow$ Lewis acidic character

The calculation value of $|x - y|^2$. Where x and y correct and incorrect order respectively.

ANSWER KEY

Single Correct Option type Questions

1. (A)	**2.** (C)	**3.** (C)	**4.** (C)	**5.** (B)	**6.** (D)	**7.** (A)
8. (A)	**9.** (D)	**10.** (B)	**11.** (C)	**12.** (C)		

Statement Based Questions

13. (A)

Multiple Correct Option type Questions

14. (A,D)	**15.** (A,B,D)	**16.** (A,D)	**17.** (B,C,D)	**18.** (A,B,D)	**19.** (A,B,D)	**20.** (A,B,C)
21. (B,C,D)	**22.** (A,B,C)	**23.** (A,B,D)	**24.** (C,D)	**25.** (B,C,D)		

Passage Based Questions

26. (B)	**27.** (D)	**28.** (A)	**29.** (D)	**30.** (C)	**31.** (C)	**32.** (B)

Column Matching Type Questions

33. [**A** → P,T; **B** → Q,R,S; **C** → Q,R; **D** → T]

34. [B]

Numerical Response Type Questions

35. (8)	**36.** (2)	**37.** (4)	**38.** (7)	**39.** (9)	**40.** (4)