Chapter 01 Periodic Table and Periodic Properties

JEE RANKER'S STUFF

SINGLE CORRECT QUESTIONS

Q.1 Which of the following elements have electron affinity greater than S?
(1) O (2) Se
(3) Te (4) None of these

Q.2 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 $(n-2)f^{1-14}(n-1)d^{10}ns^2$.
(1) TTFT (2) TFFT (3) FFTF (4) FTTF

Q.3 Choose the correct order of ionization energy for the following species.
(1) Sc > La > Y (2) Sc > Y ≈ La
(3) Sc > Y > La (4) Sc < Y > La

Q.4 Choose the incorrect order for acidic strength.
(1) $CO_2 > CO$ (2) $SO_2 < SO_3$
(3) $HClO_2 > HOCl$ (4) $SiO_2 > CO_2$

Q.5 The smallest size cation and anion that can exist are respectively
(1) H^+ and H^- (2) H^+ and F^-
(3) Li^+ and F^- (4) Li^+ and H^-

Q.6 Assuming that elements are formed to complete the seventh period, what would be the atomic number of the alkaline earth metal of the eighth period?
(1) 113 (2) 120 (3) 119 (4) 106

Q.7 The correct order of atomic/ionic radii is:
(1) Sc > Ti > V > Cr
(2) Co > Ni > Cu > Zn
(3) $S^{2-} > Cl^- > O^{2-} > N^{3-}$
(4) None of these

Q.8 The first I.E. of Na, Mg, Al and Si are the increasing order :
(1) Na < Mg < Al < Si
(2) Na < Al < Mg < Si
(3) Na < Al < Si < Mg
(4) Na > Mg > Al > Si

Q.9 The electronegativity of the following elements increases in the order:
(1) C < N < Si < P (2) Si < P < C < N
(3) N < C < P < Si (4) C < Si < N < P

Q.10 The hydration energy of Mg^{2+} ions is lesser than that of :
(1) Al^{3+} (2) Ba^{2+}
(3) Na^+ (4) None of these

Q.11 Consider the isoelectronic species, Na^+, Mg^{2+}, F^- and O^{2-}. The correct order of increasing length of their radii is _____.
(1) $F^- < O^{2-} < Mg^{2+} < Na^+$
(2) $Mg^{2+} < Na^+ < F^- < O^{2-}$
(3) $O^{2-} < F^- < Na^+ < Mg^{2+}$
(4) $O^{2-} < F^- < Mg^{2+} < Na^+$

Q.12 Which of the following is not an actinoid ?
(1) Curium (Z = 96) (2) Californium (Z = 98)
(3) uranium (Z = 92) (4) Terbium (Z = 65)

Q.13 The order of screening effect of electrons of s, p, d and f orbitals of a given shell of an atom on its outer shell electrons is :
(1) s > p > d > f (2) f > d > p > s
(3) f < d < s < p (4) f > p > s > d

Q.14 The first ionization enthalpies of Na, Mg, Al and Si are in the order :
(1) Na < Mg < Si < Al (2) Na > Mg > Al > Si
(3) Na < Al < Mg < Si (4) Na > Al > Mg > Si

Q.15 The electronic configuration of gadolinium (Atomic number 64) is
(1) [Xe] $4f^3\ 5d^5\ 6s^2$ (2) [Xe] $4f^7\ 5d^2\ 6s^1$
(3) [Xe] $4f^7\ 5d^1\ 6s^2$ (4) [Xe] $4f^8\ 5d^6\ 6s^2$

Q.16 The statement that is not correct for periodic classification of elements is :
(1) The properties of elements are periodic function of their atomic numbers.
(2) Non metallic elements are less in number than metallic elements.
(3) For transition elements, the 3d-orbitals are filled with electrons after 3p-orbitals and before 4s-orbitals.
(4) The first ionisation enthalpies of elements generally increase with increase in atomic number as we go along a period.

Q.17 Among halogens, the correct order of amount of energy released in electron gain (electron gain enthalpy) is :
(1) F > Cl > Br > I (2) F < Cl < Br < I
(3) F < Cl > Br > I (4) F < Cl < Br < I

Q.18 The period number in the long form of the periodic table is equal to
(1) Magnetic quantum number of any element of the period.
(2) atomic number of any element of the period.
(3) Maximum Principal quantum number of any element of the period.
(4) Maximum Azimuthal quantum number of any element of the period.

Q.19 The elements in which electrons are progressively filled in 4f-orbital are called
(1) actinoids (2) transition elements
(3) lanthanoids (4) halogens

Q.20 Which of the following is the correct order of size of the given species.
(1) $I > I^- > I^+$ (2) $I^+ > I^- > I$
(3) $I > I^+ > I^-$ (4) $I^- > I > I^+$

Q.21 The element with atomic number 57 belongs to
(1) s-block (2) p-block
(3) d-block (4) f-block

Q.22 The last element of the p-block in 6^{th} period is represented by the outermost electronic configuration.
(1) $7s^2\ 7p^6$ (2) $5f^{14}\ 6d^{10}\ 7s^2\ 7p^0$
(3) $4f^{14}\ 5d^{10}\ 6s^2\ 6p^6$ (4) $4f^{14}\ 5d^{10}\ 6s^2\ 6p^4$

Q.23 Which of the elements whose atomic number are given below, cannot be accomodate in the present set up of the long form of the periodic table ?
(1) 107 (2) 118 (3) 126 (4) 102

Q.24 The electronic configuration of the element which is just above the element with atomic number 43 in the same group is _____.
(1) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5 4s^2$
(2) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5 4s^3\ 4p^6$
(3) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6 4s^2$
(4) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7 4s^2$

Q.25 The element with atomic numbers 35, 53, and 85 are all _____.
(1) noble gases (2) halogens
(3) heavy metals (4) light metals

Q.26 Electronic configurations of four elements A, B, C and D are given below :
(A) $1s^2\ 2s^2\ 2p^6$ (B) $1s^2\ 2s^2\ 2p^4$
(C) $1s^2\ 2s^2\ 2p^6\ 3s^1$ (D) $1s^2\ 2s^2\ 2p^5$
Which of the following is the correct order of increasing tendency to gain electron :
(1) A < C < B < D (2) A < B < C < D
(3) D < B < C <A (4) D < A < B < C

Q.27 The element with the highest ionisation potential is
(1) oxygen (2) nitrogen
(3) carbon (4) boron

Q.28 Which of the following elements has the least ionization potential ?
(1) Li (2) Cs (3) Mg (4) Ca

Q.29 The ionisation potential of which element is highest?
(1) H (2) He (3) Ar (4) F

Q.30 The first ionisation potentials in electron volts of nitrogen and oxygen atoms are respectively given by :
(1) 14.6, 13.6 (2) 13.6, 14.6
(3) 13.6, 13.6 (4) 14.6, 14.6

Q.31 The maximum ionisation potential in a period is shown by
(1) alkali metals
(2) inert gases
(3) representative elements
(4) halogens

Q.32 Ionisation energy of nitrogen is more than oxygen because :
(1) nucleus has more attraction for electrons
(2) half filled 'p' orbitals are more stable

(3) nitrogen atom is small
(4) more penetration effect

Q.33 Amongst the following elements (whose electronic configuration are given below) the one having highest ionisation energy is
(1) [Ne] $3s^2\ 3p^1$ (2) [Ne] $3s^2\ 3p^3$
(3) [Ne] $3s^2\ 3p^2$ (4) $3d^{10}, 4s^2\ 4p^3$

Q.34 Which of the following transitions involves maximum energy ?
(1) $M^-(g) \rightarrow M(g)$
(2) $M^{2+}(g) \rightarrow M^{3+}(g)$
(3) $M^+(g) \rightarrow Mg^{2+}(g)$
(4) $M(g) \rightarrow M^+(g)$

Q.35 A sudden large jump between the values of second and third ionisation energies of an element would be associated with the electronic configuration
(1) $1s^2, 2s^2\ 2p^6, 3s^1$
(2) $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^1$
(3) $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^2$
(4) $1s^2, 2s^2\ 2p^6, 3s^2$

Q.36 The incorrect statement among the following is
(1) The first ionisation potential of Al is less than the first ionisation potential of Mg
(2) The second ionisation potential of Mg is greater than the second ionisation potential of Na
(3) The first ionisation potential of Na is less than the first ionisation potential of Mg
(4) The third ionisation potential of Mg is greater than third ionisation potential of Al

Q.37 Identify the least stable ion amongst the following
(1) Li^- (2) Be^- (3) B^- (4) C^-

Q.38 Which of the following elements has the maximum electron affinity ?
(1) oxygen (2) chlorine
(3) fluorine (4) nitrogen

Q.39 Electron affinity of X would be equal to
(1) electron affinity of X^-
(2) ionisation potential of X^-
(3) ionisation potential of X
(4) none of the above

Q.40 Halogen with highest electron affinity
(1) I (2) Br (3) F (4) Cl

Q.41 Increasing order of electron affinity is
(1) N < O < Cl < Al (2) O < N < Al < Cl
(3) N < Al < O < Cl (4) Cl < N < O < Al

Q.42 The electronegativity of the following elements increases in the order of :
(1) C, N, Si, P (2) N, Si, C, P
(3) Si, P, C, N (4) P, Si, N, C

Q.43 In the series carbon, nitrogen, oxygen and fluorine, electronegativity
(1) Decreases from carbon to fluorine
(2) Remains constant
(3) Decreases from carbon to oxygen and then increases
(4) Generally increases from carbon to fluorine

Q.44 The outermost electronic configuration of the most electronegative element is
(1) $ns^2\ np^3$ (2) $ns^2\ np^4$
(3) $ns^2\ np^5$ (4) $ns^2\ np^6$

Q.45 Of the following elements, which one has the highest electronegativity?
(1) I (2) Br (3) Cl (4) F

Q.46 Which one of the following configurations represents a metallic character ?
(1) 2, 8, 2 (2) 2, 8, 4
(3) 2, 8, 7 (4) 2, 8, 8

Q.47 The most non-metallic element among the following is
(1) $1s^2, 2s^2\ 2p^6$ (2) $1s^2, 2s^2\ 2p^5$
(3) $1s^2, 2s^2\ 2p^4$ (4) $1s^2, 2s^2\ 2p^3$

Q.48 Atoms of which of the following group lose electrons most easily ?
(1) Li, Na, K (2) Cl, Br, I
(3) O, S, Se (4) N, P, As

Q.49 Among the following outermost configurations of transition metals which shows the highest oxidation state, is
(1) $3d^3\ 4s^2$ (2) $3d^5\ 4s^1$
(3) $3d^5\ 4s^2$ (4) $3d^6\ 4s^2$

NUMERICAL VALUE TYPE QUESTIONS

Q.50 The number of electron pairs for Zn^{+2} cation that have the value of azimuthal quantum number = 0 is :

Q.51 Consider the following orders :
(i) HF > HCl > HBr > HI : Lewis basic character
(ii) $CH_4 < CCl_4 < CCF_4$:Electronegativity of central 'C'-atom
(iii) $Mg^{2+} < K^+ < S^{2-} < Se^{2-}$: Ionic radius
(iv) Ni > Pd > Pt : Ionisation energy

(v) $As^{5+} > Sb^{5+} > Bi^{5+}$: Stable oxidation state
(vi) LiF > NaF > KF > RbF : Lattice energy
(vii) $F^-_{(aq.)} > Cl^-_{(aq.)} > Br^-_{(aq.)} > I^-_{(aq.)}$: Electrical conductance
(viii) $Li^+ < Mg^{2+} < Al^{3+}$: Hydration energy
(ix) Cl > Br > F > I : Electron affinity
(x) $BeCl_2 > AlCl_3 < SiCl_4$: Lewis acidic character
Then calculate value of $|x - y|^2$, where x and y are correct and incorrect orders respectively.

Q.52 Find out total number of representative elements among the given elements :
Cd, Nb, Ta, Te, Ra, Mo, Po, Pd, Tc

Q.53 Total many pairs are, in which first species has lower ionisation energy than second species :
(i) N and O
(ii) Br and K
(iii) Be and B
(iv) I and I^-
(v) Li and Li^+
(vi) O and S
(vii) Ba and Sr

Q.54 How many of the following options are incorrect in accordance with the mentioned properties?
(I) IP_1 of ion M^{2+} > EA1 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)

Q.55 How many of the following energies are involved in the transformation of
$Na(s) \longrightarrow Na^+(aq)$?
IE, ΔH_{sub}, ΔH_{diss}, $\Delta H_{hydration}$, ΔH_{LE}

Q.56 Which of the following elements form amphoteric oxides?
Be, B, Al, Ga, Sn, Zn, Ge, Cu, Mn

Q.57 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.)

Q.58 Successive ionization energies data (in eV/atom) of an element of second period is

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

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

Q.59 How many of the following reactions proceed with the absorption of energy?
$Cl(g) \rightarrow Cl^-(g)$
$O2^-(g) \rightarrow O^-(g)$
$N(g) \rightarrow N\text{-}(g)$
$Mg(g) \rightarrow Mg^{2+}(g)$
$Cl^-(g) \rightarrow Cl^{2-}(g)$
$Be(g) \rightarrow Be^-(g)$

STATEMENT TYPE QUESTIONS

Each question contains statement-I (Assertion) and statement-II (Reason.)
Examine the statements carefully and mark the correct answer according to the instructions given below
(A) If both the statements are correct and statement II is the correct explanation of statement I.
(B) If both the statements are correct but statement II is NOT the correct explanation of statement I.
(C) If statement I is correct and statement II is incorrect.
(D) If statement I is incorrect and statement II is correct.

Q.60 **Statement-I:** Helium atom has highest ionisation energy among all the elements.
Statement-II: Helium is smallest atom among all the elements.
(1) A (2) B (3) C (4) D

Q.61 **Statement-I:** The third period contains only 8 elements and not 18 like 4^{th} period.
Statement-II: In III period filling starts form $3s^1$ and complete $3p^6$ whereas in IV period it starts form $4s^1$ and complete after $3d^{10}$
(1) A (2) B (3) C (4) D

Q.62 **Statement-I:** F atom has less electron affinity than Cl atom.

Statement-II: Additional electrons are repelled more strongly by 3p electrons in Cl atoms than by 2p electrons in F atom.

(1) A (2) B (3) C (4) D

Q.63 **Statement-I:** Cs and F_2 combines violently to form CsF.

Statement-II: Cs is most electropositive and F is most electronegative.

(1) A (2) B (3) C (4) D

Q.64 **Statement-I:** Formation of Cl^- ion is exothermic whereas O^{2-} ion formation is endothermic.

Statement-II: EA_2 of oxygen is endothermic and greater than its exothermic EA_1 value of oxygen.

(1) A (2) B (3) C (4) D

Q.65 **STATEMENT -I:** Second E.A. for halogens is almost zero.

STATEMENT-II: Fluorine has maximum value of electron affinity.

(1) A (2) B (3) C (4) D

Q.66 **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.

(1) A (2) B (3) C (4) D

Q.67 **Statement-I:** Tl^{3+} has higher electronegativity as compared to Tl^+ .

Statement-II: The oxidation state of Tl in TlI_3 is not + 3.

(1) A (2) B (3) C (4) D

Q.68 **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.

(1) A (2) B (3) C (4) D

Q.69 **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 .

(1) A (2) B (3) C (4) D

MORE THAN ONE CORRECT TYPE QUESTIONS

Q.70 Assign the position of the element having outer electronic configuration,

(A) ns^2np^2 (n = 6)

(B) $(n-1)\,d^2ns^2$ (n = 4)

(C) $(n-1)\,f^7\,(n-1)\,d^1ns^2$ (n = 6)

Which of the following statement(s) is/are correct?

(1) The element 'A' belong to 3rd period and 16th group.

(2) The element 'B' belong to 4th period and 4th group.

(3) The element 'C; belong to 6th period and 3rd group and is lanthanide element.

(4) All A, B, C elements are metals

Q.71 Mark the correct statement out of the following:

(1) He has the highest I.E. in the periodic table

(2) Cl has the highest E.A. out of all the elements in the periodic table

(3) Hg and Br are liquid at room temperature

(4) In any period, the atomic radius of the noble gas is lowest

Q.72 The properties which are common to both groups 1 and 17 elements in the periodic table are:

(1) Electropositive character increases down the groups

(2) Reactivity decreased from top to bottom these groups

(3) Atomic radii increases as the atomic number increases

(4) Electronegativity decreases on moving down a group

Q.73 Which of the following match is/are correct regarding B, Al, C and S elements?

(1) The highest first ionisation enthalpy : C

(2) The largest atomic size : Al

(3) The most negative electron gain enthalpy : C

(4) The most metallic character : Al

COMPREHENSION TYPE QUESTIONS

Q.74 Some elements along with their electronic configuration are given below

I : $1s^2 2s^2$

II : $1s^2 2s^2 2p^6$

III : $1s^2 2s^2 2p^6 3s^2$

IV : $1s^2 2s^2 2p^3$

IV : $1s^2 2s^2 2p^5$

Answer the following question :

(i) The element with highest I.E. is :

(1) I (2) II (3) III (4) IV

(ii) The element with lowest electron gain enthalpy is:

(1) I (2) II (3) III (4) IV

(iii) The most ionic compound will be formed between :

(1) I and IV (2) I and V

(3) III and IV (4) III and V

(iv) Which of the following is the correct order of increasing size?

(1) I < III < IV < V

(2) V < IV < III < I

(3) I < IV < V < III

(4) V < IV < I < III

Q.75 Ionization energies of five elements in kcal/mol are given below :

Atom	I	II	III
P	300	549	920
Q	99	734	1100
R	118	1091	1652
S	176	347	1848
T	497	947	1500

(i) Which element is a noble gas?

(1) P (2) T (3) R (4) S

(ii) Which element form stable unipositive ion?

(1) P (2) Q (3) S (4) T

(iii) The element having most stable oxidation state +2 is ?

(1) Q (2) R (3) S (4) T

(iv) Which is a non-metal (excluding noble gas) ?

(1) P (2) Q (3) R (4) S

(v) If Q reacts with fluorine and oxygen, the molecular formula of fluoride and oxide will be respectively :

(1) QF_3, Q_2Q_3 (2) QF, Q_2O

(3) QF_2, QO (4) None of these

(vi) Which of the following pair represents elements of same group?

(1) Q, R (2) P, Q

(3) P, S (4) Q, S

MATCH THE COLUMN TYPE QUESTIONS

Q.76

Column-I		Column-II	
(A)	X (at. no. = 52)	(P)	Inner-transition element
(B)	Y (at. no. = 57)	(Q)	Representative element
(C)	Z (at. no. = 48)	(R)	Non-transition element
		(S)	d-block element

(1) A → Q ; B → S ; C → R, S

(2) A → P ; B → R ; C → R, S

(3) A → R ; S → P ; C → P, Q

(4) A → S ; R → Q ; C → P, Q

Q.77

Column-I		Column-II	
(A)	Increasing order of I.E.	(P)	F < O < S < Se
(B)	Increasing order of electron affinity	(Q)	O < N < F < Ne
(C)	Increasing order of atomic size	(R)	Na < Mg < Al < Si
		(S)	$O^{2-} < O^{-} < O < O^{+}$

(1) A → P, Q ; B → R ; C → S

(2) A → Q, P ; B → S ; C → S

(3) A → R, S ; B → P ; C → Q

(4) A → Q, S ; B → S ; C → P

ANSWER KEY

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Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	4	3	3	4	2	2	1	2	2	1	2	4	1	3	3
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	3	3	3	3	4	3	3	3	1	2	1	2	2	2	1
Que.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
Ans.	2	2	2	2	4	2	2	2	2	4	3	3	4	3	4
Que.	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans.	2	2	1	3	6	16	3	2	2	3	6	19	13	4	3
Que.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74(i)**	**74(ii)**
Ans.	1	3	1	1	3	1	2	4	1	2,3,4	1,3,2	1,3,4	1,2,4	3	2
Que.	**74(iii)**	**74(iv)**	**75(i)**	**75(ii)**	**75(iii)**	**75(iv)**	**75(v)**	**75(vi)**	**76**	**77**					
Ans.	4	4	2	2	3	1	2	1	1	4					