

# Gaining Apex Coaching Centre

(Where Toppers Make...Toppers)

Compiled by: Dapinderjeet Singh

## Classification of Elements & Periodicity in Properties Assignment

### Classified Multiple Choice Questions

#### Mendeleev's Periodic Table

1. The most significant contribution towards the development of periodic table was made by:
  - a. Mendeleev
  - b. Avogadro
  - c. Dalton
  - d. Cavendish
2. Which of the following statements is not correct about modified Mendeleev's periodic table?
  - a. It consists of nine groups and seven periods.
  - b. Group VIII like groups I - VII has been divided into two sub groups A and B.
  - c. The group of an element in the periodic table represents its valency.
  - d. The elements of group IB are called coinage metals.
3. The number of elements known at that time when Mendeleev

arranged them in the periodic table was:

- a. 63
- b. 60
- c. 71
- d. 65

#### Atomic Number of Modern Periodic Law

4. The cause of periodicity of properties is
  - a. Increasing atomic radius
  - b. Increasing atomic weights
  - c. Number of electrons in the valency orbit.
  - d. The recurrence of similar outer electronic configuration.

#### Long form of the periodic Table

5. On the basis of electronic configuration, all the elements in the long form of the periodic table have been grouped in
  - a. 3 Blocks
  - b. 4 Blocks
  - c. 4 Blocks + lanthanoids
  - d. 3 Blocks + lanthanoids + actinoids

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6. Elements whose other electronic configuration vary from  $ns^2np^1$  to  $ns^2np^6$  constitute.
- s-Block of elements
  - p-Block of elements
  - d-Block of elements
  - f-Block of elements
7. Incompletely filled orbitals in representatives elements are:
- s- and p-
  - d- Only
  - f- only
  - Both d- and f
8. Representative elements belong to
- s- and p- blocks
  - p- and d-blocks
  - f-blocks only
  - d- and f- blocks
9. The name 'rare earths' is used for
- Lanthanoids only
  - Actinoids only
  - Both lanthanoids and actinoids
  - Alkaline earth metals
10. Which one of the following is not a characteristics of p-block elements?
- The last electron in them enters into a p-orbital.
  - They mostly form covalent compounds.
  - In any row, the metallic character decrease from left to right.
  - The oxidizing power decreases from left to right.
11. f-Block elements are called inner transition elements because:
- They have properties similar to those of transition elements.
  - They have been taken out of the transition elements.
  - The last electrons enters into the f-orbital of penultimate shell.
  - The last electrons enters into the f-orbital of the ante-penultimate shell.
12. Which of the following statement is wrong about d-block elements.
- The electronic configuration of these elements have two incomplete shells
  - The last electrons enters into the d-orbital of the ante penultimate shell.

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- c. The last electron enters into the  $d$ -orbital of the penultimate shell.
- d. They are all metals.
13. In transition elements, the incoming electron occupies  $(n-1)d$ -subshell in preference to
- $np$ -subshell
  - $ns$ -subshell
  - $(n-1)p$ -subshell
  - $(n+1)s$ -subshell
14. The  $3d$  - transition series contains elements having atomic numbers ranging from
- 22 to 30
  - 21 to 30
  - 21 to 31
  - 21 to 29
15. The quantum numbers of the last electron which enters and element are:  $l=3$ ,  $m = -2$  and  $s = +\frac{1}{2}$ . In which block of the periodic table is the element present?
- $s$ -Block
  - $p$ -Block
  - $d$ -Block
  - $f$ -Block
16. The element with atomic number 57 belongs to
- Lanthanoids
  - Actinoids
  - Transition elements
  - $s$ -Block
17. An element which lies in the same group of the periodic table as mercury is
- Cadmium
  - Gold
  - Tin
  - Thallium
18. The physical properties of vanadium are more closely related to
- Titanium
  - Tungsten
  - Niobium
  - Nobelium
19. Diagonal relationship is shown by certain elements of periods
- 2<sup>nd</sup> and 3<sup>rd</sup>
  - 3<sup>rd</sup> and 4<sup>th</sup>
  - 4<sup>th</sup> and 5<sup>th</sup>
  - 1<sup>st</sup> and 2<sup>nd</sup>
20. Which of the following pairs does not show diagonal relationship?
- Li and Mg
  - Be and Al
  - B and Si
  - C and S

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21. The electronic configuration of the element which is just above the element with atomic number 43 in the same periodic group is

- a.  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$
- b.  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$
- c.  $1s^2 2s^2 2p^6 3d^2 3p^6 3d^6 4s^1$
- d.  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1 4p^6$

## Atomic and Ionic Radii

22. Which out of the following has largest size?

- a.  $Mg^{2+}$
- b.  $Rb^+$
- c.  $Li^+$
- d.  $Na^+$

23. Which of the following statements is correct?

- a. Atomic size decreases down a group.
- b. Radius of cation is more than that of the atom.
- c. Atomic size decreases along a period.
- d. Radius of anion is less than that of the atom.

24. The atomic radii in case of inert gases is

- a. Ionic radii
- b. Covalent radii
- c. Van der Waals radii
- d. None.

25. The covalent and van der Waals radii of hydrogen respectively are:

- a.  $0.37 \text{ \AA}, 1.2 \text{ \AA}$
- b.  $0.37 \text{ \AA}, 0.37 \text{ \AA}$
- c.  $1.2 \text{ \AA}, 1.2 \text{ \AA}$
- d.  $1.2 \text{ \AA}, 0.37 \text{ \AA}$

26. The size of the species, Pb,  $Pb^{2+}$ ,  $Pb^{4+}$  decrease as

- a.  $Pb^{4+} > Pb^{2+} > Pb$
- b.  $Pb > Pb^{2+} > Pb^{4+}$
- c.  $Pb > Pb^{4+} > Pb^{2+}$
- d.  $Pb^{4+} > Pb > Pb^{2+}$

27. Which of the following has largest radius?

- a.  $1s^2, 2s^2, 2p^6, 3s^2$
- b.  $1s^2, 2s^2, 2p^6, 3s^2 3p^1$
- c.  $1s^2, 2s^2, 2p^6, 3s^2 3p^3$
- d.  $1s^2, 2s^2, 2p^6, 3s^2 3p^5$

28. The correct order of atomic size of C, N, P, S follows the orders

- a.  $N < C < S < P$
- b.  $N < C < P < S$
- c.  $C < N < S < P$
- d.  $C < N < P < S$

29. In which one of the following sets, elements have nearly same atomic radii?

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- a. Li, Be, B, C  
b. Mg, Ca, Sr, Ba  
c. O, S, Se, Te  
d. Fe, Co, Ni, Cu
30. Which pair of elements has nearly same atomic size?  
a. Sr, Ba                      c. Zr, Hf  
b. Br, I                         d. Sn, Pb
31. In which of the following species, the size of the first species is not more than the second?  
a. Li, F  
b.  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$   
c.  $\text{Na}^+$ ,  $\text{F}^-$   
d. S, O
32. In which of the following compounds does the ratio of anion size to cation size has the lowest value?  
a. CsI                      c. LiF  
b. LiI                        d. CsF
33. Which ion possesses the smallest radius?  
a.  $\text{I}^-$                         c.  $\text{Cs}^+$   
b.  $\text{Ba}^{2+}$                     d.  $\text{Te}^{2-}$
34. A sodium cation has a different number of electrons from:  
a.  $\text{O}^{2-}$                       c.  $\text{Li}^+$   
b.  $\text{F}^-$                         d.  $\text{Al}^{3+}$
35. The ionic species having largest size is  
a.  $\text{Li}^+(g)$                       c.  $\text{Rb}^+(aq)$   
b.  $\text{Na}^+(aq)$                     d.  $\text{Li}^+(aq)$
36. Which one the following is correct order of increase of size  
a.  $\text{Mg} < \text{Na}^+ < \text{F}^- < \text{Al}$   
b.  $\text{Na}^+ < \text{Al} < \text{Mg} < \text{F}^-$   
c.  $\text{Na}^+ < \text{F}^- < \text{Al} < \text{Mg}$   
d.  $\text{Na}^+ < \text{F}^- < \text{Mg} < \text{Al}$
- Ionization Enthalpy**
37. Arrange the elements S, P as in order of increasing ionization enthalpy  
a.  $\text{S} < \text{P} < \text{As}$   
b.  $\text{P} < \text{S} < \text{As}$   
c.  $\text{As} < \text{S} < \text{P}$   
d.  $\text{As} < \text{P} < \text{S}$
38. Which of the following process required largest amount of energy  
a.  $\text{Al}(g) \rightarrow \text{Al}^+(g) + e^-$   
b.  $\text{Al}^{2+}(g) \rightarrow \text{Al}^{3+}(g) + e^-$   
c.  $\text{Al}^+(g) \rightarrow \text{Al}^{2+}(g) + e^-$   
d. All the processes require same amount of energy
39. Atoms which have first ionization enthalpy always have  
a. High nuclear charge

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- b. Small atomic size  
c. Metallic properties  
d. Strongly bound valence electrons.
40. The second ionization enthalpy is
- Smaller than the first ionization enthalpy
  - Almost equal to the first ionization enthalpy
  - Smaller than the third ionization enthalpy.
  - Equal to the second electron gain enthalpy
41. From the ground state electronic configurations of the elements given below, pick up the one with highest value of second ionization enthalpy.
- $1s^2 2s^2 2p^6 3s^2$
  - $1s^2 2s^2 2p^6 3s^1$
  - $1s^2 2s^2 2p^6$
  - $1s^2 2s^2 2p^5$
42. IE1 and IE2 of Mg are 178 and 348 kcal mol<sup>-1</sup> respectively. The energy required for the reaction  $\text{Mg(g)} \rightarrow \text{Mg}^{2+}(\text{g}) + 2e^-$  is
- +170 kcal
  - + 526 kcal
  - 170 kcal
  - 525 kcal
43. For the given value of n (principal quantum number), ionization enthalpy is highest for
- d - Electrons
  - f - Electrons
  - p - Electrons
  - s - Electrons
44. Which of the following metals requires the radiation of highest frequency to cause the emission of electrons:
- Na
  - Mg
  - K
  - Ca.
45. The lowest first ionization enthalpy would be associated with which of the following structures
- $1s^2 2s^2 2p^6 3s^1$
  - $1s^2 2s^2 2p^5$
  - $1s^2 2s^2 2p^6$
  - $1s^2 2s^2 2p^6 3s^2 3p^2$
46. The correct order of decreasing first ionization enthalpy is
- C > B > Be > Li
  - C > Be > B > Li
  - B > C > Be > Li
  - Be > Li > B > C
47. Alkali metals in each period have?
- Smallest size

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- b. Lowest ionization enthalpy
- c. Highest ionization enthalpy
- d. Highest electronegativity.

## Electron Gain Enthalpy

48. Ionization enthalpy of  $F^-$  is  $320 \text{ kJ mol}^{-1}$ . The electrons gain enthalpy of fluorine would be

- a.  $-320 \text{ kJ mol}^{-1}$
- b.  $-160 \text{ kJ mol}^{-1}$
- c.  $320 \text{ kJ mol}^{-1}$
- d.  $160 \text{ kJ mol}^{-1}$

49. Second electron gain enthalpy

- a. Is always negative (energy is released)
- b. Is always positive (energy is absorbed)
- c. Can be positive or negative
- d. Is always zero

50. The element having very high ionization enthalpy but positive electron gain enthalpy is

- a. H
- b. F
- c. He
- d. Be

51. The electron enthalpies of B, C, N and O with negative sign are in the order:

- a.  $B < C < N < O$
- b.  $B < C < O > N$
- c.  $B < C > O > N$

- d.  $B > C < O < N$

52. The correct order for electron gain enthalpy with negative sign is

- a.  $F > Br > I$
- b.  $F < Br < I$
- c.  $F < I < Br$
- d.  $Br < I < F$

53. Which of the following element is expected to have highest negative electron gain enthalpy.

- a.  $1s^2 2s^2 2p^6 3s^2 3p^5$
- b.  $1s^2 2s^2 2p^3$
- c.  $1s^2 2s^2 2p^4$
- d.  $1s^2 2s^2 2p^5$

54. Which of the following species has highest electron gain enthalpy with -ve sign?

- a.  $F^-$
- b.  $O$
- c.  $O^-$
- d.  $Na^+$

## Electronegativity

55. An atom of an electronegative element becomes an ion by

- a. Gain of electrons
- b. Loss of electrons
- c. Loss of its radius
- d. Serving as a reductant

56. Outermost electron configuration of least electronegative element in the periodic table is

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- a.  $2s^2 2p^5$                       c.  $2s^2 2p^4$                       a. Polarity of bonds
- b.  $3s^2 3p^6$                       d.  $6s^2 6p^6 7s^1$                       b. Dipole moments
57. Which of the following element has the highest electronegativity?
- a. As                      c. P                      c. Valency of elements
- b. Sb                      d. S                      d. Position in the electrochemical series
58. An atom with high electronegativity generally has
- a. Tendency to form +ve ions                      62. The ionization enthalpy and electron gain enthalpy of an element are 13.0 eV and 3.8eV respectively. Its electro negativity on the Pauling scale is
- b. High ionization enthalpy                      a. 4.0                      c. 3.0
- c. Large atomic size                      b. 3.5                      d. 2.8
- d. Less -ve electrons gain enthalpy
59. Which of the following sets of elements has the strongest tendency to form anions?
- a. P, S, Cl                      63. Which of the following represents most electro positive element?
- b. N, O, F                      a. [He]  $2s^1$                       c. [Xe]  $6s^1$
- c. V, Cr, Mn                      b. [He]  $2s^2$                       d. [Xe]  $6s^2$
- d. Ga, In, Tl
60. The electronegativity's of the following elements; H, O, F, S and Cl increase in the order
- a. H < O < F < S < Cl                      64. Which of the following is arranged in the order of decreasing electro-positive character?
- b. Cl < H < O < F < S                      a. Fe, Mg, Cu
- c. H < S < O < Cl < F                      b. Mg, Cu, Fe
- d. H < S < Cl < O < F                      c. Mg, Fe, Cu
61. Electronegativity values for the elements help in predicting
- d. Cu, Fe, Mg
65. The electro-negativity follows the order:
- a. F > O > Cl > Br
- b. F > Cl > Br > O
- c. O > F > Cl > Br
- d. Cl > F > O > Br



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## Atomic Volume and Acid-Base Behavior of Oxides and Hydroxides

66. Which of the following metals form amphoteric oxide?

- a. Ca                      c. Cu  
b. Fe                      d. Zn

67. Amongst the following oxides is least acidic?

- a.  $\text{Al}_2\text{O}_3$                   c.  $\text{CO}_3$   
b.  $\text{B}_2\text{O}_3$                   d.  $\text{NO}_2$

68. In the periodic table from left to right in the period the atomic volume.

- a. Decreases  
b. Increases  
c. Remains same  
d. First decrease then increases

## HOTS (Higher Order Thinking Skills)

69. The property which is not common to both groups 1 and 17 elements in the periodic table is

- a. Electro positive character increases down the groups  
b. Reactivity decreased from top to bottom in these groups  
c. Atomic radii increase as the atomic number increases

d. Electronegativity decrease on moving down a group

70. The element having different value of electro negativity from others is

- a. H                      c. Te  
b. S                      d. P

71. If the ionization enthalpy and electron gains enthalpy of an element are 275 and 86 kcal mol<sup>-1</sup> respectively, then the electro negativity of the element on the Mulliken scale is

- a. 2.8                      c. 4.0  
b. 0.0                      d. 2.6

72. The van der Waals radii of O, N, Cl, F and Ne increase in the order

- a. F, O, N, Ne, Cl  
b. N, O, F, Ne, Cl  
c. Ne, F, O, N, Cl  
d. F, Cl, O, N, Ne

73. The electronic configuration and the group number is the periodic table in which the element with atomic number 107 lies are

- a.  $[\text{Rn}] 5f^{14} 6d^1 7s^2 7p^4$ , Group 3  
b.  $[\text{Rn}] 5f^{14} 6d^5 7s^2$ , Group 2  
c.  $[\text{Rn}] 5f^{14} 7s^2 7p^5$ , Group 7  
d.  $[\text{Rn}] 5f^{14} 6d^2 7s^2 7p^3$ , Group 15

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74. The IUPAC name of the element with atomic number  $Z=109$  is
- a. U *np*                      c. U *no*  
b. U *ns*                      d. U *ne*
75. Which of the following elements with atomic numbers 25, 30, 48 and 80 has the highest vapour pressure at room temperature?
- a.  $Z = 30$                       c.  $Z = 80$   
b.  $Z = 48$                       d.  $Z = 25$
76. The higher oxide of an element  $E$  has the formula  $EO_3$ . Its hydride contains 2.47% hydrogen, the element is
- a. S                                  c. Te  
b. Se                                d. Si
77. The mass fraction of hydrogen in a compound of group 14 element is 0.125. The hydride of this element has the formula
- a.  $CH_4$                       c.  $SiH_4$   
b.  $GeH_4$                       d.  $SnH_4$
78. Pd has exceptional outer electronic configuration as  $4d^{10}5s^0$ . It belongs to
- a. 4<sup>th</sup> Period, group 11  
b. 5<sup>th</sup> Period, group 10  
c. 6<sup>th</sup> Period, group 9  
d. 3<sup>rd</sup> Period, group 16
79. Which of the following sequence contains atomic number of only representative elements?
- a. 55, 12, 48, 53  
b. 13, 33, 54, 83  
c. 3, 33, 53, 87  
d. 22, 33, 55, 66
80. Ionization enthalpy of an ion is equal to
- a. Electron gain enthalpy of the atom  
b. Electronegativity of the ion  
c. Ionization enthalpy of the atom.  
d. None of these
81. The correct values of ionization enthalpies (in  $\text{kJ mol}^{-1}$ ) of Si, P, Cl and S respectively are:
- a. 786, 1012, 999, 1256  
b. 1012, 786, 999, 1256  
c. 786, 1012, 1256, 999  
d. 786, 999, 1012, 1256
82. The atomic numbers of the metallic and non-metallic elements which are liquid at room temperature (298K) respectively are:
- a. 55, 87                      c. 35, 80  
b. 33, 87                      d. 80, 35

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83. The second electron gain enthalpies (in  $\text{kJ mol}^{-1}$ ) of oxygen and Sulphur respectively are

- a.  $-780, +590$
- b.  $-590, +780$
- c.  $+590, +780$
- d.  $+780, +590$

84. The ionization enthalpies of Li and sodium are  $520 \text{ kJ mol}^{-1}$  and  $495 \text{ kJ mol}^{-1}$  respectively. The energy required to convert all the atoms present in 7mg of Li vapours and 23mg of sodium vapours to their respective gaseous cations respectively are

- a. 52J, 49.5 J
- b. 520J, 495 J
- c. 49.5 J, 52 J
- d. 495 J, 520 J

85. Which of the period 4 elements given below exhibit its identical Valency in its hydride and higher oxide?

- a. Bromine
- b. Germanium
- c. Arsenic
- d. Selenium

86. Which of the following set includes the elements which were named in honour of certain countries?

- a. In, Ge, Po
- b. Ge, Bk, Cf
- c. Ru, Am, Ge
- d. All are correct

87. The bond dissociation energies of H-H, C-C and C-H bonds respectively are 104.2, 83.1 and 98.8  $\text{kcal mol}^{-1}$ . The electronegativity of carbon is

- a. 2.53
- b. 2.51
- c. 2.50
- d. 2.52

## Matrix Match type questions

Match the entries of column I with appropriate entries of column II. Each entry in column I may have one or more than one correct options from column II. If the correct matches are A-p,s ; B-r; C-p, q and D-s, then correctly bubbled 4x4 matrix should be as follows:

88.

	Column I		Column II
A	s-Block	p	Representative element
B	p-Block	q	Transition elements
C	d-Block	r	Inner transition elements
D	f-Block	s	Lanthanides and Actinides

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89.

	Column I		Column II
A	O	<i>p</i>	Diatomic
B	N	<i>q</i>	Tetrahedral
C	P	<i>r</i>	Puckered ring
D	S	<i>s</i>	Solid at room temperature

90.

	Column I		Column II
A	Lithium	<i>p</i>	Reducing agent
B	Fluorine	<i>q</i>	Oxidizing agent
C	Oxygen	<i>r</i>	Lightest metal
D	Cesium	<i>s</i>	Highly reactive

## Assertion - Reason type questions

### For Engineering Students

Directions: Each question given below contains Statement - 1 (Assertion) and Statement - 2 (Reason). Each question has 4 choices (a), (b), (c) and (d) out of which only one is correct. Choose the correct option as under:

- Statement -1 is True; Statement 2 is a correct explanation for statement 1
- Statement 1 is True; Statement 2 is true, Statement 2 is Not a correction explanation for statement 1.
- Statement 1 is true; statement 2 is false.
- Statement 1 is False, Statement 2 is True.

91. Statement 1: Be resembles Al

Statement 2:  $\text{Be}^{2+}$  has almost same charge density as  $\text{Al}^{3+}$

92. Statement 1: LiCl is predominantly a covalent compound.

Statement 2: Electro negativity difference between Li and Cl is too small.

93. Statement 1: Noble gases have highest ionization enthalpies in their respective periods.

Statement 2: Noble gases have stable closed shell electronic configuration.

94. Statement 1: The first ionization enthalpy of aluminum is lower than that of magnesium

Statement 2: Ionic radius of aluminum is smaller than that of magnesium

95. Statement 1: van der Waals radius of an element is always larger than its covalent radius

Statement 2: van der Waals radius is one half of the distance between the nuclei of two non-bonded isolated atoms.

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96. Statement 1: The electron gain enthalpy of N is +ve while that of P is -ve.

Statement 2: This is due to the smaller atomic size of N in which there is considerable electron-electron repulsion and hence the additional electron is not accepted easily.

## For Medical Students

**Directions.** In case of the following questions, a statement of Assertion (A) is given followed by a corresponding statement of Reason (R) just below it. Of the statements, mark the correct answer as

- If both assertion and reason are true and reason is the correct explanation of the assertion.
- If both assertion and reason are true but reason is not the correct explanation of assertion.
- If assertion is true but reason is false.
- If both assertion and reason are false.

97. Assertion: The first ionization enthalpy of Be is greater than that of B.

Reason: 2 *p*-orbital is lower in energy than 2 *s*-orbital.

98. Assertion: Na<sub>2</sub>SO<sub>4</sub> is soluble while BaSO<sub>4</sub> is insoluble.

99. Reason: Lattice energy of BaSO<sub>4</sub> exceed its hydration energy

100. Assertion: Electron gain enthalpy of oxygen is less -ve than that of fluorine but more -ve than that of nitrogen.

Reason: Ionization enthalpy is as follows: N > O > F

101. Assertion: Zinc is not a d-block element

Reason: Zinc does not form coordination compounds.

102. Assertion: The second electron gain enthalpy of an element is taken as positive.

Reason: Energy is released when an electron is added to the atom

103. Assertion: For the same element as the *s*-character of hybrid orbital decreases, the electro negativity also decreases

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Reason: More the participation of s-orbital in the state of hybridization more is the attraction towards bonded pair of electrons.

