Q1: NTA Test 01 (Numerical)

The values of electronegativity of atom A and B are 1.20 and 4.0 respectively. The percentage of ionic character of A − B bond is nearly

Q2: NTA Test 02 (Single Choice)

The atomic masses of Li and K are 7 and 39, respectively. According to law of triads the atomic mass of Na will be

(A) 23

(B) 32

(C) 46

(D) 64

Q3: NTA Test 03 (Single Choice)

Three elements X, Y, and Z have atomic numbers 19, 37, and 55 respectively. Then the correct statements(s) is/are

(A) their ionization potential would increase with increasing atomic numbers

(B) Y would have an ionization potential between those of X and Z

(C) Y would have the highest ionization potential

(D) Z would have the highest ionization potential

Q4: NTA Test 05 (Single Choice)

Second ionization potential value is lowest for -

(A) Sodium

(B) Magnesium

(C) Fluorine

(D) Oxygen

Q5: NTA Test 06 (Single Choice)

Which of the following is metalloid ?

(A) Sb

(B) Mg

(C) Zn

(D) Bi

Q6: NTA Test 08 (Single Choice)

Which of the following orders is incorrect with respect to the property indicated ?

(A) $NH_3 < PH_3 < AsH_3$ (acidic behaviour)

(B) $Li < Be < B < C$ (first ionisation energy)

(C) $Al_2O_3 < MgO < Na_2O < K_2O$ (basic character)

(D) $Li^+ < Na^+ < K^+ < Cs^+$ (ionic radius)

Q7: NTA Test 09 (Single Choice)

Identify the correct decreasing order of acid strength for the following compounds:

(I) HClO, (II) HBrO, (III) HIO

(A) I > II > III

(B) II > I > III

(C) III > II > I

(D) I > III > II

Q8: NTA Test 10 (Single Choice)

Which among the following elements have lowest value of IE_1?

(A) Pb

(B) Sn

(C) Si

(D) C

Q9: NTA Test 12 (Single Choice)

The atomic numbers of vanadium (V), chromium (Cr), manganese (Mn) and iron (Fe) are respectively 23, 24, 25 and 26. Which one of these may be expected to have the highest second ionization enthalpy?

(A) Mn

(B) V

(C) Cl

(D) Fe

Q10: NTA Test 14 (Single Choice)

Correct order of Pauling's electronegativity

(A) H > B > C

(B) B > C > H

(C) C > B > H

(D) C > H > B

Q11: NTA Test 16 (Single Choice)

Select the incorrect statement

(A) IE_1 of He is greater than Ne

(B) Cl has greater election affinity than F

(C) $HClO > HClO_2 > HClO_3 > HClO_4$ (order of acidity)

(D) There are 32 elements in period 6

Q12: NTA Test 17 (Single Choice)

The incorrect order of first ionisation energy is:

(A) Au > Cu > Ag

(B) Pt > Ni > Pd

(C) C > Pb > Sn

(D) B > Ga > Al

Q13: NTA Test 18 (Single Choice)

Highest electron affinity is shown by:

(A) F^-

(B) Cl^-

(C) Na^+

(D) Li^+

Q14: NTA Test 19 (Numerical)

Total number of inner transition elements are: -

W, Ru, U, Tc, La, Yb, Po, No

Q15: NTA Test 20 (Single Choice)

The set representing the correct order of ionic radii is

(A) $Li^+ > Be^{2-} > Na^+ > Mg^{2+}$

(B) $Li^+ > Na^+ > Mg^{2+} > Be^{2+}$

(C) $Mg^{2+} > Be^{2+} > Li^- > Na^-$

(D) $Na^+ > Li^+ > Mg^{2+} > Be^{2+}$

Q16: NTA Test 21 (Numerical)

First and second ionization energies of magnesium are 7.646 and 15.035 eV respectively. The amount of energy in kJ/mol needed to convert all the atoms of Magnesium into Mg^{2+} ions present in 12 mg of magnesium vapours is: (Report your answer by multiplying with 10 and round it upto nearest integer)

[Given: 1 eV = 96.5 kJ mol^{-1}]

Q17: NTA Test 22 (Single Choice)

Incorrect order of properties given in parenthesis are

(A) Cl > S > F > O (Electron affinity)

(B) O > F > B > C (IE_2)

(C) N > O > P > S (IE_1)

(D) O > C > B > N (Electron affinity)

Q18: NTA Test 23 (Numerical)

Among the following, total numbers of radioactive elements are

In, Ac, At, Ba, Tc, Pm, Ta, Xe

Q19: NTA Test 24 (Single Choice)

The atomic number of elements A, B, C and D are $Z-1$, Z, $Z+1$, $Z+2$ respectively. If B is a noble gas, choose the correct option

(i) (A) has higher electron affinity

(ii) (C) exists in + 2 oxidation state

(iii) (D) is an alkaline earth metal

(A) (i) and (ii)

(B) (ii) and (iii)

(C) (i) and (iii)

(D) (i), (ii) and (ii)

Q20: NTA Test 27 (Single Choice)

In graph of atomic volume versus atomic weight, the elements corresponding to peaks in the curve belong to

(A) Group 1

(B) Group 18

(C) Group 4

(D) Group 14

Q21: NTA Test 32 (Single Choice)

Increasing order of density is

(A) $Li < K < Na < Rb < Cs$

(B) $Li < Na < K < Rb < Cs$

(C) $Li < Na < K < Cs < Rb$

(D) $K < Li < Na < Rb < Cs$

Q22: NTA Test 40 (Single Choice)

If the dipole moment of AB molecule is given by 1.2 D and A-B the bond length is 1 Å then % ionic character of the bond is

[Given: 1debye = 10^{-18} esu. cm]

(A) 75

(B) 50

(C) 60

(D) 25

Q23: NTA Test 44 (Single Choice)

Germanium (II) compounds are powerful reducing agents whereas lead (IV) compounds are strong oxidising agents even they belongs to same group (14), this is due to

(A) More powerful inert pair effect in Pb than Ge

(B) The ionisation energy of Pb < IE of Ge

(C) Pb is more electronegative than Ge

(D) The ionic radius of Ge^{2+} and Ge^{4+} are greater than Pb^{2+} and Pb^{4+}

Q24: NTA Test 45 (Single Choice)

Which among the following species have the same number of electrons in its outermost as well as penultimate shell

(A) Mg^{2+}

(B) O^{2-}

(C) F^{-}

(D) Ca^{2+}

Q25: NTA Test 47 (Single Choice)

Which of the following represents the correct order of increasing first ionization enthalpy for Ca, Ba, S, Se and Ar ?

(A) Ba < Ca < Se < S < Ar

(B) Ca < Ba < S < Se < Ar

(C) Ca < S < Ba < Se < Ar

(D) S < Se < Ca < Ba < Ar

Answer Keys

Q1: 72.24 **Q2:** (A) **Q3:** (B)

Q4: (B) **Q5:** (A) **Q6:** (B)

Q7: (A) **Q8:** (B) **Q9:** (C)

Q10: (D) **Q11:** (C) **Q12:** (B)

Q13: (D) **Q14:** 3 **Q15:** (D)

Q16: 11 **Q17:** (A) **Q18:** 4

Q19: (C) **Q20:** (A) **Q21:** (A)

Q22: (D) **Q23:** (A) **Q24:** (D)

Q25: (A)

Solutions

Q1: 72.24

% ionic character of a bond is determined with the help of Hanny-Smith's equation.

$$\% \text{ ionic characters} = 1.6\left(\Delta EN\right) + 3.5\left(\Delta EN\right)^2$$

Where, ΔEN= difference of electronegativity =

$4.0 - 1.2 = 2.80$

So, % ionic character $= 1.6\left(2.80\right) + 3.5\left(2.80\right)^2 = 72.24\%$

Q2: (A) 23

Atomic mass of middle element of triad is equal to average of masses of terminal elements.

Li	Na	K	
7	23	39	$\frac{7+39}{2} = 23$

Q3: (B) Y would have an ionization potential between those of X and Z

The elements X(19), Y(37) and Z(55) are the elements of same group (IA). As atomic number, increases, the ionization potential decrease down the group. Since, the position of Y is in between X and Z. Thus, the ionization potential of Y will also be in between X and Z.

Q4: (B) Magnesium

2^{nd} ionization energy of Mg is lower because it gets the inert gas configuration after losing 2^{nd} electron.

Q5: (A) Sb

A metalloid is a chemical element with properties that are intermediate between those of metals and nonmetals.

Metalloids = B, Si, As, Te, At, Sb, Ge

Q6: (B) $Li < Be < B < C$ **(first ionisation energy)**

(i) Bond angle of $NH_3 = 107^o$

$PH_3 > AsH_3 = 90^o$

According to bond angle the %s character of lp in $NH_3 = 22\%$ while in PH_3 & AsH_3 having approximately 100%, so the donation of lp in PH_3 & AsH_3 are difficult. Hence, the acidic character increases and the order of acidic character is $NH_3 < PH_3 < AsH_3$ is correct

(ii) On moving left to right in a period ionisation energy increases. $Li < Be < B < C$ but the first ionisation potential of Be is higher than that of B because Be has fulfilled configuration.

(iii) Metallic character increases hence the basic character of oxide increases.

(iv) In a group from top to the bottom, the number of the shell increases hence radius increases.

Q7: (A) I > II > III

The acidic character of hypohalous acid depends on the electronegativity of halogen. As the electronegativity value of halogen increases the acidic strength of hypohalous acid increases.

Here, Electronegativity of atom X (Cl, Br or I) attached to O decreases down the group, polarity of OH bond decreases, acid strength decreases. It means more the electronegativity of the halogen atom, more the tendency to pull electron and weaker the $O - H$ bond and hence proton (H^+) can easily be removed.

Q8: (B) Sn

Ionisation energy of carbon group follows the order C > Si > Ge > Pb > Sn.

$IE_{Pb} > IE_{Sn}$ because of poor shielding effect of electrons resulting in lanthanide contraction.

Q9: (C) Cl

Consider Electronic configuration of M^+

$_{23}V^+ \Rightarrow_{18} [Ar]\ 4s^1\ 3d^3$

$_{24}Cr^+ \Rightarrow_{18} [Ar]\ 4s^0\ 3d^5$

$_{25}Mn^+ \Rightarrow_{18} [Ar]\ 4s^1\ 3d^5$

$_{26}Fe^+ \Rightarrow_{18} [Ar]\ 3d^6\ 4s^1$

Removal of second electron from stable configuration of $_{18}[Ar]\ 4s^0\ 3d^5$ will require very high energy input i.e. (Cr) as it will disturb the stable electronic configuration of $3d^5$ (half filled subshell).

Q10: (D) C > H > B

Electronegativity values $H \rightarrow 2.1$, $B \rightarrow 2.0$, $C \rightarrow 2.5$

Q11: (C) $HClO > HClO_2 > HClO_3 > HClO_4$
(order of acidity)

Correct acidity order is:

$HClO < HClO_2 < HClO_3 < HClO_4$

Q12: (B) Pt > Ni > Pd

First ionization energy of Pd > Nidue to its d^{10} configuration.

Q13: (D) Li^+

Energy released, when electron is added in outer most shell of isolated gaseous atom or ions is called electron affinity.

$$\text{Electron affinity} \propto \frac{\text{Nuclear charge}}{\text{Radius of atoms/ions}}$$

$Li^+ + 1e^- \rightarrow$ Attraction

$Li^+ > Na^+$ electron can reach more nearer to nucleus & Energy released will be highest.

Q14: 3

U, Yb, No

Q15: (D) $Na^- > Li^+ > Mg^{2+} > Be^{2+}$

2 + charge cation is smaller in size than 1 + charge cation due to more effective nuclear charge.

$Na^+ > Li^+$ (down the group)

$Mg^{2+} > Be^{2+}$ (down the group)

Q16: 11

$\frac{12 \text{ mg}}{24 \text{ g}} = 0.5 \times 10^{-3}$ moles

Energy per atom = 7.646 + 15.035 = 22.68 eV

$22.68 \times 96.48 = 21.88 \times 10^2$ kJ/mol

E (needed) $21.88 \times 10^2 \times 0.5 \times 10^{-3}$

$10.94 \times 10^{-1} = 1.094$ kJ/mol

Q17: (A) $Cl > S > F > O$ **(Electron affinity)**

Correct order is:

$Cl > F > S > O$

Q18: 4

Ac, At, Tc, Pm are radioactive elements

Q19: (C) (i) and (iii)

Atomic number of $(B) = Z$ and is a noble gas

Atomic number of $(A) = Z - 1$ (i.e., is a Halogen)

Atomic number $(C), = Z + 1$ (i.e., is a alkali metal)

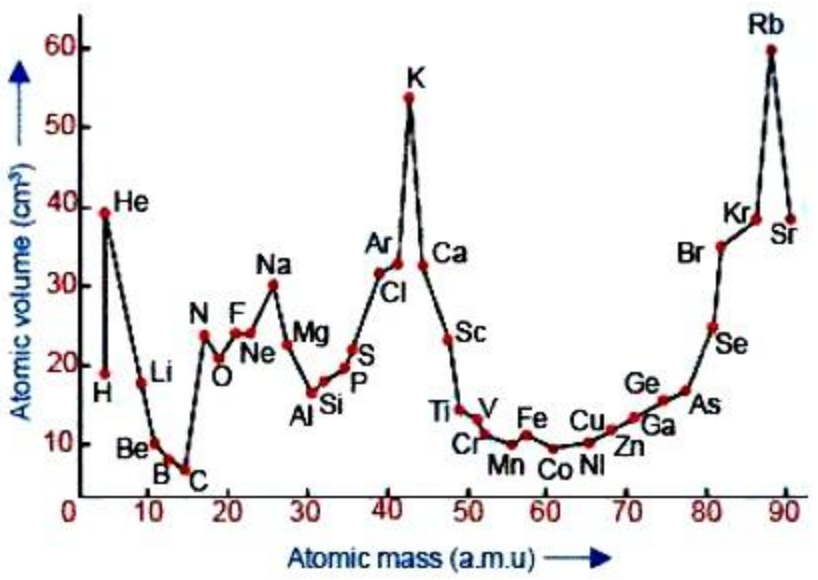
At number of $(D) = Z + 2$ (i.e., alkaline earth metal)

Hence, element (A) must be a Halogen, so has highest electron affinity among the given species. (C). is an alkali metal and (D) is an alkaline earth metal

Q20: (A) Group 1

If we see the atomic mass versus atomic volume curve, we will notice the following features:

- Alkali metals such as Na, K, Rb which have similar properties occur as peaks of the curve.
- Halogen elements like F, Cl, Br, which have similar properties occur at the rising or the ascending part of the curve.
- Noble gases such as Ne, Ar, Kr which have similar properties occur just before the alkali elements.
- Hydrogen and Helium seem to be exception to the rule.



Q21: (A) $\mathrm{Li} < \mathrm{K} < \mathrm{Na} < \mathrm{Rb} < \mathrm{Cs}$

As per Lother-Meyer's curve, the atomic volume of Cs is maximum among s-block elements. But atomic masses increases more rapidly than atomic volume, hence density increases along the group

Q22: (D) 25

$\mu_{\text{Cal}} = 4.8 \times 10^{-10} \text{e. s. u} \times 10^{-8} \text{ cm}$

$= 4.8 \times 10^{-18} \text{esu cm}$

$= 4.8 \text{ D}$

Hence % ionic character $= \frac{\mu_{\text{experimental}}}{\mu_{\text{calculated}}} \times 100$

$= \frac{1.2}{4.8} \times 100 = 25\%$

Q23: (A) More powerful inert pair effect in Pb than Ge

Inert pair effect increases in 14th group as the atomic number increases.

On moving top to bottom on group 14

	(Z)	
C	6	•Atomic number increases
Si	14	
Ge	32	
Sn	50	•Inert pair effect increases
Pb	82	

Q24: (D) Ca^{2+}

$_{20}Ca = 2,\ 8,\ 8,\ 2$

$Ca^{2+} = 2,\ 8,\ 8$

Hence, Ca^{2+} has 8 electrons each in outermost and penultimate shell.

Q25: (A) Ba < Ca < Se < S < Ar

Ba < Ca < Se < S < Ar

Ba, Ca belong to gr IIA (alkaline earth metals)

Se and S belong to gr Vl A (Chalcogens)
and as we go down the group ionaization enthalpy decreases with increasing atomic size. So,

Ba < Ca and
Se < S

Ar has stable completely filled electronic configuration and, therefore,has higest ionization enthalpy.Hence,the correct order is

	Ba	<	Ca	<	Se	<	S	<	Ar
in $kJmol^{-1}$	503		590		941		999		1520