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**UNIT**  
**01**

# Periodic Classification of Elements And Periodicity

## MULTIPLE CHOICE QUESTIONS

Encircle the right answer:

- Keeping in view the size of atoms, which order is correct one: (Board 2013, 15)  
(a)  $Mg > Sr$  (b)  $Ba > Mg$  12201058  
(c)  $Lu > Ce$  (d)  $Cl > I$
- Mark the correct statement: (Board 2014, 15, 16) 12201059  
(a)  $Na^+$  is smaller than Na atom  
(b)  $Na^{+1}$  is larger than Na atom  
(c)  $Cl^{-1}$  is smaller than Cl atom  
(d)  $Cl^{-1}$  and Cl are equal in size
- Mark the correct statement: 12201060  
(a) All lanthanides are present in the same group  
(b) All halogens are present in the same period  
(c) All the alkali metals are present in the same group  
(d) All the noble gases are present in the same period
- Which statement is incorrect? 12201061  
(a) All the metals are good conductor of electricity  
(b) All the metals are good conductor of heat  
(c) All the metals form positive ions  
(d) All the metals form acidic oxides
- Which statement is correct? 12201062  
(a) Hydrogen resembles in properties with IA, IVA and VIIA elements  
(b) Hydrogen resembles with IIIA, IVA and VA elements  
(c) Hydrogen resembles in properties with IA, IVA, and VIA elements  
(d) Hydrogen resembles in properties with IIA, IIIA and VIIA elements
- Mark the correct statement: 12201063  
(a) The ionization energy of calcium is lower than that of barium  
(b) The ionization energy of calcium is lower than that of magnesium  
(c) The ionization energy of calcium is higher than that of beryllium  
(d) The ionization energy of calcium is lower than that of strontium
- Mark the correct statement: 12201064  
(a) Electron affinity is a measure of energy required to remove the electron  
(b) Ionization energy is a measure of energy released by adding an electron  
(c) Electron affinity is a measure of energy released by adding an electron  
(d) Electron affinity is a measure of energy released by removing an electron
- Mark the correct statement: (Board 2006) 12201065  
(a) Metallic character increases down the group  
(b) Metallic character increases along a period  
(c) Metallic character remains same along a period  
(d) Metallic character remains the same down the group
- Mark the correct statement: 12201066  
(a) Melting points of halogens decrease down the group  
(b) Melting points of halogens increase down the group  
(c) Melting points of halogens remain the same throughout the group  
(d) Melting points of halogens first increase then decrease down the group
- Mark the correct statement: 12201067  
(a) Covalent character of metal halides increases from left to right in a period  
(b) Boiling points of group IV hydrides decrease down the group  
(c) Ionic character of hydrides increases from left to right in a period  
(d) The basicity of group IIA oxides decreases on descending the group
- Lanthanides are present in: 12201068  
(a) 4th period (b) 5th period  
(c) 6th period (d) 7th period



- 5th period contains total number of elements: (Board 2014) 12201069  
(a) 10 (b) 32  
(c) 18 (d) 14
- Which of the following is smaller in size? 12201070  
(a) H (b)  $Li^+$   
(c) He (d)  $Be^{+2}$
- A metal having half filled p-orbital in its configuration belongs to: 12201071  
(a) IIA (b) IIB  
(c) VA (d) VIA
- Lanthanide contraction occurs in the elements for which electron filling occurs in: 12201072  
(a) 3d (b) 5d  
(c) 4f (d) 5f
- Which one of the following is isoelectronic with  $Ca^{+2}$ : 12201073  
(a)  $Sr^{+2}$  (b) Na  
(c) Ar (d)  $Mg^{+2}$
- Elements of group IB are called: 12201074  
(a) Representative elements  
(b) Transition elements (c) Rare earths  
(d) Coinage metals
- Which one of the following is a non-metal? 12201075  
(a) Bi (b) Sb  
(c) Al (d) Br
- Which is the pair of metalloids? 12201076  
(a) Na and K (b) F and Cl  
(c) As and Sb (d) Cu and Au
- The elements placed on the extreme right of the periodic table are: 12201077  
(a) Transition elements (b) Non-metals  
(c) Metalloids (d) Metals
- When we move from left to right along a period: 12201078  
(a) Reducing power of elements increases  
(b) Basic nature of oxides decreases  
(c) Acidic nature of oxides decreases  
(d) Atomic size increases
- Which of the following has the highest first ionization energy? 12201079  
(a) B (b) C  
(c) O (d) N
- Alkali metals are strong reducing agents because: 12201080  
(a) These are metals  
(b) Their atomic radii are large  
(c) They are monovalent  
(d) Their ionization energies are very low
- Which of the following is not an ionic hydride? 12201081  
(a) CsH (b) LiH  
(c) HCl (d) NaH
- When hydrogen loses its electron to form  $H^+$  ion, then it resembles: 12201082  
(a) Transition metals (b) Halogens  
(c) Alkali metals (d) Noble gases
- The hydration energy of  $Mg^{+2}$  is larger than that of: 12201083  
(a)  $Al^{+3}$  (b)  $Na^+$   
(c)  $Be^{+2}$  (d)  $Si^{+4}$
- Alkaline earth metals are: 12201084  
(a) Acidic in nature  
(b) Amphoteric in nature  
(c) Strong oxidizing agents  
(d) Strong reducing agents
- The law of triads applies to the following sets of elements: 12201085  
(a) B, N, C (b) Be, Mg, Ca  
(c) Ar, K, Ca (d) Se, Te, As
- Point out the incorrect statement for the periodic classification of elements:  
(a) The properties of the elements are the periodic function of their atomic numbers 12201086  
(b) Non-Metallic elements are lesser in no. than metallic elements  
(c) The first ionization energies of elements along a period do not vary regularly with increase in atomic no.  
(d) For transition elements the d sub-shells are filled with electrons monoatomically with increase in atomic no.
- The law of triad is applicable to: 12201087  
(a) C, N, O  
(b) H, O, N  
(c) Na, K, Rb  
(d) Cl, Br, I





31. Mendeleev's periodic table is upset by fact that: 12201088  
 (a) Noble gases do not form compounds  
 (b) Many elements have several isotopes  
 (c) Atomic weights of elements are not always in whole no.  
 (d) None of the above
32. The modern periodic table reveals that the elements are: 12201089  
 (a) Arranged in the order of increasing atomic weight  
 (b) Taken in group of eight  
 (c) Arranged in the order of increasing no. of protons in the nucleus  
 (d) Arranged in the order of increasing no. of neutrons in the nucleus
33. As we go from left to right in a period, the atomic volume: 12201090  
 (a) First decreases then increases  
 (b) First increases then decreases  
 (c) Increases regularly  
 (d) Remains constant
34. Lower atomic volume generally leads to higher: 12201091  
 (a) Density (b) Brittleness  
 (c) Melting & Boiling Point  
 (d) All of the above
35. Lithium is very similar to Mg although these are placed in different groups. It is due to fact that: 12201092  
 (a) Both have the same size  
 (b) The ratio of their charge to size is same  
 (c) Both are found together in nature  
 (d) Both have same configuration
36. While moving from Li to F in II period, there is a regular decrease in: 12201093  
 (a) Ionization potential  
 (b) Electronegativity  
 (c) Atomic mass (d) Atomic size
37. The property 'not shown' by all transition elements is that: 12201094  
 (a) These elements show variable valency  
 (b) These act as catalyst  
 (c) These are paramagnetic  
 (d) All impart color to flame

38. Electronic configuration of four elements A, B, C, D are as follows, which will be the most metallic? 12201095  
 (a) A = 2, 8, 4 (b) B = 2, 8, 6  
 (c) C = 2, 8, 8, 1 (d) D = 2, 8, 8, 7
39. Which of the following pair of elements have the same no. of electrons in outer most shell? 12201096  
 (a) Sb and Bi (b) Na and Ca  
 (c) Pb and Sb (d) Na and O
40. The hydration energy is minimum for: 12201097  
 (a) Cs<sup>+</sup> (b) K<sup>+</sup>  
 (c) Na<sup>+</sup> (d) Li<sup>+</sup>
41. Which of the following ions will form most water soluble hydroxide? 12201098  
 (a) Ni<sup>2+</sup> (b) K<sup>+</sup>  
 (c) Zn<sup>2+</sup> (d) Al<sup>3+</sup>
42. Which of the following sets of elements is arranged in increasing order of electron affinity? 12201099  
 (a) F, Cl, Br (b) Br, Cl, F  
 (c) Br, F, Cl (d) Cl, Br, F
43. Ionization energy of N is higher than that of oxygen because of: 12201100  
 (a) Greater attraction of electrons by the nucleus  
 (b) The half filled p-orbitals of N possess extra stability  
 (c) Greater penetration effect  
 (d) The size of the N atom being smaller
44. The values of 1st, 2nd, 3rd, 4th, 5th ionization potentials of an element are 7.1, 14.3, 24.5, 46.8 & 162.2 eV respectively. The element is: 12201101  
 (a) Na (b) Ca  
 (c) Al (d) Si
45. Electronegativity of Be is same as that of: 12201102  
 (a) B (b) Mg  
 (c) Al (d) Na
46. From Li<sup>+</sup> to Cs<sup>+</sup> ion, the degree of hydration: 12201103  
 (a) Decreases (b) Increases  
 (c) Remains same (d) None of these
47. Which of the following has least density? 12201104  
 (a) Mg (b) K  
 (c) Na (d) Li

48. The element which exists in liquid state at room temp. is: 12201105  
 (a) Hg (b) Br  
 (c) Ga (d) All of these
49. Size of cation is smaller than that of atom, because: 12201106  
 (a) The whole of outer shell of electron is removed  
 (b) Effective nuclear charge increases  
 (c) Gain of electrons  
 (d) Both (a) & (b)
50. Percentage covalent character in HF is: 12201107  
 (a) 50% (b) 33%  
 (c) 56% (d) 58%
51. The most electropositive element among Fe, Na, Cs, Pb is: 12201108  
 (a) Fe (b) Na  
 (c) Cs (d) Pb
52. Which pair of elements is chemically most similar: 12201109  
 (a) Na, Al (b) Cu, Au  
 (c) Ar, F (d) Se, Zr
53. The electronic configuration of an element 'M' is 1s<sup>2</sup>, 2s<sup>2</sup>, 2p<sup>6</sup>, 3s<sup>2</sup>. The formula of its oxide will be: 12201110  
 (a) M<sub>2</sub>O (b) MO  
 (c) M<sub>2</sub>O<sub>3</sub> (d) MO<sub>2</sub>
54. Ionization energy is lowest for: 12201111  
 (a) Inert Gases  
 (b) Alkali Metals  
 (c) Halogens  
 (d) Alkaline Earth Metals
55. Which of the following has the highest melting point? 12201112  
 (a) NaCl (b) NaBr  
 (c) NaI (d) NaF
56. Excluding H & He, the smallest element in the periodic table is: 12201113  
 (a) Lithium  
 (b) Fluorine  
 (c) Caesium  
 (d) Iodine
57. Out of Na, Mg, Na<sup>+</sup> & Mg<sup>2+</sup>, the highest ionization energy is of: 12201114  
 (a) Na (b) Na<sup>+</sup>  
 (c) Mg (d) Mg<sup>2+</sup>



58. The second electron affinity of oxygen is: 12201115  
 (a) -141 kJ mole<sup>-1</sup> (b) +780 kJ mole<sup>-1</sup>  
 (c) -337 kJ mole<sup>-1</sup> (d) +29 kJ mole<sup>-1</sup>
59. Which of the following is most electropositive? 12201116  
 (a) Na (b) Mg  
 (c) Cs (d) Li
60. Aluminium is diagonally related to: 12201117  
 (a) Li (b) Be  
 (c) Na (d) B
61. The element with atomic no. 106 belongs to: 12201118  
 (a) s-block (b) p-block  
 (c) d-block (d) f-block
62. The correct order of 1st Ionization potential of C, N, O & F is: 12201119  
 (a) F > N > O > C (b) C > N > O > F  
 (c) O > F > C > N (d) N > C > F > O
63. In case of inner transition elements the last electrons are received by: 12201120  
 (a) s-orbitals (b) f-orbitals  
 (c) p-orbitals (d) d-orbitals
64. In Mendeleev's periodic table Zn, Cd, Hg were placed with: 12201121  
 (a) Alkali metals  
 (b) Alkaline earth metals  
 (c) Transition metals  
 (d) Coinage metals
65. Basic character of oxides increases down the group due to: 12201122  
 (a) Increase in electropositive character  
 (b) Increase in atomic size  
 (c) Increase in electron affinity  
 (d) Increase in both size & electropositive character
66. Atomic radius increases from top to bottom within a group due to: 12201123  
 (a) Addition of an extra shell of electrons  
 (b) Increase in atomic number  
 (c) Increase in shielding effect  
 (d) All of the above
67. The second electron affinity is endothermic due to: 12201124  
 (a) Repulsion of incoming electron by negatively charged ion  
 (b) Attraction of Electron by Nucleus  
 (c) Decrease in size of atom  
 (d) Increase in electronegativity of atom





68. Mark the correct statement: 12201125  
 (a)  $\text{Cl}^-$  is larger than Cl  
 (b)  $\text{Na}^+$  is larger than Na atom  
 (c) I is smaller than I atom  
 (d) I and I are equal in size

69. Which one of the following elements can have only negative oxidation states:

- (a) Br (b) F 12201126  
 (c) I (d) Cl

70. Which statement is incorrect? 12201127

- (a) All metals are good conductor of heat & electricity  
 (b) All metals have high electron affinity  
 (c) Metallic character increases down the group  
 (d) All metals have low electronegativity

71. Which of the following oxides is amphoteric in nature? (Board 2010) 12201128

- (a) ZnO (b) MgO  
 (c)  $\text{SO}_3$  (d)  $\text{P}_2\text{O}_5$

72. Which of the following statements is incorrect about electronegativity? 12201129

- (a) Electronegativity is related to ionization energy  
 (b) Electronegativity is related to electron affinity  
 (c) Electronegativity is the power of an atom to attract electron  
 (d) Electronegativity is the power of an atom to repel electron

73. Which of the following statements is not correct: 12201130

- (a) Atomic radius increases with the increase in atomic no. along the period  
 (b) Ionization potential decreases down the group  
 (c) Shielding effect increases down the group  
 (d) Electron affinity decreases down the group

74. The difference in the physical and chemical characteristics of the elements of the A & B sub groups in the periodic table is the least in: 12201131

- (a) Group I (b) Group III  
 (c) Group IV (d) Group VII

75. The strongest acid among the following is: 12201132

- (a) HI (b) HBr  
 (c) HCl (d) HF

76. Among the ionic halides, which has highest melting & boiling points: 12201133

- (a) Fluorides (b) Chlorides  
 (c) Bromides (d) Iodides

77. The sixth period of periodic table consists of 32 elements which are: 12201134

- (a) Two s-block, six p-block and twenty four d-block elements  
 (b) Eight normal, ten d-block and 14f block elements  
 (c) Eight normal, ten transition and ten inner transition elements  
 (d) Eight normal & twenty four d-block elements

78. Which of the following is covalent oxide (Board 2007) 12201135

- (a) BeO (b) MgO  
 (c) SrO (d) CaO

79. How many semi metals are present in first period? (Board 2007) 12201136

- (a) Zero (b) 3  
 (c) 2 (d) 6

80. Hydrogen can be placed in group IV A because both: (Board 2008) 12201137

- (a) Act as strong oxidizing agents  
 (b) Act as strong reducing agents  
 (c) Possess the property of catenation  
 (d) Form neutral oxides

81. Most of the elements are: (Board 2010) 12201138

- (a) Crystalloids (b) Metals  
 (c) Metalloids (d) Non-metals

82. The number of elements in fourth Period in modern Periodic table is: (Board 2011) 12201139

- (a) 32 (b) 18  
 (c) 10 (d) 8

83. The decrease in atomic sizes is much prominent across rows containing elements of: 12201140

- (a) s-Block (b) p-Block  
 (c) d-Block (d) f-Block



84. Potassium oxide is: (Board 2010) 12201141

- (a) Acidic (b) Amphoteric  
 (c) Basic (d) Neutral

85. Elements of group IA are called: 12201142

- (a) Alkali metals  
 (b) Metalloids  
 (c) Alkaline earth metals  
 (d) Coinage metals

86. Smaller the size of an ion: (Board 2014) 12201143

- (a) Lesser is the degree of hydration  
 (b) Lesser is the polarizing power  
 (c) Greater is the electron affinity  
 (d) Greater is the degree of hydration

87. Which of the following form amphoteric oxide: (Board 2016)

- (a) Na (b) Mg 12201144  
 (c) O (d) Zn

## ANSWERS

1.	(b)	2.	(a)	3.	(c)	4.	(d)	5.	(a)
6.	(b)	7.	(c)	8.	(a)	9.	(b)	10.	(a)
11.	(c)	12.	(c)	13.	(d)	14.	(c)	15.	(c)
16.	(c)	17.	(d)	18.	(d)	19.	(c)	20.	(b)
21.	(b)	22.	(d)	23.	(d)	24.	(c)	25.	(c)
26.	(b)	27.	(d)	28.	(b)	29.	(c)	30.	(d)
31.	(b)	32.	(c)	33.	(a)	34.	(d)	35.	(b)
36.	(d)	37.	(d)	38.	(c)	39.	(a)	40.	(a)
41.	(b)	42.	(c)	43.	(b)	44.	(d)	45.	(c)
46.	(a)	47.	(d)	48.	(d)	49.	(d)	50.	(c)
51.	(c)	52.	(b)	53.	(b)	54.	(b)	55.	(d)
56.	(b)	57.	(d)	58.	(b)	59.	(c)	60.	(b)
61.	(c)	62.	(a)	63.	(b)	64.	(b)	65.	(d)
66.	(d)	67.	(a)	68.	(a)	69.	(b)	70.	(b)
71.	(a)	72.	(d)	73.	(a)	74.	(c)	75.	(a)
76.	(a)	77.	(b)	78.	(a)	79.	(a)	80.	(b)
81.	(b)	82.	(b)	83.	(d)	84.	(c)	85.	(a)
86.	(c)	87.	(d)						





## SHORT QUESTIONS

**Q.1 To which block of the periodic table the rare earths belong?** 12201145

Ans. Lanthanides and actinides are called rare earths. Lanthanides have 4f as outermost sub-shell and actinides have 5f sub-shell as outermost. Hence they are called f-block elements.

**Q.2 How does hydrogen resemble with elements of group IVA?** (Board 2009) 12201146

Ans. Both hydrogen and group IVA elements have half electronic configuration, form covalent bonds and also have approximately same values of thermodynamic properties. Both Carbon and Hydrogen act as reducing agents.



**Q.3 What are metalloids?** (Board 2011) 12201147

Ans. These are elements which have properties of both metals as well as non-metals. These are specially lower members of IIIA, IVA and VA. Their oxides are amphoteric in nature. For example Si, Ge, As and Sb, etc.

**Q.4 What are long periods?** 12201148

Ans. The period number 4 and 5 are called long periods. Each period contains 18 elements, eight are typical and 10 are transition elements. Period 4 starts with K and ends at Kr whereas period 5 starts with Rb and ends at Xe.

**Q.5 What improvements were made in the modern periodic table?** 12201149

Ans. An extra group VIII A for noble gases was added. Alkali and Coinage metals were separated. Lanthanides and actinides were placed separately at the bottom of periodic table. Position of isotopes was mentioned. The structure of atom was explained.

**Q.6 What were the advantages of Mendeleev's periodic table?** 12201150

Ans. Mendeleev left many vacant spaces for undiscovered elements. He corrected the

atomic mass of Be to be 9.00a.m.u. He placed elements into groups.

**Q.7 Why the melting points of halides decrease from left to right in a period?** 12201151

Ans. The halides of group IA are considered purely ionic compounds with high melting points and solid in nature. Fluorides have the highest melting and boiling points which decrease in order.

fluoride > chloride > bromide > iodide

**Q.8 How does the nature of oxide (in the case of manganese oxides) change with the increase of oxidation number of the central atoms?** 12201152

Ans. The acidic character of these oxides increases as:  $\text{MnO} < \text{Mn}_2\text{O}_3 < \text{MnO}_2 < \text{Mn}_2\text{O}_7$ , because the oxidation state of Mn in these oxides increases from +2, +3, +4 and +7 respectively.

**Q.9 What is the periodic trend of hydration energy?** 12201153

Ans. The hydration energy of ions depends upon charge to size ratio. If we move from top to bottom in a group the hydration energy decreases because charge density decreases with increase in ionic radius. However the hydration energy increases significantly from left to right in a period as the charge to size ratio increases.

**Q.10 The oxidation states vary in a period but remain almost constant in a group. Give reason.** (Board 2016) 12201154

Ans. In a period from left to right, number of shells remains the same but number of electrons increases in the valence shell from left to right which causes the variation of oxidation states along a period.

While in a group from top to bottom, number of shells increases but the number of electrons in the valence shell remains same. Due to this reason, oxidation states remain almost constant in a group.

**Q.11 Why d and f-block elements are called transition elements?** 12201155

Ans. Because their properties are intermediate between s and p-block elements and there is a systematic variation in their properties.

**Q.12 The melting and boiling points of the elements increase from left to the right upto the middle of s and p-block elements and decreases onward. Why?** 12201156

Ans. Melting points in short periods increase upto the middle and then decreases. Increase in melting point is due to decrease in atomic size and increase in inter-atomic forces. After group IV A, elements exist independently as discrete units molecules and have less intermolecular forces in them therefore melting point and boiling point also decreases.

**Q.13 Why alkali metals give ionic hydrides?** (Board 2015) 12201157

Ans. Alkali metals are electropositive metals and have strong tendency to lose electron whereas H-atom gain electron forming  $\text{H}^-$  (Hydride ion). The positive metal ion  $\text{M}^+$  and negative  $\text{H}^-$  ion combine to form MH. These are crystalline solids with high M.P and B.P.

**Q.14 Ionic character of halides decreases from left to the right in a period. Why?** 12201158

Ans. As we move from left to right in a period electropositive character of elements decreases. So, tendency of forming ionic halides decreases and covalent halides tendency increases.

**Q.15 Why the order of hydration energy of the ions is  $\text{Al}^{+3} > \text{Mg}^{+2} > \text{Na}^{+}$ ?** 12201159

Ans. The hydration energy depends upon charge density. The charge density of  $\text{Al}^{+3}$  is greater than  $\text{Mg}^{+2}$  and  $\text{Na}^{+}$ , So, it has high hydration energy. All the three ions are isoelectronic but  $\text{Na}^{+}$  has least charge density hence has less hydration energy.

**Q.16 Why the electrical conductivities of the elements are related with the free electrons?** 12201160

Ans. When the potential difference is applied to the substances, then free electrons

should be available to conduct electrical current.

**Q.17 Define the following:** 12201161

(i) Coinage metals

(ii) Rare earth elements

Ans. (i) Coinage Metals:

Elements of group IB are called coinage metals. They are Cu, Ag and Au.

(ii) Rare earth elements:

Actinides and lanthanides are called rare earth metals due to their less abundance they are called f-block elements.

**Q.18 Which are the longest and shortest periods of the periodic table?** 12201162

Ans. Shortest Period.

1st period which consists of H and He is called shortest period.

Longest Period.

6th period of periodic table is called longest period. It consists of 32 – elements. In this period 8 – elements are normal elements (s+p – block elements). 10 – elements are transition elements and 14 – elements are lanthanides.

**Q.19 Why atomic radii decreases from left to right in a period?** (Board 2009) 12201163

Ans. In a period of periodic table, nuclear charge increases and force of attraction between nucleus and valence shell increases. Due to greater nuclear charge, atomic size decreases in a period.

**Q.20 Size of cation is smaller from its parent atom. Why?** 12201164

Ans. When an electron is removed from the valence shell of an atom, its nuclear charge increases. Due to increase in the nuclear charge, size of atom reduces e.g. covalent radius of Na is 157pm and ionic radius of  $\text{Na}^{+}$  is 95 pm.

**Q.21  $\text{Na}^{+}$ ,  $\text{Mg}^{+2}$ ,  $\text{Al}^{+3}$  are Isoelectronic in nature. Do these ions have same ionic radii?** 12201165

Ans.  $\text{Na}^{+}$ ,  $\text{Mg}^{+2}$ ,  $\text{Al}^{+3}$  all have 10 electrons in their valence shells but their ionic Radii are not same.

Ionic Radii decrease due to increase in the nuclear charge from left to right in period i.e.



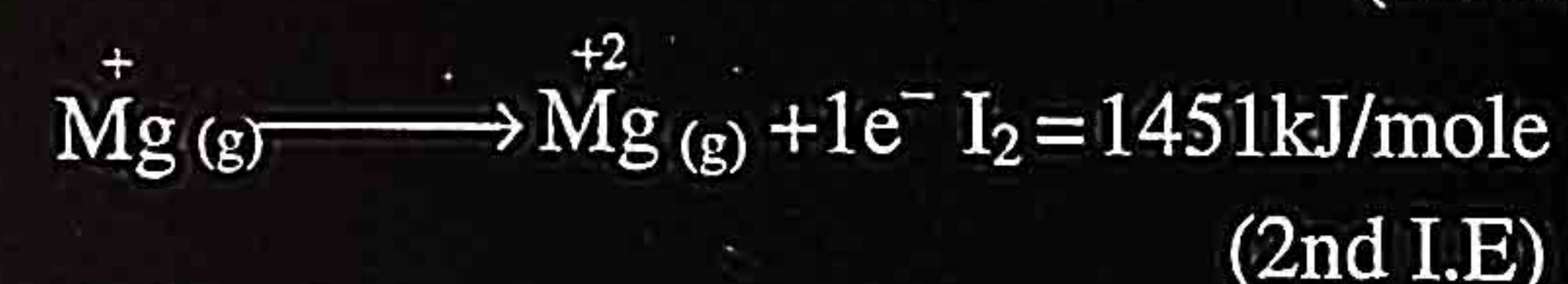
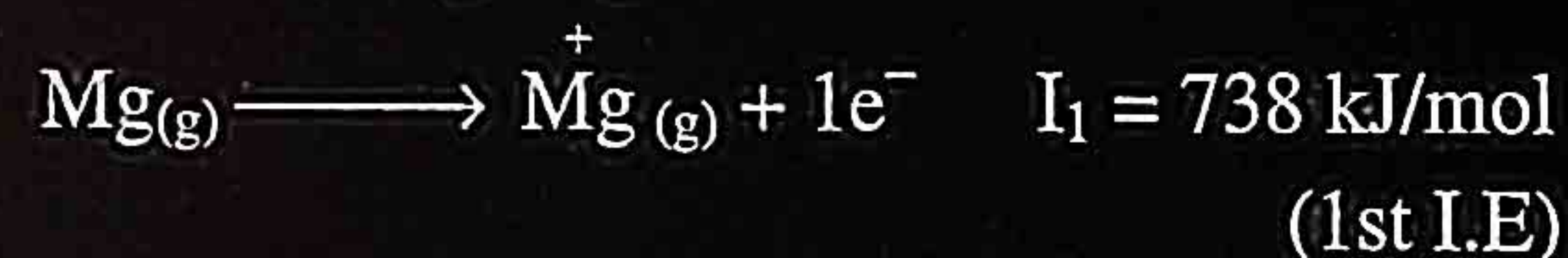


$\text{Na}^+$  has 11 protons,  $\text{Mg}^{+2}$  has 12 protons and  $\text{Al}^{+3}$  has 13 protons in it.

**Q.22 2nd Ionization energy is greater than 1st Ionization energy, why?** 12201166

**Ans.** Amount of energy required to remove 1st electron from an atom in gaseous state is called 1st ionization energy.

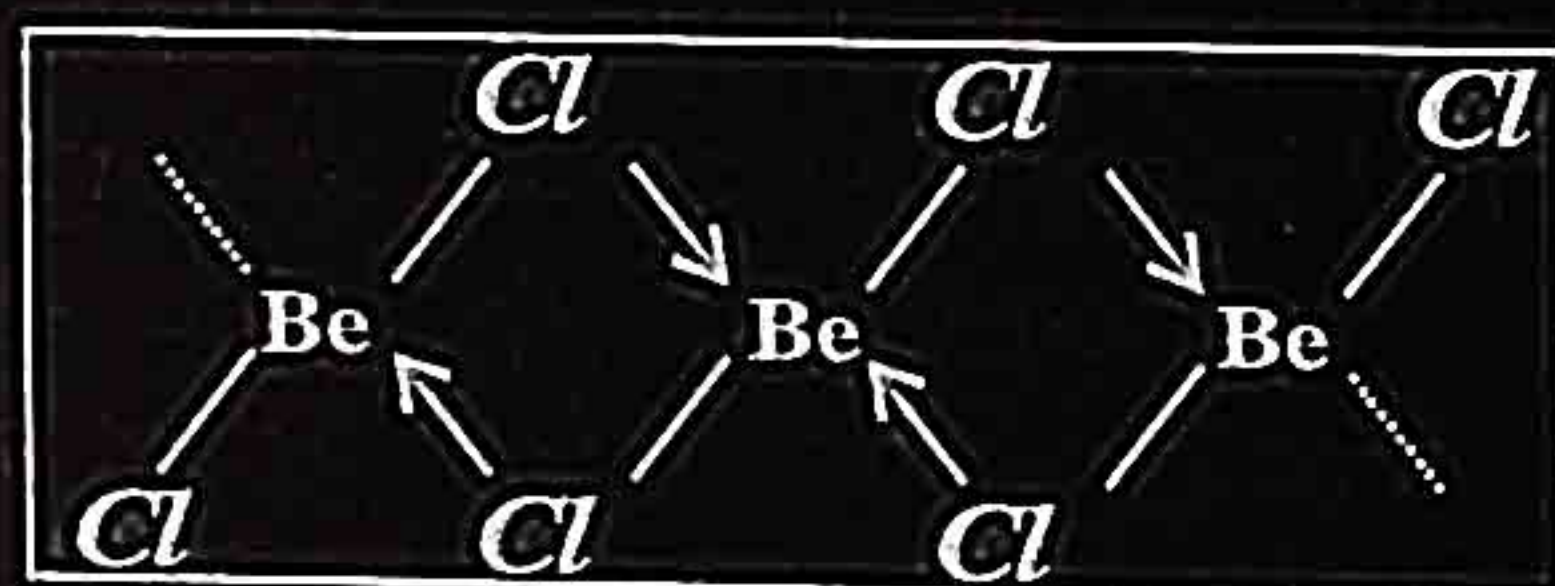
Amount of energy required to remove 2nd electron from monovalent ion is called 2nd ionization energy. 2nd ionization energy is greater than 1st I.E due to increase in the nuclear charge e.g.



**Q.23 What are polymeric halides?**

12201167

**Ans.** The halides which have intermediate characters b/w ionic & covalent halides are called polymeric halides. Less electropositive elements like Be, Ga, Al etc. form polymeric halides.



**Q.24 What are amphoteric oxides? Explain with an example.** 12201168

**Ans.** The oxides which have basic as well as acidic character in them are called amphoteric oxides. They react with acids or bases to form salt e.g.



**Q.25 Why the second values of electron affinity has positive sign?** (Board 2008) 12201169

**Ans.** The amount of energy absorbed when an electron is added in the outer most shell of an atom is called electron affinity when an electron is added to an atom, it forms a negative ion. Second electron is always added to the uni-negative ion. Due to presence of same charge on the electron and

uni-negative ion, they repel each other and some energy is required to add electron e.g.



**Q.26 What are bridge elements?** 12201170

**Ans.** Elements of second period are known as bridge elements. Properties of bridge elements resemble with the properties of diagonal elements of third period.

**Q.27 How are elements classified into blocks?**

12201171

**Ans.** Elements are classified into four blocks on the basis of their configuration. These are s, p, d & f blocks. This classification depends upon the nature of atomic orbital into which last electron enters.

**Q.28 Lanthanide contraction control the atomic size of elements of 6<sup>th</sup> & 7<sup>th</sup> period?**

**Explain.**

12201172

**Ans.** Gradual reduction in size of lanthanide elements is significant and is called lanthanide contraction.

In a period, as the atomic no. increases from left to right the atomic radius decreases. This gradual decrease in the radius is due to increase in the positive charge in the nucleus. As the positive nuclear charge increases the negatively charged electrons in the shells are pulled closer to the nucleus. Thus the size of the outer most shell become smaller. This effect is more significant in the elements of longer periods in which 'd' and 'f' sub shells are involved like lanthanides.

**Q.29 Why transition elements show variable oxidation states?** (Board 2015) 12201173

**Ans.** Transition elements which are shown in B sub groups of the periodic table show oxidation states equal to their group number but due to greater number of valence electrons available in partially filled d-orbital and involvement of electrons of s-orbital, these elements usually show more than one oxidation states in their compounds.

**Q.30 What is shielding effect or screening effect?**

12201174

**Ans.** A valence electron in a multi electron atom is attracted by the nucleus and repelled

by the electrons of the inner shells. The combined effect of this attractive and repulsive force acting on the valence electron is that the valence electron experiences less attraction from the nucleus. This is known as shielding or screening effect.

**Q.31 Explain what do you mean by periodicity in properties?** 12201175

**Ans.** When elements are arranged in increasing order of atomic no. elements with similar properties reoccur (due to similar outer electronic configuration at regular intervals in the periodic table). This is called periodicity of properties.

**Q.32 What are inner transition elements?** 12201176

**Ans.** The f-block elements are called inner transition elements.

The last electron enters the f-orbital in the ante-penultimate (third from the outer most) shell. Inner incomplete shells are:

(i) Outermost s – orbitals (ii) d – orbital and (iii) f – orbital

f – block elements are of two types.

(a) 4f – series (lanthanides or rare earth's). These are 14 in all, (Ce58 to Lu71) in which 4f orbital is being filled. The electronic configuration of the ante penultimate shell of lanthanides is  $4s^2 3d^{10} 4f^{14}$

(b) 5f – series (Actinides)

These are also 14 in all (Th 90 – Lr 103) in which 5f – orbital is being filled, the electronic configuration of ante – penultimate shell is  $5s^2 p^6 d^{10}, 4f^{14}$

**Q.33 Why the ionic radii of negative ions are larger than size of their parent atom?**

(Board 2008, 2010) 12201177

**Ans.** When an atom gains electron, it changes to negative ion or an anion. Size of anion is always larger than its neutral atom. By addition of more electrons, the nuclear charge decreases and shell expands.

**Q.34 Why metallic character increases from top to bottom in a group of metals?**

(Board 2006, 2014, 2015) 12201178

**Ans.** Metallic character increases from top to bottom in a group due to increase in size of atom and ease to remove electrons. The



ionization energy decreases and the element becomes more electropositive.

**Q.35 Why diamond is non-conductor and graphite is fairly a good conductor of electricity?** (Board 2013) 12201179

**Ans.** Carbon, in the form of diamond is non-conductor because all of its valence electrons are tetrahedrally bound and unable to move freely, while in the form of graphite, carbon is fairly good conductor because one of its four valence electrons is relatively free to move.

**Q.36 The hydration energy of  $\text{Al}^{+3}$  is three times greater than that of  $\text{Ca}^{+2}$ . Why?** (Board 2006) 12201180

**Ans.** The hydration energy of ions depends upon charge to volume ratio. The size of  $\text{Al}^{+3}$  is smaller and it has high charge density as compared to  $\text{Ca}^{+2}$ , therefore it has greater value of hydration energy.

**Q.37 Give the reason, why the radius of fluorine atom is smaller than that of fluoride ion.** (Board 2007) 12201181

**Ans.** When fluorine atom gains electron, it changes to  $\text{F}^{-1}$  ion. Its size will be larger than F atom. By addition of more electron, the nuclear charge decreases and shell expands. The radius of F atom is 72 pm and that of  $\text{F}^{-1}$  is 136 pm.

**Q.38 The hydration energies of IIA group elements are higher than those of IA group elements. Justify.** (Board 2007) 12201182

**Ans.** The hydration energy depends upon charge density. The elements of IIA group are smaller in size and also have +2 charge on their ions therefore they have high value of hydration energy as compared to IA group elements.

**Q.39 Why the ionization energy decreases down the group and increases along a period?** (Board 2008, 2014) 12201183

**Ans.** When we move from left to right in a period, the ionization energy increases because the number of shells remain same but nuclear charge increases. Ionization energy decreases from top to bottom in the group due to increase in atomic size.



**Q.40** Why heat of hydration of alkaline earth metals decreases down the group?

12201184

**Ans.** Heat of hydration of ions depends upon charge to volume ratio. The ionic radius of group II elements increases down the group with increase in atomic number. Therefore the charge density decreases and hydration energy also decreases.

**Q.41** What are hydrides? What is the trend of boiling points of hydrides down the group VI-A?

(Board 2010) 12201185

**Ans.** The binary compounds of hydrogen with other elements are called hydrides. The boiling points of covalent hydrides generally increases on descending the group, except water which has high boiling point due to hydrogen bonding.

**Q.42** Why melting and boiling points of elements belonging to group VA and VIIA are lower?

(Board 2011) 12201186

**Ans.** From left to right in the period, the number of electrons go on increasing in the outermost shell. The tendency to unpair the electrons increases upto group IVA. The binding forces increase and hence melting and boiling point increases. From group VI to VIIA the pairing of electrons starts and binding forces become less that is why these elements have low M.P and B.P and exist as gases at room temperature.

**Q.43** Define electron affinity. Discuss its trend in periodic table.

(Board 2013) 12201187

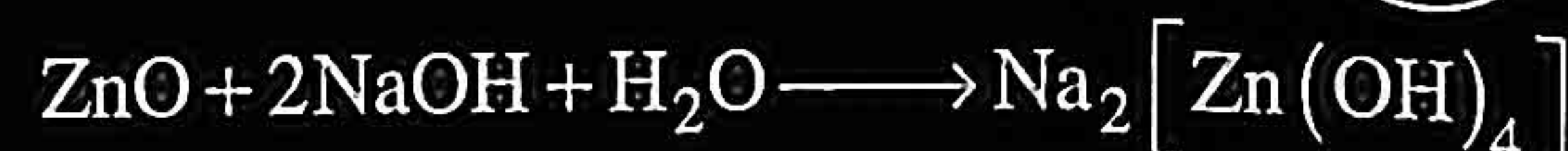
**Ans.** Electron affinity is defined as the energy released or absorbed, when an electron is added to a gaseous atom to form a negative ion.

E.A generally increases along a period and decreases from top to bottom in a group.

**Q.44** How does ZnO behave as an amphoteric oxide?

(Board 2013, 2014) 12201188

**Ans.** Amphoteric oxides are those which behave as acid as well as a base. ZnO behaves as an amphoteric oxide as it reacts with acids and bases as:



**Q.45** Why is the oxidation state of noble gases usually zero? (Board 2013, 2014) 12201189

**Ans.** Oxidation state of noble gases is usually zero as there is no vacancy in the outermost shells of these elements. That's why they are also called inert elements.

**Q.46** Define modern periodic law.

(Board 2014) 12201190

**Ans.** According to the modern periodic law: If the elements are arranged in ascending order of their atomic numbers, their chemical properties repeat in a periodic manner.

**Q.47** Why do metals conduct electricity?

(Board 2014) 12201191

**Ans.** Metals can conduct electricity due to the presence of relatively loose electrons in the outermost shell of the element and ease of their movement in the solid lattice.

**Q.48** Although both sodium and phosphorus are present in the same period of the periodic table yet their oxides are different in nature, Na<sub>2</sub>O is basic while P<sub>2</sub>O<sub>5</sub> is acidic in character. Give reason.

12201192

**Ans.** Sodium and Phosphorus belong to the same period but they differ from each other in the way that sodium is a metal while phosphorus is a non-metal.



(Acid)

Sodium like all metals combine with oxygen to form basic oxides while phosphorus like all non-metals combines with oxygen to form acidic oxide.



(Base)

**Q.49** Zn, Cd, Hg were placed with alkaline earth metals in Mendeleev's table. How this confusion is removed in the modern periodic table? (Board 2015) 12201193

**Ans.** In modern periodic table, elements are divided in two types of vertical groups, A and

B. Alkaline earth metals are placed in group IIA and Zn, Cd, Hg in group IIB.

**Q.50** What is Lanthanide contraction?

(Board 2016) 12201194

**Ans.** In a period of the periodic table, there is a gradual decrease in the radius due to increase in positive charge in the nucleus. Increased positive nuclear charge pulls the negatively charged electrons closer to the nucleus so the size of the outer shell becomes gradually smaller. This effect is called Lanthanide contraction as it is quite remarkable in the elements of longer periods in which "d" and "f" shells are involved. e.g. the gradual reduction in the size of Lanthanides is significant.

**Q.51** Name various classes of hydrides.

(Board 2016) 12201195

**Ans.** According to the nature of bonding, hydrides may be broadly classified into three classes:

i. Ionic hydrides



ii. Covalent hydrides  
iii. Intermediate hydrides

**Q.52** How does hydrogen resemble with Alkali metals? Write any four points.

(Board 2016) 12201196

**Ans.**

- Like Alkali metals hydrogen atom has one electron in 1s subshell, which it can lose to form H<sup>+</sup>.
- Both hydrogen and alkali metals have a strong tendency to combine with electronegative elements such as halogens.
- Similar to Alkali metals hydrogen forms ionic compounds which dissociate in water.
- Valence electronic configuration of both, hydrogen and Alkali metals can be represented as ns<sup>1</sup>.