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Time : 6 Hour | STD 11 Science Chemistry | Total Marks : 200

kd 90+ ch-3 classification of elements and periodicity in properties

* **Choose The Right Answer From The Given Options.[1 Marks Each]** **[74]**

1. Which of the following elements will gain one electron more readily in comparison to other elements of their group?

(A) S(g) (B) Na(g) (C) O(g) (D) Cl(g)

2. Compound of a metal 'M' is M_2O_3. The formula of its nitride will be-

(A) M_3N (B) MN (C) M_3N_2 (D) M_2N_3

3. The electronegativities of C, N, Si and Pare in order of:

(A) Si < P < C < N (B) Si < P < N < C

(C) P < Si < N < C (D) P < Si < C < N

4. An element belongs to 3rd period and group-13 of the periodic table. Which of the following properties will be shown by the element?

(A) Good conductor of electricity. (B) Liquid, metallic.

(C) Solid, metallic. (D) Solid, non metallic.

5. Which of the following pairs show reverse properties on moving along a period from left to right and from top to bottom in a group?

(A) Atomic radius and electron gain enthalpy (negative value).

(B) Nuclear charge and ionisation enthalpy.

(C) Ionisation enthalpy and electron gain enthalpy (negative value).

(D) None of the above.

6. Which of the following compounds is/ are amphoteric in nature?

(A) Cl_2O_7 (B) Al_2O_3

(C) As_2O_3 (D) Both (b) and (c).

7. Which of the following decreases in going down the halogen group?

(A) Ionic radius (B) Atomic radius

(C) Ionisation potential (D) Boiling point

8. The oxide formed by the element on extreme right and in the left of periodic table are generally:

(A) Acidic, amphoteric respectively. (B) Acidic, basic respectively.

(C) Neutral, amphoteric respectively. (D) Basic, neutral respectively.

9. I.P. of sodium is 5.14 eV then I.P. of potassium will be:

(A) Equal to sodium (B) 5.68 eV

(C) 4.34 eV (D) 10.28 eV

10. The alkaline earth metal which shows properties similar to aluminium is:

(A) Ca (B) Be (C) Sr (D) Ba

11.

A solution of $CuSO_4$ was kept in an iron pot. After few days the iron pot was found to have a number of holes in it. The balance equation of the reaction involve is:

(A) $2Fe + CuSO_4 \rightarrow Fe_2(SO_4)_3 + Cu$ (B) $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

(C) $3Fe + CuSO_4 \rightarrow Fe_3(SO_4)_4 + Cu$ (D) $Fe + CuSO_4 \rightarrow Fe_2SO_4 + Cu$

12. The electronic configuration of gadolinium (Atomic number 64)

(A) $[Xe]\ 4f^3\ 5d^5\ 6s^2$ (B) $[Xe]\ 4f^7\ 5d^2\ 6s^1$

(C) $[Xe]\ 4f^7\ 5d^1\ 6s^2$ (D) $[Xe]\ 4f^8\ 5d^6\ 6s^2$

13. The first ionisation enthalpies of Na, Mg, Al and Si are in the order:

(A) Na < mg > Al < Si (B) Na > mg > Al > Si

(C) Na < Mg < Al < Si (D) Na > mg > Al < Si

14. Alkaline earth (group 2 or IIA elements) differ from group 12 (or IIB) elements in the electronic configuration of their:

(A) Anitipenultimate shell (B) Innermost shell

(C) Outermost shell (D) Penultimate shell

15. IE of an element does not depend on:

(A) Its nuclear charge (B) The shielding effect

(C) Electron neutrality (D) Penetration effect

16. The element with positive electron gain enthalpy is:

(A) Hydrogen. (B) Sodium. (C) Oxygen. (D) Neon.

17. The polarizing power of the following anions N^{3-}, O^{2-} and F^-, follow the order.

(A) $N^{3-} < F^- < O^{2-}$ (B) $O^{2-} < N^{3-} < F^-$

(C) $O^{2-} < F^- < N^{3-}$ (D) $N^{3-} > O^{2-} > F^-$

18. Which one of the following is correct order of electron gain enthalpy?

(A) S < O < Cl < F (B) Cl < F < S < O

(C) F < Cl < O < S (D) O < S < F < Cl

19. The property which regularly increases down the group in the periodic table is:

(A) Ionisation energy (B) Electronegativity

(C) Reducing nature (D) Electron affinity

20. Who developed the long form of the periodic table?

(A) Niels Bohr. (B) Moseley.

(C) Mendeleef. (D) Lothar Meyer.

21. Arrange Be, Ca, Ba, Ra in increasing order of ionisation energy:

(A) Be < Ra < Ca < Ba (B) Ba < Ca < Ra < Be

(C) Ra < Ba < Ca < Be (D) Ba < Ra < Ca < Be

22. Which is incorrect configuration for s-block elements?

(A) $[Ar]3d^{10}4s^2$ (B) $[Ar]3d^{10}4s^1$

(C) Both A and B (D) None of these

23. In which of the following, which of the following is incorrect:

(A) I < Br < Cl < F (increasing electron gain enthalpy)

(B) Li < Na < K < Rb (increasing metallic radius)

(C) Al < Mg < Na < F increasing ionic size)

(D) B < C < O < N (increasing first ionisation enthalpy)

24. General outer electronic configuration of d-block elements is:

(A) $(n - 1)d^{1-10}\ ns^3$ (B) $(n + 1)d^{1-10}\ ns^{0-2}$

(C) $(n - 1)d^{1-10}\ ns^{0-2}$ (D) $(n - 1)d^0\ ns^{0-2}$

25. The correct order of electronegativity of Na, O and F is:

(A) Na > O > F (B) O > F > Na

(C) O > Na > F (D) F > O > Na

26. Considering the elements F, Cl, O and N the correct order of their chemical reactivity in terms of oxidizing property is:

(A) F>Cl>O>N (B) F>O>Cl>N (C) Cl>F>O>N (D) O>F>N>Cl

27. In the P^{3-}, S^{2-} and Cl^- ions, the increasing order of size is:

(A) Cl^-, S^{2-}, P^{3-} (B) P^{3-}, S^{2-}, Cl^-

(C) S^{2-}, Cl^-, P^{3-} (D) S^{2-}, P^{3-}, Cl^-

28. The properties of _____ were predicted by Mendeleev before their isolation.

(A) Co and Ni

(B) I and Te

(C) Sc, Ga and Ge

(D) Cl, Ar and K

29. Which one of the following arrangement represents the correct order of electron gain enthalpy of the given atomic species?

(A) Cl < F < S < O (B) S < O < F < Cl

(C) S < O < Cl < F (D) F < Cl < O < S

30. Which of the following sets contain only isoelectronic ions?

(A) $Zn^{2+}, Ca^{2+}, Ga^{3+}, Al^{3+}$ (B) $K^+, Ca^{2+}, Sc^{3+}, Cl^-$

(C) $P^{3-}, S^{2-}, Cl^-, K^+$

(D) $Ti^{4+}, Ar, Cr^{3+}, V^{5+}$

31. The 100^{th} element is named in honor of:

(A) Einstein (B) Bohr (C) Fermi (D) Curie

32. Arrange the following elements in order of their increasing ionization energies O, S, Se, Te, Po.

(A) Se, Te, S, Po, O (B) O, S, Se, Te, Po

(C) Po, Te, Se, S, O (D) Te, O, S, Po, Se

33. Which of the following is the correct order of size of the given species:

(A) $I > I^- > I^+$ (B) $I^+ > I^- > I$

(C) $I > I^+ > I^-$ (D) $I^- > I > I^+$

34. In Mendeleev's periodic table, gaps were left for the elements to be discovered later. Which of the following elements found a place in the periodic table later?

(A) Germanium (B) Chlorine

(C) Oxygen (D) Silicon

35. Which group of elements does not show diagonal relationship?

(A) Li, Mg (B) Be, Al (C) B, Si (D) C, P

36. Anomalous pair among the following is:

(A) Boron - silicon (B) Aluminium - nickel

(C) Beryllium - indium (D) Cobalt - nickel

37. 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:

(A) A < C < B < D (B) A < B < C < D

(C) D < B < C < A (D) D < A < B < C

38. Which of the following statements is incorrect?

(A) Mendeleev's arranged elements in horizontal rows and vertical columns.

(B) Mendeleev's arranged elements in order of their increasing atomic number.

(C) Mendeleev's system of classifying elements was more elaborate than that of Lother Meyer.

(D) None of the above.

39. 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:

(A) s > p > d > f (B) f > d > p > s

(C) p < d < s > f (D) f > p > s > d

40. Which elements is expected to have lowest ionization enthalpy?

(A) Sr (B) As (C) Xe (D) S

41. The horizontal rows and the vertical columns in the periodic table are termed as respectively?

(A) Periods, groups. (B) Groups, periods.

(C) Series, periods. (D) Family, periods.

42. Which important property did Mendeleev use to classify the elements in his periodic table?

(A) Atomic weight. (B) Atomic number.

(C) Melting point. (D) None of these.

43. In which of the following options order of arrangement does not agree with the variation of property indicated against it?

(A) $Al^{3+} < Mg^{2+} < Na+ < F^-$ (increasing ionic size)

(B) B < C < N < O (increasing first ionisation enthalpy)

(C) I < Br < Cl < F (increasing electron gain enthalpy)

(D) Li < Na < K < Rb (increasing metallic radius)

44. Why do elements in the same group have similar physical and chemical properties?

(A) Because of same electronic configuration.

(B) Because of same number of electrons.

(C) Because of same number of protons.

(D) Because of same valence electrons.

45. The symbol and name according to the IUPAC system for the element with atomic number = 120, respectively are:

(A) Ubn and unbinilium. (B) Ubn and unbiunium.

(C) Ubn and unnilbium. (D) Ubn and unnilium.

46. Consider the isoelectronic species, Na^+, Mg^{2+}, F^- and O^{2-}. The correct order of increasing length of their radii is ____________.

(A) $F^- < O^{2-} < mg^{2+} < Na^+$

(B) $Mg^{2+} < Na^+ < F^- < O^{2-}$

(C) $O^{2-} < F^- < Na^+ < mg^{2+}$

(D) $O^{2-} < F^- < Mg^{2+} < Na^+$

47. Recently (in Aug 2003) two new elements have been discovered with atomic number:

(A) 113, 114 (B) 114, 115 (C) 115, 116 (D) 113, 115

48. In general second ionisation enthalpy of an atom will be:

(A) Higher than the first ionisation enthalpy.

(B) Equal to the first ionisation enthalpy.

(C) Higher than the third ionisation enthalpy.

(D) Equal to the third ionisation enthalpy.

49. The pair of amphoteric hydroxides is:

(A) $Al(OH)_3$, LiOH (B) $Be(OH)_2$, $Mg(OH)_2$

(C) $B(OH)_3$, $Be(OH)_2$ (D) $Be(OH)_2$, $Zn(OH)_2$

50. The elements in which electrons are progressively filled in 4f-orbital are called:

(A) Actinoids. (B) Transition elements.

(C) Lanthanoids. (D) Halogens.

51. Write the electronic configuration of the Ca^{2+} in absence of Aufbau Principle.

(A) $1s^2, 2s^22p^6, 3s^23p^6$ (B) $1s^2, 2s^22p^6, 3s^23p^34d^3$

(C) $1s^2, 2s^22p^6, 3s^{23}p^54d^1$ (D) None of these

52. The decreasing order of the second ionization potential of K, Ca and Ba is:

(A) K>Ca>Ba (B) Ca>Ba>K

(C) Ba>K>Ca (D) K>Ba>Ca

53. Which of the following types of elements show variable valency?

(A) Transition elements. (B) s-block elements.

(C) f-block elements. (D) Both (a) and (c).

54. Elements having similar outer shell electronic configuration in their atoms are arranged in:

(A) Groups. (B) Vertical columns.

(C) Families. (D) All of these.

55. Mendeleev corrected the atomic weight of:

(A) Be (B) N (C) O (D) Cl

56. Which of the following have no unit?

(A) Electronegativity. (B) Electron gain enthalpy.

(C) Lonisation enthalpy. (D) Metallic character.

57. Which of the following will have the most negative and least negative electron gain enthalpy respectively, P, S, Cl and F?

(A) P and Cl. (B) S and Cl. (C) Cl and F. (D) Cl and P.

58. The ionization energies from Ga to Tl do not decrease due to:

(A) Shielding effect
(B) Improper shielding effect.
(C) Increase in the atomic size.
(D) Decrease in the nuclear charge.

59. The element with configuration $1s^2$, $2s^2$, $2p^6$, $3s^2$ would be:
(A) A metal
(B) A non-metal
(C) A inert gas
(D) A metalloid

60. A neutral atom of an element has a nucleus with nuclear charge 11 times and mass 23 times that of hydrogen. Write the electronic configuration of the element?
(A) 2, 1
(B) 2, 8, 1
(C) 2, 8
(D) 2, 8, 8, 3

61. Which of the following elements can show covalency greater than 4?
(A) Be
(B) P
(C) S
(D) B

62. The most reactive metal is:
(A) Sodium
(B) Magnesium
(C) Potassium
(D) Calcium

63. 3d-transition series of elements starts with scandium which has the electronic configuration:
(A) $3d^1\ 4s^2$
(B) $3d^1\ 4s^1$
(C) $3d^2\ 4s^2$
(D) $3d^3\ 4s^2$

64. Which of the following is not a noble gas?
(A) Helium
(B) Xenon
(C) Radium
(D) Radon

65. Outer electronic configuration of f-block elements is:
(A) $(n + 1)f^{1-14}(n - 1)d^{0-1}ns^2$
(B) $(n - 2)f^{1-14}(n + 1)d^{0-1}ns^2$
(C) $(n - 2)f^{1-14}(n - 1)d^{0-1}ns^2$
(D) None of the above.

66. From Be to Ra, ionization energies:
(A) Increases
(B) Decreases
(C) Remain same
(D) None of these

67. The chemistry of lithium is very similar to that of magnesium even though they are placed in different groups. Its reason is that:
(A) Both are found together in nature.
(B) Both have nearly the same size.
(C) Both have similar electronic configurations.
(D) The ratio of their charge to size is nearly the same.

68. As we go down in the electro-chemical series of metals, the reactivity _____ .
(A) Decreases and then increases
(B) Increases and then decreases
(C) Decreases
(D) Increases

69. The period number in the long form of the periodic table is equal to:
(A) Magnetic quantum number of any element of the period.
(B) Atomic number of any element of the period.
(C) Maximum principal quantum number of any element of the period.
(D) Maximum azimuthal quantum number of any element of the period.

70. A pair of atomic numbers which belong to s-block are:
(A) 7, 15
(B) 6, 12
(C) 9, 17
(D) 3, 12

71. The ionisation energy of nitrogen is more than oxygen because of:

(A) More attraction of electrons by the nucleus.

(B) The extra stability of half-filled p-orbitals.

(C) The ionic radius of nitrogen atom is smaller.

(D) All of the above are correct.

72. The atomic number of Uut is:

(A) 113 (B) 114 (C) 108 (D) 115

73. Which of the following has maximum difference in 1^{st} and 2^{nd} ionisation enthalpy.

(A) $1s^2, 2s^2, 2p^6, 3s^1$ (B) $1s^2, 2s^2, 2p^6, 3s^1$

(C) $1s^2, 2s^2, 2p^1$ (D) $1s^2, 2s^2, 2p^6$

74. The first ionisation potential is maximum for:

(A) Lithium (B) Uranium (C) Iron (D) Hydrogen

*** a statement of Assertion (A) is followed by a statement of Reason (R). [2]**

Choose the correct option.

75. **Note:** In the following questions a statement of Assertion (A) followed by a statement of reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): Boron has a smaller first ionisation enthalpy than beryllium.

Reason (R): The penetration of a 2s electron to the nucleus is more than the 2p electron hence 2p electron is more shielded by the inner core of electrons than the 2s electrons.

i. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
ii. Assertion is correct statement but reason is wrong statement.
iii. Assertion and reason both are correct statements and reason is correct explanation for assertion.
iv. Assertion and reason both are wrong statements.

76. **Note:** In the following questions a statement of Assertion (A) followed by a statement of reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): Generally, ionisation enthalpy increases from left to right in a period.

Reason (R): When successive electrons are added to the orbitals in the same principal quantum level, the shielding effect of inner core of electrons does not increase very much to compensate for the increased attraction of the electron to the nucleus.

i. Assertion is correct statement and reason is wrong statement.
ii. Assertion and reason both are correct statements and reason is correct explanation of assertion.
iii. Assertion and reason both are wrong statements.
iv. Assertion is wrong statement and reason is correct statement.

*** Answer The Following Questions In One Sentence.[1 Marks Each] [17]**

77. Anything that influences the valence electrons will affect the chemistry of the element. Which one of the following factors does not affect the valence shell?

a. Valence principal quantum number (n)
b. Nuclear charge (Z)
c. Nuclear mass
d. Number of core electrons.

78. Which element do you think would have been named by:
Lawrence Berkeley Laboratory.

79. What is the total number of sigma and pi bonds in the following molecules?
C_2H_4

80. Electronegativity of F on Pauling scale is 4.0. What is the value on Mulliken's scale.

81. The electronic configuration of Re^{3+} is $[Xe]4f^{14}5d^4$. Calculate the number of unpaired electrons in this ion.

82. What is covalency of Al in $[AlCl_4]^-$?

83. State modern periodic law.

84. Which is the smallest among Na^+, Mg^{2+}, Al^{3+} and why?

85. An element belongs to 5th period and 3rd group, identify the element.

86. Which hybrid orbitals are used by carbon atoms in the following molecules?
CH_3 –CH=CH_2;

87. How do the basic character and solubility in water vary from $Be(OH)_2$ to $Ba(OH)_2$?

88. An element X belongs to the third period of p-block. It has 4 electrons in the outermost shell. Name the element.

89. Considering the elements B, C, N, F, and Si, the correct order of their non-metallic character is :
    a. B > C > Si > N > F
    b. Si > C > B > N > F
    c. F > N > C > B > Si
    d. F > N > C > Si > B

90. Explain why chlorine can be converted into chloride ion more easily as compared to fluoride ion from fluorine.

91. To which series do man-made elements belong?

92. Write the IUPAC name and symbol for the element with atomic number 109.

93. Arrange the following species in increasing order of their size:
Mg^{2+}, Al^{3+}, Na^+, O^{2-}, F^-.

*** Given Section consists of questions of 2 marks each.** **[24]**

94. Magnesium and Lithium both form nitride, why? Write the equation for formation of their nitride.

95. How does ionisation energy vary (i) down the group, (ii) along the period from left to right?

96. Give the name and atomic number of the inert gas tom in which total number of d-electrons is equal to difference in number of total 'p' and s-electrons.

97. Among the elements of the third period Na to Ar, pick out the element:
    i. With highest first ionisation enthalpy.
    ii. With largest atomic radius.
    iii. Which is most reactive non-metal.
    iv. Which is most reactive metal.

98.

Arrange the following elements in the increasing order of non-metallic character. Give reason.

B, C, O, N, F

99.
i. Name the most metallic element in second period and most non-metallic element.
ii. Name the element with (a) largest atomic radius, (b) smallest atomic radius in third period.
iii. Name the element having general electronic configuration $ns^2\ np^4$ in fourth period.

100. What would be IUPAC names and symbols for elements with atomic numbers 122, 127, 135, 149 and 150?

101.
i. How do the electronic configurations of the elements with Z = 107 to 109 differ from one another?
ii. Rn (Z = 86) is the last noble gas discovered. Predict what will be the atomic number of the next noble gas to be discovered. Write its symbol.

102. Element 'Al' belongs to group 13 forms ionic compounds. Write,
a. Formula of its oxide.
b. Arrange the following in decreasing order of electropositive character Li, Na, K, Cs Give reason.

103. Eka-aluminium and eka-silicon were the names given by Mandeleev for the then unknown elements gallium and germanium respectively. A recently discovered element was first named as eka-mercury. What is its atomic number? Write its group number, electronic configuration, IUPAC and official names.

104.
i. How does basic character of oxides and hydroxides down the group in alkali metals change? Why?
ii. How does reducing power of elements vary in Group I?

105. Name the species that will be isoelectronic with the following atoms or ions:
i. Na
ii. Cl^-
iii. Ca^{2+}
iv. Rb^+

*** Given Section consists of questions of 3 marks each.** **[15]**

106. How would you react to the statement that the electronegativity of N on Pauling scale is 3.0 in all the nitrogen compounds?

107. Give reason for the following:
i. Halogens act as good oxidising agent.
ii. Electron gain enthalpy of noble gas is almost zero.
iii. Na and Mg^+ have same number of electrons but removal of electron from Mg^+ requires more energy.

108. Consider the element N, P, O and S and arrange them in order of:
i. Increasing first ionisation enthalpy.
ii. Increasing negative electron gain enthalpy.
iii. Increasing non-metallic character.

109.

a. Name the group of the elements in which electrons are progressively filled in 4f-orbital and 5f orbitals.

b. Which of the following is the correct order of size of the given species: I, I^+, I^-?

c. Which of the following elements can show covalency greater than 4?

Be, P, S, B

110. Among the elements B, Al, C and Si:

i. Which element has the highest first ionisation enthalpy?

ii. Which element has the most metallic character? Justify your answer in each case.

* Case study based questions [8]

111. The s-Block Elements The elements of Group 1 (alkali metals) and Group 2 (alkaline earth metals) which have ns1and ns2 outermost electronic configuration belong to the s-Block Elements. They are all reactive metals with low ionization enthalpies. They lose the outermost electron(s) readily to form 1+ ion (in the case of alkali metals) or 2+ ion (in the case of alkaline earth metals). The metallic character and the reactivity increase as we go down the group. Because of high reactivity they are never found pure in nature. The compounds of the s-block elements, with the exception of those of lithium and beryllium are predominantly ionic. The p-Block Elements comprise those belonging to Group 13 to 18 and these together with the s-Block Elements are called the Representative Elements or Main Group Elements. The outermost electronic configuration varies from ns2np1 to ns2np6 in each period. At the end of each period is a noble gas element with a closed valence shell ns2np6 configuration. All the orbitals in the valence shell of the noble gases are completely filled by electrons and it is very difficult to alter this stable arrangement by the addition or removal of electrons. The noble gases thus exhibit very low chemical reactivity. Preceding the noble gas family are two chemically important groups of non-metals. They are the halogens (Group 17) and the chalcogens (Group 16).The non-metallic character increases as we move from left to right across a period and metallic character increases as we go down the group. These are the elements of Group 3 to 12 in the centre of the Periodic Table. These are characterised by the filling of inner d orbitals by electrons and are therefore referred to as d-Block Elements. These elements have the general outer electronic configuration (n-1)d1-10ns0-2 . They are all metals. They mostly form coloured ions, exhibit variable valence (oxidation states), paramagnetism and oftenly used as catalysts. However, Zn, Cd and Hg which have the electronic configuration, (n-1) d10ns2 do not show most of the properties of transition elements. In a way, transition metals form a bridge between the chemically active metals of s-block elements and the less active elements of Groups 13 and 14 and thus take their familiar name “Transition Elements”.The two rows of elements at the bottom of the Periodic Table, called the Lanthanoids, Ce(Z = 58) – Lu(Z = 71) and Actinoids, Th(Z = 90) – Lr (Z = 103) are characterised by the outer electronic configuration (n-2)f 1-14 (n-1)d 0–1ns2 . The last electron added to each element is filled in f- orbital. These two series of elements are hence called the Inner- Transition Elements (f-Block Elements). They are all metals. Within each series, the properties of the elements are quite similar. The chemistry of the early actinoids is more complicated than the corresponding lanthanoids, due to the large number of oxidation states possible for these actinoid elements. Actinoid elements are radioactive. Many of the actinoid elements have been made only in nanogram quantities or even less by nuclear reactions and their chemistry is not fully studied. The elements after uranium are called Transuranium Elements. The elements can be divided into Metals and Non-Metals. In contrast, non-metals are located at the top right hand side of the Periodic Table. The elements become more metallic as we go down a group; the non- metallic character

increases as one goes from left to right across the Periodic Table. Periodic Table show properties that are characteristic of both metals and non- metals. These elements are called Semi-metals or Metalloids.

i. Alkali metal and alkaline earth metal belongs to ..
   a. S – block
   b. P – block
   c. D – block
   d. F – block

ii. The metallic character and the reactivity … as we go down the group.
   a. Decreases
   b. Increases
   c. Remains Constant
   d. None of Above

iii. Group … Elements known as chalcogens.
   a. 12
   b. 14
   c. 16
   d. 18

iv. Elements Ce(Z = 58) to Lu(Z = 71) are known as:
   a. Halogens
   b. Chalcogens
   c. Actinoids
   d. Lanthenoids

v. The elements after uranium are called … Elements.
   a. Halogens
   b. Chalcogens
   c. Actinoids
   d. Transuranium

112. We must bear in mind that when Mendeleev developed his Periodic Table, chemists knew nothing about the internal structure of atom. However, the beginning of the 20th century witnessed profound developments in theories about sub-atomic particles. In 1913, the English physicist, Henry Moseley observed regularities in the characteristic X-ray spectra of the elements. A plot of ν (whereν is frequency of X-rays emitted) against atomic number (Z) gave a straight line and not the plot of ν vs atomic mass. He thereby showed that the atomic number is a more fundamental property of an element than its atomic mass. Mendeleev's Periodic Law was, therefore, accordingly modified. This is known as the Modern Periodic Law and can be stated as : The physical and chemical properties of the elements are periodic functions of their atomic numbers.Numerous forms of Periodic Table have been devised from time to time. Some forms emphasise chemical reactions and valence, whereas others stress the electronic configuration of elements. A modern version, the so-called "long form" of the Periodic Table of the elements , is the most convenient and widely used. The horizontal rows (which Mendeleev called series) are called periods and the vertical columns, groups. Elements having similar outer electronic configurations in their atoms are arranged in vertical columns, referred to as groups or families. According to the recommendation of International Union of Pure and Applied Chemistry (IUPAC), the groups are numbered from 1 to 18 replacing the older notation of groups IA … VIIA, VIII, IB … VIIB and 0. There are altogether seven periods. The period number corresponds to the highest principal quantum number (n) of the elements in the period. The first period contains 2 elements. The subsequent periods consists of 8, 8, 18, 18 and 32 elements, respectively. The seventh period is incomplete and like the sixth period would have a theoretical maximum (on the basis of quantum numbers) of 32 elements. In this form of the

Periodic Table, 14 elements of both sixth and seventh periods (lanthanoids and actinoids, respectively) are placed in separate panels at the bottom. the IUPAC has made recommendation that until a new element's discovery is proved, and its name is officially recognised, a systematic nomenclature be derived directly from the atomic number of the element using the numerical roots for 0 and numbers 1-9. The roots are put together in order of digits which make up the atomic number and "ium" is added at the end.Groupwise Electronic Configurations Elements in the same vertical column or group have similar valence shell electronic configurations, the same number of electrons in the outer orbitals, and similar properties. theoretical foundation for the periodic classification. The elements in a vertical column of the Periodic Table constitute a group or family and exhibit similar chemical behaviour. This similarity arises because these elements have the same number and same distribution of electrons in their outermost orbitals. We can classify the elements into four blocks viz., s-block, p-block, d-block and f-block depending on the type of atomic orbitals that are being filled with electrons. Two exceptions to this categorisation. Strictly, helium belongs to the s-block but its positioning in the p-block along with other group 18 elements is justified because it has a completely filled valence shell (1s) and as a result, exhibits properties characteristic of other noble gases. The other exception is hydrogen. It has only one s-electron and hence can be placed in group 1 (alkali metals). It can also gain an electron to achieve a noble gas arrangement and hence it can behave similar to a group 17 (halogen family) elements. Because it is a special case, we shall place hydrogen separately at the top of the Periodic Table.

i. In 1913, the English physicist, ...observed regularities in the characteristic X-ray spectra of the elements.
   a. Johann Dobereiner
   b. John Alexander Newlands
   c. Demitri Mendeleev
   d. Henry Moseley

ii. Horizontal row in periodic table called:
   a. Group
   b. Period
   c. Triad
   d. Octave

iii. Vertical Column in periodic table called:
   a. Group
   b. Period
   c. Triad
   d. Octave

iv. According to Modern Periodic Law the physical and chemical properties of the elements are periodic functions of their ....
   a. Atomic mass
   b. Atomic numbers
   c. Atomic structure
   d. Atomic size

v. What is IUPAC name of element having atomic number 107.
   a. Unnilpentium
   b. Unnilhexium
   c. Unnilseptium
   d. Unniloctium

*** Given Section consists of questions of 5 marks each. [60]**

113.

What is the significance of the terms — 'isolated gaseous atom' and 'ground state' while defining the ionization enthalpy and electron gain enthalpy?
Hint : Requirements for comparison purposes.

114. Consider the following species:

N^{3-}, O^{2-}, F^{-}, Na^{+}, Mg^{2+} and Al^{3+}

a. What is common in them?
b. Arrange them in the order of increasing ionic radii.

115. The first ionization enthalpy values (in kJ mol^{-1}) of group 13 elements are:

B	Al	Ga	In	Tl
801	577	579	558	589

How would you explain this deviation from the general trend?

116. Distinguish between a sigma and a pi bond.

117. Among the second period elements the actual ionization enthalpies are in the order Li < B < Be < C < O < N < F < Ne.Explain why,

i. Be has higher $\Delta_t H$ than B
ii. O has lower $\Delta_t H$ than N and F?

118. Among the second period elements the actual ionization enthalpies are in the order Li < B < Be < C < O < N < F < Ne.Explain why,

i. Be has higher $\Delta_t H$ than B
ii. O has lower $\Delta_t H$ than N and F?

119. On the basis of quantum numbers, justify that the sixth period of the periodictable should have 32 elements.

120. p-Block elements form acidic, basic and amphoteric oxides. Explain each property by giving two examples and also write the reactions of these oxides with water.

121. Write the drawbacks in Mendeleev's periodic table that led to its modification.

122. Explain why cation are smaller and anions larger in radii than their parent atoms?

123. Consider the following species:

N^{3-}, O^{2-}, F^{-}, Na^{+}, Mg^{2+} and Al^{3+}

a. What is common in them?
b. Arrange them in the order of increasing ionic radii.

124. What is the basic difference in approach between the Mendeleev's Periodic Lawand the Modern Periodic Law?

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