Classification of Elements and Periodicity in Properties & Chemical Bonding and Molecular Structure

1. Consider the elements Mg, Al, S, P and Si, the correct increasing order of their first ionization enthalpy is :

   A. $Mg < Al < Si < P < S$

   B. $Mg < Al < Si < S < P$

   C. $Al < Mg < S < Si < P$

   D. $Al < Mg < Si < S < P$

2. Match List-I with List-II.

	List-I		List-II
	Electonic configuration of elements		$\Delta_1 H\ (in\ kJ\ mol^{-1})$
(a)	$1s^2 2s^2$	(i)	801
(b)	$1s^2 2s^2 2p^4$	(ii)	899
(c)	$1s^2 2s^2 2p^3$	(iii)	1314
(d)	$1s^2 2s^2 2p^1$	(iv)	1402

   Choose the most appropriate answer from the options given below:

   A. $(a) \rightarrow (i), (b) \rightarrow (iii), (c) \rightarrow (iv), (d) \rightarrow (ii)$

   B. $(a) \rightarrow (i), (b) \rightarrow (iv), (c) \rightarrow (iii), (d) \rightarrow (ii)$

   C. $(a) \rightarrow (iv), (b) \rightarrow (i), (c) \rightarrow (ii), (d) \rightarrow (iii)$

   D. $(a) \rightarrow (ii), (b) \rightarrow (iii), (c) \rightarrow (iv), (d) \rightarrow (i)$

3. The correct order of electron gain enthalpy is :

   A. $O > S > Se > Te$

   B. $Te > Se > S > O$

   C. $S > O > Se > Te$

   D. $S > Se > Te > O$

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4. The characteristics of elements X, Y and Z with atomic numbers, respectively, $33, 53$ and 83 are

   A. X and Y are metalloids and Z is a metal

   B. X is a metalloid, Y is a non-metal and Z is a metal

   C. X and Z are non-metals and Y is a metalloid.

   D. X, Y and Z are metals.

5. The absolute value of the electron gain enthalpy of halogens satisfies:

   A. $Cl > Br > F > I$

   B. $I > Br > Cl > F$

   C. $F > Cl > Br > I$

   D. $Cl > F > Br > I$

6. The ionic radius of Na^+ ion is $1.02\mathring{A}$. The ionic radii $in\ \mathring{A}$ of Mg^{2+} and Al^{3+}. respectively, are

   A. 0.71 and 0.54

   B. 1.05 and 0.99

   C. 0.68 and 0.72

   D. 0.85 and 0.99

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7. The first ionization energy of magnesium is smaller as compared to that of elements X and Y, but higher than that of Z. The elements X, Y and Z , respectively, are

   A. chlorine, lithium and sodium

   B. argon, lithium and sodium

   C. argon, chlorine and sodium

   D. neon, sodium and chlorine

8. Which of the follwing atoms has the highest first ionization energy?

   A. Na

   B. K

   C. Sc

   D. Rb

9. The ionic radii of K^+, Na^+, Al^{3+} and Mg^{2+} are in the order

   A. $Na^+ < K^+ < Mg^{2+} < Al^{3+}$

   B. $Al^{3+} < Mg^{2+} < K^+ < Na^+$

   C. $Al^{3+} < Mg^{2+} < Na^+ < K^+$

   D. $K^+ < Al^{3+} < Mg^{2+} < Na^+$

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10. The ionic radii of F^- and O^{2-} respectively are $1.33\ \mathring{A}$ and $1.4\ \mathring{A}$ while the covalent radius of N is $0.74\ \mathring{A}$.

    The correct statement for the ionic radius of N^{3-} from the following is :

    A. It is smaller than O^{2-} and F^- , but bigger than of N

    B. It is bigger than F^- and N, but smaller than of O^{2-}

    C. It is bigger than O^{2-} and F^-

    D. It is smaller than F^- and N

11. Identify the elements X and Y using the ionisation energy values given below :

	1st Ionisation Enthalpy(KJ/mol)	2nd Ionisation Enthalpy(KJ/mol)
X	495	4563
Y	731	1450

    A. $X = Na\ ;\ Y = Mg$

    B. $X = Mg\ ;\ Y = F$

    C. $X = F\ ;\ Y = Mg$

    D. $X = Mg\ ;\ Y = Na$

12. Chalcogen group elements are :

    A. O, Ti and Po

    B. S, Te and Pm

    C. Se, Tb and Pu

    D. Se, Te and Po

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13. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

    Assertion (A) : Metallic character decreases and non-metallic character increases on moving from left to right in a period.

    Reason (R) : It is due to increase in ionisation enthalpy and decrease in electron gain enthalpy, when one moves from left to right in a period.

    In the light of the above statements, choose the most appropriate answer from the options given below :

    A. Both (A) and (R) are correct and (R) is the correct explanation of (A)

    B. (A) is true but (R) is false

    C. Both (A) and (R) are correct but (R) is not the correct explanation of (A)

    D. (A) is false but (R) is true

14. The electron gain enthalpy (in kJ/mol) of fluorine, chlorine, bromine and iodine, respectively, are :

    A. $-333, -349, -325$ and -296

    B. $-333, -325, -349$ and -296

    C. $-296, -325, -333$ and -349

    D. $-349, -333, -325$ and -296

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15. The correct order of ionic radii for the ions, $P^{3-}, S^{2-}, Ca^{2+}, K^{+}, Cl^{-}$ is

A. $K^{+} > Ca^{2+} > P^{3-} > S^{2-} > Cl^{-}$

B. $P^{3-} > S^{2-} > Cl^{-} > Ca^{2+} > K^{+}$

C. $P^{3-} > S^{2-} > Cl^{-} > K^{+} > Ca^{2+}$

D. $Cl^{-} > S^{2-} > P^{3-} > Ca^{2+} > K^{+}$

16. Which of the following are isostructural pairs?

A. SO_4^{2-} and CrO_4^{2-}

B. $SiCl_4$ and $TiCl_4$

C. NH_3 and NO_3^{-}

D. BCl_3 and $BrCl_3$

A. A and C only

B. B and C only

C. A and B only

D. C and D only

17. The correct shape and $[I—I—I]^{-}$ bond angles respectively in I_3^{-} ion are:

A. Distorted trigonal planar; 135° and 90°

B. Trigonal planar; 120°

C. T-shaped; 180° and 90°

D. Linear; 180°

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18. According to molecular orbital theory, the species among the following that does not exist is:

A. He_2^-

B. Be_2

C. He_2^+

D. O_2^{2-}

19. Which among the following species has unequal bond lengths?

A. XeF_4

B. BF_4^-

C. SF_4

D. SiF_4

20. Given below are two statements:
Statement I: *o*-Nitrophenol is steam volatile due to intramolecular hydrogen bonding.
Statement II: *o*-Nitrophenol has high melting point due to hydrogen bonding.
In the light of the above statements, choose
the most appropriate answer from the
options given below:

A. Both statement I and statement II are true

B. Statement I is false but statement II is true

C. Statement I is true but statement II is false

D. Both statement I and statement II are false

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21. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R
Assertion A: Dipole-dipole interactions are only non-covalent interactions, resulting in hydrogen bond formation.
Reason R: Fluorine is the most electronegative element and hydrogen bonds in HF are symmetrical.
In the light of the above statements, choose the most appropriate answer from the options given below:

A. A is false but R is true

B. Both A and R are true and R is the correct explanation of A

C. A is true but R is false

D. Both A and R are true but R is NOT the correct explanation of A

22. Match list-I with list-II:

List-I (Molecule)	List-II (Bond order)
(a)Ne_2	(i) 1
(b)N_2	(ii) 2
(c)F_2	(iii) 0
(d)O_2	(iv) 3

Choose the correct answer from the options given below

A. $(a)-(iv);(b)-(iii);(c)-(ii);(d)-(i)$

B. $(a)-(ii);(b)-(i);(c)-(iv);(d)-(iii)$

C. $(a)-(i);(b)-(ii);(c)-(iii);(d)-(iv)$

D. $(a)-(iii);(b)-(iv);(c)-(i);(d)-(ii)$

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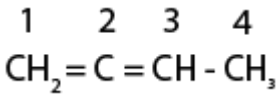
23. In given molecule,



the hybridization of carbon 1, 2, 3 and 4 respectively, are :

A. sp^2, sp^2, sp^2, sp^3

B. sp^2, sp, sp^2, sp^3

C. sp^3, sp, sp^3, sp^3

D. sp^2, sp^3, sp^2, sp^3

24. Given below are two statements one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: The H — O — H bond angle in water molecule is 104.5°.
Reason R: The lone pair-lone pair repulsion of electrons is higher than the bond pair-bond pair repulsion.
In the light of the above statements, choose the correct answer from the options given below.

A. A is false but R is true

B. A is true but R is false

C. Both A and R are true, and R is the correct explanation of A

D. Both A and R are true, but R is not the correct explanation of A

25. A central atom in a molecule has two lone pairs of electrons and forms three single bonds. The shape of this molecule is,

A. Trigonal pyramidal

B. See-saw

C. T-shaped

D. Trigonal planar

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26. AX is a covalent diatomic molecule where A and X are second row elements of periodic table. Based on molecular orbital theory, the bond order of AX is 2.5. The total number of
electrons in AX is
(Round off to the Nearest Integer).

27. $SF_4, BF_4^-, ClF_3, AsF_3, PCl_5, BrF_5, XeF_4, SF_6$
The number of species that have two lone pairs of electrons in their central atom is/are

28. The number of lone pairs of electrons on the central I-atom in I_3^- is

29. The difference between bond orders of CO and NO^+ is $\frac{x}{2}$ where x is (Round off to the Nearest Integer)

30. In gaseous triethylamine the $''-C-N-C-''$ bond angle is degree.