CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

PERIODIC TABLE

A.Development of Periodic Table, Period, Group and Block

1. According to Moseley, a straight line graph is obtained on plotting:

A. the frequencioes of characteristic line graph

B. the square of the frequencies of characteristic X-rays of elements against their atomic numbers

C. the square root of the frequencies of characteristis X-rays of elements against their atomic numbers.

D. the reciprocal of the frequencies of characteristic X-rays of elements against their atomic numbers

Answer: C

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2. The atomic volume was chosen as the basis of periodic classification of elements by:

A. Niel Bohr

B. Mendeleev

C. Lother Meyer

D. Newland

Answer: C

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3. Element in periodix table with electronic configuration as $[Ar]^{18}3d^5 4s^1$ is placed in:

A. IA,s-block

B. VIA,s-block

C. VIB,s-block

D. VIB,d-block

Answer: D

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4. In a given energy level, the order of penetration effect of different orbitals is

A. $f < d < p < s$

B. $s = p = d = f$

C. $s < p < d < f$

D. $p > s > d > f$

Answer: A

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5. Atomic number of Ag is 47. in the same group, the atomic number of elements placed above and below Ag will be:

A. 37,67

B. 29,79

C. 39,69

D. 18,28

Answer: B

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6. In the periodic table, where are non-metals located?

A. Between groups IIA and IIIA

B. On the lower left hand side

C. On the upper left hand side

D. On the upper right hand side

Answer: D

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7. Which of the following statements is wrong for the transition elements?

A. Transition elements are placed from 3rd to 6th period

B. Last electron enters in $(n-d)d$ subshell

C. Exhibits variable valency

D. General electronic configuration is $(n-1)d^{1-10}ns^{1-2}$.

Answer: A

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8. The first element of a group in many ways differ from the heavier memebers of group. This is due to a)the small size b)the high electronegativity c)high ionisation potential d)the unavailability of d-orbitals

A. the small size

B. the high electronegativity and high ionisation potential

C. the unavailability of d-orbitals

D. all of the above

Answer: D

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9. The statement that is not correct for the periodic classification of elements is : a)The properties of elements are the periodic functions of their atomic numbers. b)non-metallic elements are lesser in number than metallic elements. c)the first ionisation energies of elements along a period do not vary in a regular manner with increase in atomic number. d)for transition elements the $d-$ subshells are filled with electrons monotonically with increase in atomic number.

A. the properties of elements are the periodic functions of their atomic numbers

B. non-metallic elements are lesser in number than metallic elements

C. the third period contains 8 elements and not 18 as 4th period contains

D. for transition elements the d-subshells are filled with electrons monotonically with increase in atomic number

Answer: D

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10. Which of the following statement is not correct regarding hydrogen atom?

A. It resembles halogens in some properties

B. It resembles alkali metals in some properties

C. It can be placed in 7th group of periodic table

D. It cannot be placed in first group of periodic table

Answer: D

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11. According to modern periodic law the elements with similar chemical and physical properties repeat at regular intervals when the elements are arranged in order of :

A. decreasing atomic number

B. increasing atomic weight

C. increasing atomic number

D. decreasing atomic weight

Answer: C

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12. Which one of the following statements related to the modern periodic table is incorrect?

A. The p-block has 6 columns, because a maximum of 6 electrons can occupy all the orbitals in a p-subshell

B. The d-block has 8 columns, because a maximum of 8 electrons can occupy all the orbitals in a d-subshell

C. Each block contains a number of columns equal to the number of electrons that can occupy that subshell.

D. The block indicates value of azimuthal quantum number (l) for the last subshell that received electrons in building up the electronic configuration.

Answer: B

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13. Which set does not show correct matching ?

A. $Sc^{3+}[Ne]3s^2 3p^6$ zero group

B. $Fe^{2+}[Ar]3d^6$ 8th group

C. $Cr[Ar]3d^5 4s^1$ 6th group

D. All of the above

Answer: A

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14. The atomic numbers of the metallic and non-metallic elements which are liquid at room temperature respectively are:

A. 55,87

B. 33,87

C. 35,80

D. 80,35

Answer: D

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15. Total number of elements in 6th period are:

A. 8

B. 18

C. 32

D. 28

Answer: C

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16. Atomic number of 15, 33,51 represents the following family:

A. carbon family

B. nitrogen family

C. oxygen family

D. none of these

Answer: B

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17. The element with atomic number $Z = 118$ will be categorised as a:

A. noble gas

B. transition metal

C. alkali metal

D. alkaline earth metal

Answer: A

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18. The places that were left empty by Mendeleev were for:

A. aluminium and silicon

B. gallium and germanium

C. arsenic and antiomny

D. molybdenum and tungsten

Answer: B

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19. In which group all the elements do not have same number of valence electrons?

A. zero

B. second

C. first

D. seventh

Answer: A

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20. The elements which exhibit both vertical and horizontal similarities are:

A. inert gas elements

B. representative elements

C. transition element

D. rare earth element

Answer: C

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21. Which of the following is the atomic number of a metal?

A. 35

B. 34

C. 36

D. 38

Answer: D

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22. In which element shielding effect is not possible ?

A. H

B. Be

C. B

D. N

Answer: A

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23. Which of the following is true about the element $._{33}As$?

A. It is 5th period element

B. It is p-block element

C. It belongs to 16th group

D. It is the member of VIA group

Answer: B

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24. Chalcogens are elements of:

A. group 16

B. p-block

C. ns^2np^4 configuration

D. all are correct

Answer: D

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25. Electronic configuration of M^{3+} is $[Ar]3d^{10}4s^2$, it belongs to

A. s-block

B. p-block

C. d-block

D. f-block

Answer: B

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26. Of the following pairs, the one containing examples of metalloid elements in the periodic table is:

A. Na and K

B. F and Cl

C. Cu and Ag

D. As and Sb

Answer: D

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27. Which group of elements is analogous to the lanthanides?

A. Halides

B. Actinides

C. Chalcogenides

D. Borides

Answer: B

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28. Principle of modern periodic table was given by:

A. Moseley

B. Mendeleev

C. Doberenier

D. Newland

Answer: A

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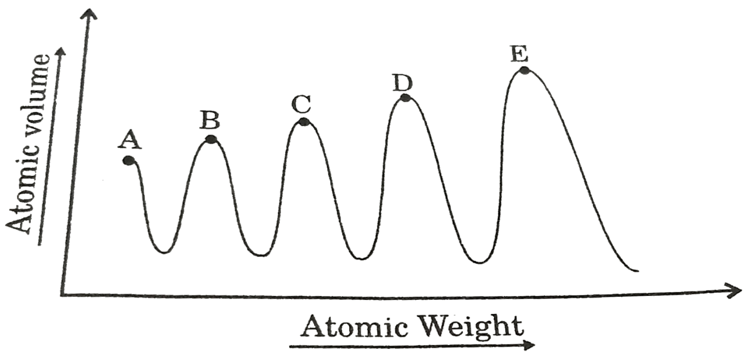
29. In the Lother Meyer graph, A,B,C,D and E elements are :



A. halogens

B. alkaline earth metals

C. alkali metals

D. transition metals

Answer: C

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30. Most of the d block elements are known as:

A. alkali metals

B. alkaline earth metals

C. innertransition elements

D. transition elements

Answer: D

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31. Which of the following represents the electronic configuration of a transition element?

A. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$

B. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6 3d^2, 4s^2$

C. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^2 4p^2$

D. $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^2 4p^1$

Answer: B

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32. As applied to periodic table, which of the following sets include only magic number?

A. 2,8,8,18,19,32

B. 2,8,18,32

C. 8,8,18,18

D. 2,18,18,32

Answer: A

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33. The number of elements which should be theoretically present in 8^{th} period of the modern long from of periodic table, is

A. 32

B. 40

C. 50

D. 48

Answer: C

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34. If an orbital can have maximum 4 electrons then, how many elements can be present in 8th period?

A. 100

B. 75

C. 128

D. 64

Answer: A

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35. which of the following number for the element Unbiunnium is

A. 120

B. 121

C. 112

D. 122

Answer: B

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36. Elements A,B,C,D and E have following electronic configuration.

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

(C) $1s^2, 2s^2 2p^6, 3s^2 3p^3$ (D) $1s^2, 2s^2 2p^6, 3s^2 3p^5$

(E) $1s^2, 2s^2 2p^6, 3s^2 3p^6$

Which among the belongs to same group in the periodic table. ?

A. A and C

B. A and D

C. A and E

D. A and B

Answer: D

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37. If Aufbau rule is not followed, K-19 will be placed in

A. s-block

B. p-block

C. d-block

D. f-block

Answer: C

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38. In the Lother Meyer, which of the following option is incorrect.

A. Alkali metals occupied peak position at curve

B. Halogens occupied ascending position at curve

C. Alkaline earth elements descendings position at curve

D. Alkali metals are in the lower curve of graph

Answer: D

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39. If A,B and C are the three elements of Dobereiner's Traid and atomic weight of A and B are 7 and 15 respectively then the atomic weight of C is:

A. 1

B. 11

C. 23

D. 25

Answer: C

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40. According to the Lother Meyer's curve which of the following statements is incorrect?

A. The element having similar properties will occupy the same position in the curve

B. Alkaline earth metals are at the peaks of the curve

C. Halogens are at ascending part of the curve

D. The atomic volume of the elements in a period initially decreases and then increases

Answer: B

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41. If the atomic number of an element is 33, it will be placed in the periodic table in the ____

A. first group

B. third group

C. fifth group

D. seventh group

Answer: C

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42. Eka-aluminium and Eka -silicon are known as :

A. gallium and germanium

B. aluminium and silicon

C. iron and sulphur

D. proton and silicon

Answer: A

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43. The electronic configuration of gadolinium (Atomic number 64) is

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. $[Xe]4f^8 5d^6 6s^2$

Answer: C

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44. The statement that is not correct for periodic classification of elements is

A. The properties of elements are periodic function of their atomic numbers

B. Non metallic elements are less in number than metallic elements

C. For transition elements, the 3d-orbitals are filled with electrons after 3p-orbitals and before 4s-orbitals

D. The first ionisation enthalpies of elements generally increase with increase in atomic number as we go along a period..

Answer: C

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45. Which of the following is not an actinoid?

A. Curium $(Z = 96)$

B. Californium $(Z = 98)$

C. Uranium $(Z = 92)$

D. Terbium $(Z = 65)$

Answer: D

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46. Which of following is not correctly matached?

A. d-block element : electronic configuration is $ns^{0-2}(n-1)d^{1-10}$

B. p-block element: electronic configuration is $ns^{1-2}np^{1-6}$

C. s-block element: electronic configuration is ns^{1-2}

D. Ce: f-block's first member

Answer: B

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47. Newland's law of octave applies to which of the following set elements ?

A. Na,K, Rb

B. F,Cl,Br

C. Be,Mg,Ca

D. B,Al,Ga

Answer: C

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48. Which are correct match?

(i) Eka silicon-Be (ii) Eka aluminium -Ga

(iii) Eka mangenese-Tc (iv) Eka scandium-B

A. (ii) and (iii)

B. (i),(ii) and (iv)

C. (i) and (iv)

D. All of these

Answer: A

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49. In Lother Meyer plot, the peaks are occupied by

A. alkali metals

B. highly electropositive elements

C. elements habing large atomic volume

D. all of the above

Answer: D

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50. In Mendelev's modified periodic table, there are________vertical column called groups.

A. 8

B. 9

C. 18

D. 12

Answer: B

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51. The elements of group $1, 2, 13, 14, 15, 16, 17, 18$ are collectively called

A. noble gases

B. representative or normal elements

C. transition elements

D. inner transition elements

Answer: B

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52. Which of the following is known as the bridge element of 2nd group in Mendeleev's table?

A. Zn

B. Sr

C. Mg

D. Hg

Answer: C

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53. Which pair is different from the others?

A. $Li - Mg$

B. $B - Si$

C. $Be - AI$

D. $Li - Na$

Answer: D

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54. Atomic number of 15, 33,51 represents the following family:

A. carbon family

B. nitrogen family

C. oxygen family

D. none of these

Answer: B

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55. Three elements X,Y,Z are following Dobereiner's Triad rule. If the atomic weight of X and Y are 10 and 26 respectively, then atomic weight of Z will be:

A. 34

B. 40

C. 42

D. 18

Answer: C

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56. Which of the following numbers are called magic numbers?

A. 2,8,20,28,82,126

B. 2,8,8,18,18,32

C. 2,2,8,8,18,32

D. 2,8,18,18,32,32

Answer: B

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57. In the general electronic configuration :

$(n-2)f^{1-14}(n-1)d^{0-1}ns^2$, if the value of n = 7, then the configuration will be of :

A. lanthanides

B. actinides

C. transition elements

D. none of these

Answer: B

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58. In lanthanum $(Z = 57)$, the 5th electron enters in a:

A. 6p orbital

B. 5d orbital

C. 6s orbital

D. 4f orbital

Answer: B

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59. Atomic number is the basis of :

(p) Lother Meyer curve

(q) Newland octave rule

(r) Modern periodic table

(s) Dobereiner triad rule

(t) Long form of periodic table

A. (p),(q),(s)

B. (r),(t)

C. (p),(s)

D. (p),(r),(t)

Answer: B

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60. It each orbital can hold a maximum of three electrons, the number of elements in 9th period of periodic table (long form) are:

A. 48

B. 162

C. 50

D. 75

Answer: D

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61. The electronic configuration of an element is $1s^2 2s^2 2p^6, 3s^2 3p^5$. The atomic number of element present just below the above element in periodic table is:

A. 34

B. 35

C. 36

D. 30

Answer: B

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62. 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

Answer: A

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63. Find the odd element from the given electronic configuration.

A. $1s^2 2s^2 2p^6 3s^1$

B. $1s^2 2s^1$

C. $1s^2 2s^2 2p^6 3s^2 3p^1$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

Answer: C

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64. Which of following is not correctly matched?

A. d-block element : electronic configuration is $ns^{0-1}(n-1)d^{1-10}$

B. p-block element : electronic configuration is $ns^{1-2}np^{1-6}$

C. s-block element : electronic configuration is ns^{1-2}

D. Ce: f-block's first member

Answer: B

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65. 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

Answer: C

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66. The elements in which electrons are progressively filled in 4f-orbitals are calleD:

A. actinoids

B. transition elements

C. lanthanides

D. halogens

Answer: C

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67. Which of the following relation is correct for boron element? Here P = period number of boron

N = number of valence electrons is boron

A. $(P+1) > N$

B. $(P+1) < N$

C. $(P+1) = N$

D. $P = N$

Answer: C

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68. Maximum value of $n+l+m$ for the last unpaired electron in an element present in 17th group and 4th period of periodic table:

A. 4

B. 5

C. 6

D. 7

Answer: C

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69. $IUPAC$ name for the element with $Z = 117$ is ______ and its symbol is _____.

A. Uuo

B. Uus

C. Uuh

D. Uun

Answer: B

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70. Had three electrons been possible to be placed in an orbital, the block of potassium in periodic table would be:

A. s

B. p

C. d

D. f

Answer: B

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71. Which element has chemical properties most similar to those of P?

A. N

B. Al

C. S

D. As

Answer: D

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72. Which list gives nonmetals that are found in their elemental forms in nature?

A. neon, phosphorus, flourine

B. helium, hydrogen, iodine

C. nitrogen, oxygen, sulphur

D. oxygen, chlorine, phosphorus

Answer: C

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73. The most abundant noble gas in the atmosphere is

A. He

B. Ne

C. Ar

D. Rn

Answer: C

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74. In which set are both elements metalloids?

A. Cr and Mo

B. Ge and As

C. Sn and Pb

D. Se and Br

Answer: B

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75. Which existing element would the chemistry of element 119 most resemble?

A. $Rn(Z=86)$

B. $Fr(Z=87)$

C. $Ra(Z=88)$

D. $Ac(Z=89)$

Answer: B

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76. Which element has the greatest electrical conductivity?

A. As

B. Ge

C. P

D. Sn

Answer: D

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77. Which element in a liquid at $25^{\circ} C$ and 1 atm?

A. Fluorine

B. Chlorine

C. Bromine

D. Iodine

Answer: C

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78. The material used in solar cells contains

A. As

B. Ge

C. P

D. Si

Answer: D

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79. Which pair of symbols identifies two elements that are metalloids?

A. Si and Ge

B. Mg and Si

C. P and As

D. Ti and V

Answer: A

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80. All of the following possess complete d shells except:

A. Ag^{+}

B. Cu^{2+}

C. Ga^{3+}

D. Zn^{2+}

Answer: B

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81. Which element is a gas at $25^{\circ}C$ and 1 atm pressure?

A. Chlorine

B. Phosphorus

C. Silicon

D. Sulphur

Answer: A

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82. Which element has the greatest electrical conductivity?

A. Ge

B. Se

C. Sn

D. Te

Answer: C

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83. Select the option in which all the information about element ($Z = 113$) are correct:

A.
Block	group	Period	Valence shell configuration
s	2	7	$7s^2$

B.
Block	group	Period	Valence shell configuration
p	13	7	$7s^2 7p^1$

C.
Block	group	Period	Valence shell configuration
p	13	6	$6s^2 6p^1$

D.
Block	group	Period	Valence shell configuration
d	12	6	$6s^2$

Answer: B

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84. An element z has electronic configuration: $ns^2 np^6 (n-1)d^{10}(n-2)f^{14}$. Which value of n is not possible?

A. 6

B. 3

C. 5

D. Both (b) and (c)

Answer: D

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85. Which of the following statements is wrong?

A. No inert gas is present in 7th period

B. 3rd period contains 18 elements

C. 1st period contains two non metals

D. In p-block, metal, non-metal and metalloids are present

Answer: B

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86. Which substance is stored in contact with water to prevent if from reacting with air?

A. Bromine

B. Lithium

C. Mercury

D. Phosphorus

Answer: D

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87. Stannic chloride is a molecule in which central metal atom belongs to carbon family. What is the period and atomic number of this metallic element?

A. 5,50

B. 4,40

C. 6,60

D. 7,70

Answer: A

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88. Which element has an outer electron configuration os s^2p^4?

A. Ca

B. Cr

C. Ge

D. Se

Answer: D

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89. In the long form of periodic table all the non-metals are placed under

A. s-block

B. p-block

C. d-block

D. f-block

Answer: B

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90. Each period in the periodic table starts with a subshell of the new shell and ends with:

A. same subshell

B. different subshell of the same shell

C. the subshell of next higher shell

D. p-subshell of the same new shell

Answer: D

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91. In the long form of the periodic table the valence shell electronic configuration of $5s^2 5p^4$ corresponds to the element present in:

A. group 16 and period 5

B. group 17 and period 6

C. group 17 and period 5

D. group 16 and period 6

Answer: A

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92. Atomic number of the inert gas of 7^{th} period $= 118$. Which is correct IUPAC name of last element of halogen family in 7th period?

A. Ununoctium

B. Ununnilium

C. Ununennium

D. Ununseptium

Answer: D

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93. The valence shell of the element X contains 1 electron in 5s subshell and below that shell, 4 electrons in 4d subshell. The element belongs to which group (IUPAC) of periodic table?

A. 4th group

B. 5th group

C. 6th group

D. 7th group

Answer: B

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94. According to Moseley, a straight line graph is obtained on plotting:

Where, v is frequency and Z is atomic number.

A. v us Z

B. v^2 us Z

C. $\sqrt{v}$ us Z

D. $\frac{1}{v}$ us Z

Answer: C

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95. Which pair of atomic numbers represent s-block elements?

A. 3,12

B. 6,12

C. 9,17

D. 7,15

Answer: A

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96. Suppose an orbital may accommodate three electrons, then estimate the number of elements in 2nd period:

A. 3

B. 6

C. 8

D. 12

Answer: D

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97. Maximum number of quantum numbers which can be equal for last electron of two elements of same group of periodic table (group does not contain any element having exeptional electronic configuration):

A. 2

B. 3

C. 4

D. 1

Answer: B

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98. Unniltrium belongs to which block and group of the periodic table?

A. d-block, group -10

B. f-block,group 3

C. p-block, group-13

D. d-block,group-11

Answer: B

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99. The element having the lowest atomic number and a ground state electronic configuration of $(n-1)d^6ns^2$ is placed in:

A. fifth period

B. fourth period

C. sixth period

D. third period

Answer: B

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100. Representative elements or main group elements are called:

A. s-block element

B. p-block element

C. both (a) and (b)

D. none of these

Answer: C

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101. The elements $Z = 117$ and 120 have not yet have been discovered, In which family/group would you place these elements and also give the electronic configuration in each case.

A. group 17, $[Rn]5f^{14}, 6d^{10}, 7s^2 7p^5$

B. group 1, $[Rn]7s^1$

C. group 17, $[Rn]7s^2 7p^5$

D. group 1, $[Rn]8s^1$

Answer: A

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102. Select the incorrect statement regarding LotherMeyer curve:

A. alkali metals occupy the peak position of curve

B. alkali earth metals are at the ascending part of curve

C. halogens are at the ascending part of curve

D. atomic volume of an element is not the volume of an atom of that element

Answer: B

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103. The elements after uranium are called:

A. transuranic elements

B. lanthanides

C. transition elements

D. none of the above

Answer: A

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104. Which orbitals are filled in given order in 5th period of periodic table?

A. $5s \rightarrow 4d \rightarrow 5p$

B. $5s \rightarrow 4d \rightarrow 5d$

C. $4s \rightarrow 5d \rightarrow 4p$

D. $5s \rightarrow 3d \rightarrow 4p$

Answer: A

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105. Which of the following is not f-block elements?

A. Th

B. Ce

C. Lu

D. None of these

Answer: D

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106. Consider the following 3 elements. Fe, Cu, ZN

Choose the incorrect option.

A. Only 2 are paramagnetic

B. Number of d-electron: $Fe < Cu < Zn$

C. All are transition elements

D. All are less metallic than s-block elements of same period

Answer: C

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107. Which of the following is not d-block elements?

A. Cu

B. Zn

C. Fe

D. Sn

Answer: D

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108. The electronic configuration:

$1s^2, 2s^2 2p^6, 3s^2 3p^6, 3d^{10}, 4s^2 4p^6 4d^{10}, 5s^2$ is for:

A. f-block element

B. d-block element

C. p-block element

D. s-block element

Answer: B

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B.Atomic and Ionic Radius

1. Select correct statement about radius of an atom:

A. Values of van der Waal's radii are larger than those of covalent radii because the van der Waal's forces are much weaker than the forces operating between atoms in a covalently bonded molecule.

B. The metallic radii are smaller than the van der Waal's radii, since the bonding forces in the metallic crystal lattice are much stronger than the van der Waal's forces.

C. Both are correct

D. None is correct

Answer: C

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2. Which of the following order of radii is correct?

A. $Li < Be < Mg$

B. $H^{+} < Li^{+} < H^{-}$

C. $O < F < Ne$

D. $Na^{+} > F^{-} > O^{2-}$

Answer: B

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3. Which of the following is not isoelectronic series?

A. CI^{-}, P^{3-}, Ar

B. N^{3-}, Ne, Mg^{2+}

C. B^{3+}, He, Li^{+}

D. N^{3-}, S^{2-}, CI^{-}

Answer: D

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4. Which of the following order of atomic / ionic radius is not correct?

A. $I^{-} > I > I^{+}$

B. $Mg^{2+} > Na^{+} > F^{-}$

C. $P^{5+} < P^{3+}$

D. $Li > Be > B$

Answer: B

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5. The radii of N, N^{3-}, O and O^{2-} are in the order of:

A. $O^{2-} > N^{3-} > O > N$

B. $O^{2-} > N^{3-} > N > O$

C. $N^{3-} > O^{2-} > N > O$

D. $O^{2-} > O > N^{3-} > N$

Answer: C

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6. Atomic radii of F & Ne in Angstrom are respectively given by : A) $0.72, 1.60$ B)$1.60, 1.60$ C)$0.72, 0.72$ D)$1.60, 0.72$

A. 0.72, 1.60

B. 1.60,1.60

C. 0.72, 0.72

D. 1.60,0.72

Answer: A

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7. Which one of the following is the smallest in size?

A. N^{3-}

B. O^{2-}

C. F^{-}

D. Na^{+}

Answer: D

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8. Which one of the following is correct increasing order of size ?

A. $Mg < Na^{+} < O^{2-} < AI$

B. $Na^{+} < AI < Mg < O^{2-}$

C. $Na^{+} < O^{2-} < AI < Mg$

D. $Na^{+} < O^{2-} < Mg < AI$

Answer: B

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9. When the following five anions are arranged in order of decreasing ionic radius , the correct sequence is :

A. $Se^{2-}, I^{-}, Br^{-}, O^{2-}, F^{-}$

B. $I^{-}, Se^{2-}, O^{2-}, Br^{-}, F^{-}$

C. $Se^{2-}, I^{-}, Br^{-}, F^{-}, O^{2-}$

D. $I^{-}, Se^{2-}, Br^{-}, O^{2-}, F^{-}$

Answer: D

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10. Which of the following isoelectronic species has the largest radius?

A. K^{+}

B. Ca^{2+}

C. P^{3-}

D. S^{2-}

Answer: C

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11. The correct decreasing order of atomic size among the following species is :

$Ar, K^{+}, Cl^{-}, S^{2-}, Ca^{2+}$

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

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

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

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

Answer: C

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12. Ionic radii of :

A. $Ti^{4+} < Mn^{7+}$

B. $.^{35}CI^{-} < .^{37}CI^{-}$

C. $K^{+} > CI^{-}$

D. $P^{3+} > P^{5+}$

Answer: D

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13. The correct order of radii is:

A. $N < Be < B$

B. $F^{-} < O^{2-} < N^{3-}$

C. $Na < Li < K$

D. $Fe^{3+} < Fe^{2+} < Fe^{4+}$

Answer: B

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14. Arrange $Ce^{3+}, La^{3+}, Pm^{3+}$ and Yb^{3+} in increasing order of their size -

A. $Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}$

B. $Ce^{+3} < Yb^{+3} < Pm^{+3} < La^{+3}$

C. $Yb^{+3} < Pm^{+3} < La^{+3} < Ce^{+3}$

D. $Pm^{+3} < La^{+3} < Ce^{+3} < Yb^{+3}$

Answer: A

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15. Which one of the following ions has the highest value of ionic radius?

A. O^{2-}

B. B^{3+}

C. Li^{+}

D. F^{-}

Answer: A

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16. The set representing the correct order of ionic radius is

A. $Na^{+} > Li^{+} > Mg^{2+} > Be^{2+}$

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

C. $Mg^{2+} > Be^{2+} > Li^{+} > Na^{+}$

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

Answer: A

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17. Which of the following statement is incorrect for the isolectronic species?

A. They have same number of electrons

B. They may have different number of protons

C. Their ionic radii decrease with increase in nuclear charge

D. None of the above

Answer: D

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18. Ionic radii are

A. inversely proportional to effective nuclear charge

B. inversely proportional to square of effective nuclear charge

C. directly proportional to effective nuclear charge

D. directly proportional to squate of effective nuclear charge

Answer: A

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19. The correct order of radii is:

A. $N < Be < B$

B. $Mg^{2+} < Li^{+} < N^{3-}$

C. $Na < Li < K$

D. $Fe^{+3} < Fe^{2+} < Fe^{4+}$

Answer: B

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20. $K^{+}, CI^{-}, Ca^{2+}, S^{2-}$ ions are isoelectronic. The decreasing order of other size is:

A. $S^{2-} > CI^{-} > K^{+} > Ca^{2+}$

B. $Ca^{2+} > K^{+} > CI^{-} > S^{2-}$

C. $K^{+} > CI^{-} > Ca^{2+} > S^{2-}$

D. $CI^{-} > S^{2-} > Ca^{2+} > K^{+}$

Answer: A

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21. Li resembles Mg due to diagonal relationship which is atributed to:

A. nearly same atomic and ionic size

B. same value of electron affinity

C. penetration of sub-shells

D. identical effective nuclear charge

Answer: A

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22. Select the correct statement.

A. Across a transition series (from Cr to Cu), there is only a small decrease in atomic radius from one element to another due to very small increase in effective nuclear charge

B. The rate of decrease in the size across the lanthanide series is less than that across the first transition series

C. Both are correct statements

D. None of the statement is correct

Answer: C

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23. Among the following species the highest radius is of:

A. Al^{3+}

B. F^{-}

C. Na^{+}

D. N^{3-}

Answer: D

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24. In which of the following compound size of cation to anion ratio is minimum?

A. CsF

B. LiI

C. LiF

D. CsI

Answer: B

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25. Choose the incorrect ionic radius order.

A. $Ai^{3+} < Li^{+}$

B. $O^{2-} > C^{4-}$

C. $CI^{-} < S^{2-}$

D. $Na^{+} > Li^{+} > H^{+}$

Answer: B

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26. Choose the correct order of atomic/ionic radii.

A. $Sc < Y < La$

B. $Fe < Co < Ni$

C. $Be^{2+} < Mg^{2+} < AI^{3+}$

D. $Ti^{+} < Pb^{2+} < Bi^{3+}$

Answer: A

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27. Correct order of radius among the following

F^{-}, Al^{3+}, Na^{+} are

A. $AI^{3+} = Na^{+} = F^{-}$

B. $AI^{3+} > Na^{+} > F^{-}$

C. $AI^{3+} = Na^{+} > F^{-}$

D. $AI^{3+} < Na^{+} < F^{-}$

Answer: D

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28. Which of the following is correct regarding atomic radius?

A. $Fe \approx Co \approx Ni$

B. $N \approx O \approx F$

C. $O \approx S \approx Se$

D. $B \approx AI \approx Ga$

Answer: A

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29. The correct order of radii is:

A. $Fe^{+} > Fe^{3+} > Fe^{4+}$

B. $B > C > Li$

C. $Mg^{2+} > AI^{3+} > Na^{+}$

D. $F^{-} > O^{2-} > N^{3-}$

Answer: A

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30. Select the correct order of ionic radii.

A. $Te^{2-} > Se^{2-} > S^{2-} > O^{2-}$

B. $te^{2-} < Se^{2-} < S^{2-} < O^{2-}$

C. $Te^{2-} = Se^{2-} > S^{2-} = O^{2-}$

D. None of the above

Answer: A

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31. 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. $O^{2-} < F^{-} < Mg^{2+} < Na^{+}$

Answer: B

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32. Which one of the following is correct order of the size of iodine species ?

A. $I > I^{-} > I^{+}$

B. $I^{+} > I^{-} > I$

C. $I > I^{+} > I^{-}$

D. $I^{-} > I > I^{+}$

Answer: D

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33. Which statement about the radii of atoms and their ions is correct?

A. Cations are smaller than their atoms, anions are larger.

B. Cations and anions are both smaller than their atoms.

C. Cations and anions are both larger than their atoms

D. Cations are larger than their atoms, anions are smaller.

Answer: A

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34. The order of magnitude of ionic radii of ions Na^+, Mh^{2+}, Al^{3+} and Si^{4+} is

A. $Na^+ < Mg^{2+} < Ai^{3+} < Si^{4+}$

B. $Mg^{2+} > Na^+ > AI^{3+} > Si^{4+}$

C. $Ai^{3+} > Na^{+} > Si^{4+} > Mg^{2+}$

D. $Na^{+} > Mg^{2+} > AI^{3+} > Si^{4+}$

Answer: D

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35. Which ions has greatest radius in the following?

A. H^{-}

B. F^{-}

C. Br^{-}

D. I^{-}

Answer: D

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36. In the isoelectronic species the ionic radii of N^{3-}, O^{2-}, F^{-} are respectively given by

A. $1.36, 1.40, 1.71$

B. $1.36, 1.71, 1.40$

C. $1.71, 1.40, 1.36$

D. $1.70, 1.36, 1.40$

Answer: C

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37. The Lanthanide contraction is responsible for the fact that

A. Zr and Y have almost the same radius

B. Zr and Nb have similar oxidation state

C. Zr and Hf have almost the same radius

D. Zr and Zn have the same oxidation state

Answer: C

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38. Mg, Mg^{2+}, AI and AI^{3+} are arranged in decreasing order of size $1 > 2 > 3 > 4$. Species which are present at 1 and 4 position respectively are:

A. AI, Mg^{2+}

B. Mg, AI^{3+}

C. Mg^{2+}, AI

D. Mg^{2+}, AI^{3+}

Answer: B

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39. Which of the following order of radii is incorrect?

A. $Sc < Y < La$

B. $Ti < Zr \approx Hf$

C. $AI \approx Zn$

D. $He < Ne < Ar$

Answer: C

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40. Size of which elements are respresented as non-bonded radii?

A. Halogen

B. Chalcogens

C. Noble gas

D. Pnictogens

Answer: C

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41. Which gas-phase atom has the largest radius?

A. Na

B. K

C. Mg

D. Ca

Answer: B

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42. For which pair of species are the radii most similar?

A. Li and Na

B. Na and Mg

C. Mn and Fe

D. Fe^{2+} and Fe^{3+}

Answer: C

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43. The ions below are listed in order of increasing radii except:

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

B. $K^{+} < CI^{-} < Se^{2-}$

C. $CI^{-} < Br^{-} < I^{-}$

D. Fe^{2+} and Fe^{3+}

Answer: D

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44. Which atom has the largest atomic radius?

A. S

B. CI

C. Se

D. Br

Answer: C

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45. In which list are atoms of the elements Be, B, Mg and AI arranged from smallest to largest atomic radius?

A. $Be < B \leq Mg \leq AI$

B. $Mg < Be < AI < B$

C. $B < Be < AI < Mg$

D. $AI < Mg < B < Be$

Answer: C

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46. $K^{+}, CI^{-}, Ca^{2+}, S^{2-}$ ions are isoelectronic. The decreasing order of other size is:

A. $S^{2-}, Br^{-}, K^{+}, Ca^{2+}$

B. $Br^{-}, S^{2-}, K^{+}, Ca^{2+}$

C. $K^{+}, Ca^{2+}, S^{2-}, Br^{-}$

D. $Ca^{2+}, K^{+}, S^{2-}, Br^{-}$

Answer: B

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47. The radius of which is closest to that of the Li^{+} ions?

A. Na^{+}

B. Be^{2+}

C. Mg^{2+}

D. AI^{3+}

Answer: C

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48. For which pair of species is the difference in radii the greatest?

A. Li and F

B. Li^{+} and F^{-}

C. Li^{+} and O^{2-}

D. O^{2-} and F^{-}

Answer: C

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49. In which choice are the species listed in order of increasing radius?

A. Na^{+}, Mg^{2+}, AI^{3+}

B. CI^{-}, S^{2-}, P^{3-}

C. Ar, K^{+}, CI^{-}

D. CI^{-}, Ar, K^{+}

Answer: B

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50. In which list are the ions arranged in order of increasing size?

A. $F^{-} < S^{2-} < AI^{3+} < Mg^{2+}$

B. $F^{-} < S^{2-} < Mg^{2+} < AI^{3+}$

C. $Mg^{2+} < F^{-} < AI^{3+} < S^{2-}$

D. $AI^{3+} < Mg^{2+} < F^{-} < S^{2-}$

Answer: D

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51. In which series are the species listed in order of increasing size ?

A. N, O, F

B. Na, Mg, K

C. Cr, Cr^{2+}, Cr^{3+}

D. CI, CI^{-}, S^{2-}

Answer: D

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52. When the atoms: Ba, Cs, Mg, Na are arranged in order of increasing size, what is the correct order?

A. $Cs < Na < Mg < Ba$

B. $Mg < Na < Ba < Cs$

C. $Mg < Ba < Na < Cs$

D. $Ba < Mg < Na < Cs$

Answer: B

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53. Which element has the largest atomic radius?

A. Br

B. K

C. Mg

D. Na

Answer: B

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54. When the atoms, $P(Z=15), S(Z=16)$ and $As(Z=33)$, are arranged in order of increasing radius, what is the correct order?

A. P, S, As

B. As, S, P

C. S, P, As

D. P, As, S

Answer: C

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55. Which property decreases from left to right across the periodic table and increases from top to bottom?

A. Atomic radius

B. Electronegativity

C. Ionization energy

D. Melting point

Answer: A

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56. Consider the ions Li^{+}, Na^{+}, Be^{2+} and Mg^{2+}. Which two are closest to one another in size?

A. Li^{+} and Na^{+}

B. Be^{2+} and Mg^{2+}

C. Be^{2+} and Li^{+}

D. Li^{+} and Mg^{2+}

Answer: D

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57. Which pair of elements have chemical propeties that are the most similar ?

A. Be and B

B. Al and Ga

C. Co and Cu

D. F and I

Answer: B

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58. When the atoms Li, Be, B and Na are arranged in order of increasing atomic radius, what is the correct order?

A. B, Be, Li, Na

B. Li, Be, B, Na

C. Be, Li, B, Na

D. Be, B, Li, Na

Answer: A

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59. Which property of an element is most dependent on this shielding effect?

A. Atomic number

B. Atomic mass

C. Atomic radius

D. Number of stable isotopes

Answer: C

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60. Which element has the largest atomic radius?

A. Li

B. K

C. As

D. Br

Answer: B

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61. The atomic radius of elements of which of the following series would be nearly the same

A. Na, K, Rb, Cs

B. Li, Be, B, C

C. Fe, Co, Ni

D. F, CI, Br, I

Answer: C

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62. The radii of F, F^{-}, O and O^{-2} are in the order of

A. $O^{2-} > F^{-} > F > O$

B. $F^{-} > O^{2-} > F > O$

C. $O^{-2} > O > F^{-} > F$

D. $O^{2-} > F^{-} > O > F$

Answer: D

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63. Which of the following case the size ratio is minimum?

A. Li^{-} / Li

B. H^{-} / H

C. Na^{-} / Na

D. Can not be predict

Answer: C

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64. For the element X, student Surbhi measured its radius as $102nm$, Mr. Gupta as 113 nm and Mr. Agarwal as $100nm$ using same apparatus. Their teacher explained that measurements were correct by saying that recorded values by three students were

A. crystal, van der Waal's and covalent radii

B. covalent, crystal and van der Waal's radii

C. van der Waal's ionic and covalent

D. None is correct

Answer: A

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65. The species having smallest ionic radius is:

A. AI^{3+}

B. Ba^{2+}

C. K^{+}

D. Mg^{2+}

Answer: A

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66. In the crystals of which of the following ionic compounds would you expect maximum distance between the centres of the cations and anion?

A. CsF

B. CsI

C. LiI

D. LiF

Answer: B

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67. CONSEQUENE OF LANTHANIDE CONTRACTION

A. Contraction of atom of lanthanum element due to poor shielding d-subshell electron

B. Contraction of atom of lanthanum element due to high shielding of d-subshell electron

C. Contraction of atom of elements after lanthanum due to poor shielding of f-subshell electron

D. Contraction of atom of elements before lanthanum due to poor shielding of f-subshell electron.

Answer: C

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68. Which of the following have total 18 electrons and it is larger than CI^{-}?

A. K^{+}

B. Ca^{2+}

C. Br^{-}

D. None of these

Answer: D

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69. The size of isoelectronic species $F^{\ominus}$, Ne, and Na^{+} affected by

A. nuclear charge (Z)

B. valence principal quantum number (n)

C. electron-electron interaction in the outer orbitals

D. none of the factors because their size is the same

Answer: A

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70. Which of the following order of ionic-radius is correct?

A. $F^{-} > O^{2-} > N^{3-}$

B. $Na^{+} > Mg^{+2} > AI^{+3}$

C. $H^{-} > H < H^{+}$

D. $Fe < Fe^{+2} < Fe^{+3}$

Answer: B

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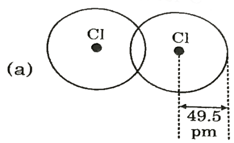
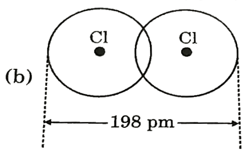
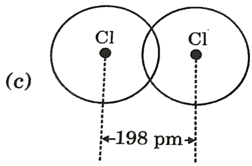
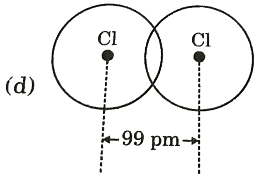
71. Covalent radius of Ci si 99 pm. Select best representation for CI_2 molecule:

A. 

B. 

C. 

D. 

Answer: C

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C.Ionisation Energy

1. The values of $IE(I), IE(II), IE(III)$ and $IE(IV)$ of an atom are respectively $7.5eV, 25.6eV, 48.6eV$ and $170.6eV$. The electronic configuration of the atom will be :

A. $1s^2, 2s^2 2p^6, 3s^1$

B. $1s^2, 2s^2 2p^6, 3s^2 3p^1$

C. $1s^2, 2s^2 2p^6, 3s^2 3p^3$

D. $1s^2, 2s^2 2p^6, 3s^2$

Answer: B

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2. IE_1 and IE_2 of Mg are 178 and $348 kcal mol^{-1}$. The energy required for the reaction $Mg \rightarrow Mg^{2+} + 2e^-$ is

A. $+170$ kcal

B. $+526$ kcal

C. -170 kcal

D. -526 kcal

Answer: B

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3. Which represents alkali metals (ie., 1 group metals) based on $(IE)_1$ and $(IE)_2$ values?

A. $\begin{array}{ccc} & (IE)_1 & (IE)_2 \\ Y & 100 & 110 \end{array}$

B. $\begin{array}{ccc} & (IE)_1 & (IE)_2 \\ Y & 95 & 120 \end{array}$

C. $\begin{array}{ccc} & (IE)_1 & (IE)_2 \\ Z & 95 & 500 \end{array}$

D. $\begin{matrix} & (IE)_1 & (IE)_2 \\ M & 200 & 250 \end{matrix}$

Answer: C

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4. Which is most similar for the elements in a group in the periodic table?

A. Physical state

B. Melting point

C. First ionization energy

D. Ground state electronic configuration

Answer: D

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5. The first ionisation potential of Al is smaller than that of Mg because:

A. the atomic size of $Al > Mg$

B. the atomic size of $Al < Mg$

C. Al has one unpaired electron in $3p-$ orbital

D. Mg has incompletely filled $3s-$ orbital

Answer: C

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6. Which of the following gaseous atoms has the highest value of ionisation enthalpy?

A. P

B. Si

C. Mg

D. Al

Answer: A

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7. The first ionisation potential of Na, Mg, Al and Si are in the order

A. $Na < Mg > AI < Si$

B. $Na > Mg > AI > Si$

C. $Na < Mg < AI < Si$

D. $Na > Mg > AI < Si$

Answer: A

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8. The first ionisation potential in electron volts of nitrogen and oxygen atoms are respectively given by

A. $14.6, 13.6$

B. $13.6, 14.6$

C. $13.6, 13.6$

D. $14.6, 14.6$

Answer: A

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9. Which of the following relation is correct with respect first (I) and second (II) ionisation of sodius and magnesium?

A. $I_{Mg} = II_{Na}$

B. $I_{Na} > I_{Mg}$

C. $II_{Mg} > II_{Na}$

D. $II_{Na} > II_{Mg}$

Answer: D

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10. The ionization energy will be higher when the electron is removed from ....if other factors being equal.

A. s-orbital

B. p-orbital

C. d-orbital

D. f-orbital

Answer: A

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11. Which of the following isoelectronic ion has the lowest 1st ionization energy?

A. Na^{+}

B. F^{-}

C. Mg^{2+}

D. O^{2-} and F^{-}

Answer: D

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12. A large difference between the third and fourth ionization energies indicates the presence of:

A. 4 valence electrons in an atom

B. 5 valence electrons in an atom

C. 3 valence electrons in an atom

D. 8 valence electrons in an atom

Answer: C

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13. The second ionisation enthalpies of elements are always higher than their first ionisation enthalpies because:

A. the cation is smaller than its parent atom

B. it is easier to remove electron from cation

C. ionization is an ednothermic process

D. cation formed always have stable half filled or completely filled valence shell electron configuration

Answer: A

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14. Which of the following is the correct order of ionisation energy?

A. $O^{2-} < F^{-} < Na^{+} < Mg^{2+}$

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

C. $O^{2-} < Na^{+} < F^{-} < Mg^{2+}$

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

Answer: A

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15. The peaks in ionisation potential curves are occupied by

A. alkali metals

B. alkaline earth metals

C. noble gas elements

D. halogens

Answer: C

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16. Which metal is the most reactive?

A. Silver

B. Lead

C. Iron

D. Caesium

Answer: D

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17. The five successive energies of an element are $800, 2427, 3658, 25024$ and $32824 kJmol^{-1}$ respectively. The number of valence electron is

A. 3

B. 5

C. 1

D. 2

Answer: A

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18. Which has maximum first ionization potential?

A. C

B. N

C. B

D. O

Answer: B

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19. Values of IE_1, IE_2 and IE_3 of an element are $9.31, 18.21$ and $553.83 eV$. What informations do these data convey?

A. The element has two electrons in the valence shell

B. The element has two p-electrons in the valence shell

C. (a) and (b) both

D. None of the two

Answer: A

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20. Which of the following is the correct order of ionisation energy?

(1) $Be^{+} > Be$ (2) $Be > Be^{+}$

(3) $C > Be$ (4) $B > Be$

A. 2,3

B. 3,4

C. 1,3

D. None of these

Answer: C

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21. The incorrect statement Among the following is A)The first ionisation potential of Al is less than the first ionisation potential of Mg. B)The first ionisation potential of Na is less than the first ionisation potential of Mg. C)The second ionisation potential of Mg greater than the second ionisation potential of Na D)The third ionisation potential of Mg greater than the third ionisation potential of Al

A. the IE_1 of Al is less than IE_1 of Mg

B. the IE_2 of Mg is less than IE_2 of Mg

C. the IE_1 of Na is less than IE_1 of Mg

D. the IE_3 of Mg is less than IE_3 of Al

Answer: B

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22. The set representing the correct order of the first ionisation potential is

A. $K > Na > Li$

B. $Be > Mg > Ca$

C. $B > C > N$

D. $Ge > Si > C$

Answer: B

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23. The increasing order of the first ionization enthalpies of the elements B,P,S and F (lowest first) is:

A. $F < S < P < B$

B. $P < S < B < F$

C. $B < P < S < F$

D. $B < S < P < F$

Answer: D

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24. Which of the following is the result of f-orbital contraction effect?

A. Similarity in the size of Al and Ga

B. Similarity in the properties of Li and Mg

C. High ionization energy of Tl as compared to In

D. Decrease in atomic size of '3d' series elements

Answer: C

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25. Which of the following magnetic moment values will correspond to the highest ionisation energy for the element which is placed in 4th period and 7th group of long form of periodic table?

A. $2\sqrt{2}$

B. $\sqrt{15}$

C. $\sqrt{35}$

D. $\sqrt{24}$

Answer: A

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26. Which of the following s-block metals has the lowest first ionisation energy?

A. Mg

B. Be

C. Na

D. Li

Answer: C

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27. Hydrogen has high ionization energy than alkali metals, due to its:

A. large size

B. small size

C. higher nuclear charge

D. more penetration power of s-subshell electrons

Answer: C

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28. Which of the following element has maximum, first ionisation potential?

A. V

B. Ti

C. Cr

D. Mn

Answer: D

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29. An element having high first ionization energy in a given period is:

A. inert gas

B. transition element

C. representative element

D. inner transition element

Answer: A

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30. Ionisation enthalpy of Na would be same as

A. electron affinity of Na^{+}

B. electronegativity of Na^{+}

C. electron affinity of He

D. ionisation potential of Mg

Answer: A

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31. Which element having the following electronic configuration has minimum ionisation potential?

A. $1s^2, 2s^2, 2p^5$

B. $1s^2, 2s^2 2p^6, 3s^2 3p^2$

C. $1s^2, 2s^2 2p^6, 3s^1$

D. $1s^2, 2s^2 2p^6$

Answer: C

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32. Select correct statement.

A. Atomic size of the same group elements of 3d and 4d-series are almost similar

B. First ionisation energies of 5d-series elements are smaller than that of 3d and 4d-series elements

C. Both are correct

D. Both are incorrect

Answer: D

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33. Which option is correct?

A. 3rd $I.E.$ of $C > N$

B. 2nd I.E. of $N < O$

C. 1st I.E. of $F > O$

D. All of these

Answer: D

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34. Which one of the following electronic configuration of an atom has the highest ionisation energy?

A. $1s^2, 2s^2 2p^3$

B. $1s^2, 2s^2 2p^6, 3s^1$

C. $1s^2, 2s^2 2p^6$

D. $1s^2, 2s^2 2p^5$

Answer: C

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35. Identify the incorrect order of first ionization energy.

A. $Li > Na > K$

B. $F > CI > I$

C. $Be < B < C$

D. $O < N < F$

Answer: C

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36. Amongst the following elements whose electronic configuration are given below, the one having the highest enthalpy is

A. $[Ne]3s^2 3p^1$

B. $[Ne]3s^2 3p^3$

C. $[Ne]3s^2 3p^2$

D. $[Ar]3d^{10} 4s^2 4p^3$

Answer: B

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37. Which of the following ion of an element E (E belongs to 2nd period) having $1s^2 2s^0, 2p^0$ electronic configuration in ground state? For the element E following data is given:

IE_1 of $E = 800 kJ/\text{mole} IE_2$ of $E = 1428 kJ/\text{mole}$

IE_3 of $E = 2394 kJ/\text{mole} IE_4$ of $E = 25020 kJ/\text{mole}$

A. E^{+}

B. E^{++}

C. E^{+++}

D. E^{++++}

Answer: C

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38. Higher values of ionisation energies of the 5d-transition elements are consistent with the:

A. relative smaller effective nuclear charge

B. relative smaller size of their atoms

C. relative smaller penetration

D. all are correct

Answer: B

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39. Metallic nature increases moving down the group because:

A. nuclear charge decrease

B. shielding increases

C. (a) and (b) both

D. none of these

Answer: B

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40. Select the correct statement.

A. More active metals are on the left side of the periodic table

B. Less active metals are on the left side of the periodic table

C. Reducing power of alkali metals (g) decreases moving down the group

D. Metallic character decreases down the group

Answer: A

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41. Which of the following sequence regarding the first ionisation potential of coinage metal is correct?

A. $Cu > Ag > Au$

B. $Cu < Ag < Au$

C. $Cu > Ag < Au$

D. $Ag > Cu > Au$

Answer: C

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42. The ionisation energy for 'Sc', 'Y' and 'La' are x,y and z kcal/mol respectively. Choose the correct relationship between them.

A. $z > x \approx y$

B. $x > y > z$

C. $z > z \approx y$

D. $z < y > z$

Answer: B

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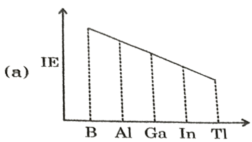
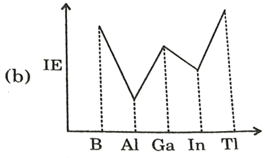
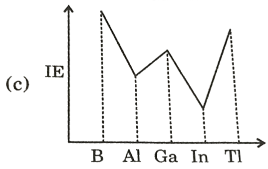
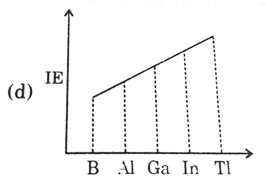
43. Select proper graph of 13th group ionization energy us. Its elements.

A. 

B. 

C. 

D. 

Answer: C

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44. Second ionisation potential of Li, Be, B is in the order:

A. $Li > Be > B$

B. $Li > B > Be$

C. $Be > Li > B$

D. $B > Be > C$

Answer: B

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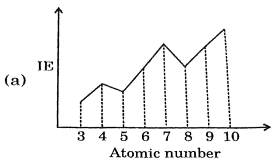
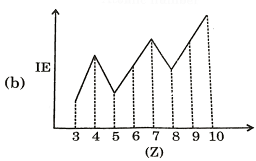
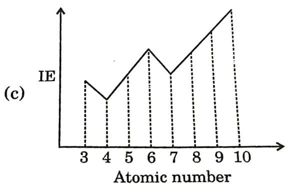
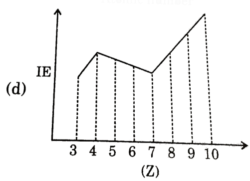
45. Select correct graph, which is plotted between ionisation energy of 2nd period elements and their atomic number.

A. 

B. 

C. 

D. 

Answer: A

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46. For metal M, first ionisation energy is equal to 38 kcal/mole. Which of the following can be a possible value of ionisation enthalpy of M^{+} ion in kcal.mole at 400K. [Given: $R = 2cal/\text{mole kelvin}]$

A. $38kcal/\text{mole}$

B. $40kcal/\text{mole}$

C. $39kcal/\text{mole}$

D. $45kcal/\text{mole}$

Answer: D

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47. The ionisation enthalpy of lithium is much lower than that of helium despite the fact that the nuclear charge of lithium is $+3$ and that of helium is $+2$. It is due to:

A. 2s electron in lithium is more strongly bound to the nucleus than the 1s electron in He

B. 2s electron in lithium is equally bound to the nucleus than the 1s electron in He

C. 2s electron in lithium is less strongly bound to the nucleus than the 1s electron in He

D. Atomic size of He is more than Li

Answer: C

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48. The first ionisation enthalpy $\left(\Delta_i H^{o-}\right)$ values of the third period elements, Na, Mg and Si are respectively $496, 737$ and $786 kJmol^{-1}$. Predict whether the first $\Delta_i H^{o-}$ value for Al will be more close to 575 or $760 kJmol^{-1}$? Justify your answer.

A. 350

B. 860

C. 575

D. 1125

Answer: C

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49. Correct order of IE_1 are:

(P) $Li < B < Be < C$ (Q) $O < N < F$

(R) $Be < N < Ne$

A. P,Q

B. Q only

C. P,R

D. P,Q,R

Answer: D

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50. If $\begin{array}{ll} X(g)^{-} \rightarrow X(g)^{2} + 3e^{-} & \Delta H_1 = 900kJ \\ X(g) \rightarrow X(g)^{2+} & \Delta H_2 = 650kJ \end{array}$

Then find ΔH_{eg} of X.

A. $-250kJ$

B. $-1550kJ$

C. $250kJ$

D. $+1550kJ$

Answer: A

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51. The correct order of the second ionisation potential of carbon, nitrogen, oxygen and fluorine is

A. $C < N < O < F$

B. $C < O < N < F$

C. $C < N < F < O$

D. $C < O < F < N$

Answer: C

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52. Sodium forms Na^{+} ion but it does not form Na^{+2} because -

A. Very low value of $(I.E.)_1$ and $(I.E.)_2$

B. Very high value of $(I.E.)_1$ and $(I.E)_2$

C. High value of $(I.\ E.\ )_1$ and low value of $(I.\ E)_2$

D. Low value of $(I.\ E.\ )_1$ and high value of $(I.\ E.\ )_2$

Answer: D

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53. One method for calculating Z_{eff} is to use the equation:

$$Z_{eff} = \sqrt{\frac{(E)(n^2)}{1312kJ/\text{mole}}}$$

where E is the energy necessary to remove an electron from an atom and n is the principal quantum number of the electron. Use this equation to calculare Z_{eff} value for the highest energetic electron in potassium. $E = 418.8kJ/\text{mole}$

A. 2.86

B. 2.26

C. 3.26

D. 2.00

Answer: B

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54. Atomic nitrogen has a higher ionization energy than atomic oxygen. This is best explained by:

A. by lower electron-electron repulsion in nitrogen

B. the greater effective nuclear charge of nitrogen

C. the fact that the electron ionized in N is from the 2s subshell, while that ionized from O is from the 2p subshell

D. the fact that N has an odd number of electron while O has an even number.

Answer: A

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55. Which elemenet has the smallest first-ionization energy?

A. Mg

B. AI

C. Si

D. P

Answer: B

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56. Which set is expected to show the smallest difference in IE_1 ?

A. He, Ne, Ar

B. B, N, O

C. Mg, Mg^{+}, Mg^{2+}

D. Fe, Co, Ni

Answer: D

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57. When the elements carbon, nitrogen and oxygen are arranged in order of increasing ionization energies, what is the correct order?

A. C, N, O

B. O, N, C

C. N, C, O

D. C, O, N

Answer: D

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58. Which has the highest ionization energy for the removal of the second electron?

A. F

B. Ne

C. Na

D. Mg

Answer: C

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59. In which list are the elements arranged in order of increasing first ionization energy?

A. Li, Na, K

B. S, O, F

C. Na, Mg, AI

D. F, Ne, Na

Answer: B

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60. Which atom has the smallest first ionization energy?

A. Na

B. K

C. Mg

D. Ca

Answer: B

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61. Which element has the largest first ionization energy?

A. Li

B. B

C. N

D. Na

Answer: C

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62. Which list gives the symbols of the element in the order of increasing first ionization energy?

A. F, Ne, Na

B. AI, Mg, Na

C. Sr, Ca, Mg

D. CI, Br, I

Answer: C

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63. Which equation represents the first ionization of calcium?

A. $Ca(s) \rightarrow Ca^{+}(g) + e^{-}$

B. $Ca(g) \rightarrow Ca^{+}(g) + e^{-}$

C. $Ca^{+}(g) + Ca^{2+}(g) + e^{-}$

D. $Ca^{2+}(g) + e^{-} \rightarrow Ca^{+}(g)$

Answer: B

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64. Which process release the most energy?

A. $Mg^{2+}(g) + e^{-} \rightarrow Mg^{+}(g)$

B. $Mg^{+}(g) + e^{-} \rightarrow Mg(s)$

C. $Na^{2+}(g) + e^{-} \rightarrow Na^{+}(g)$

D. $Na^{+}(g) + e^{-} \rightarrow Na(g)$

Answer: C

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65. Which element exhibits the successive ionization energies given in the table?

Ionization Energy$kJ \times mol^{-}$	
$1st$	738
$2nd$	1451
$3rd$	7733
$4th$	10540
$5th$	13628

A. Na

B. Mg

C. AI

D. Si

Answer: B

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66. Which element has the highest first ionization energy?

A. Al

B. Si

C. P

D. S

Answer: C

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67. The removal of an electron from which gaseous atom requires the greatest amount of energy?

A. Na

B. CI

C. K

D. Br

Answer: B

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68. Properties of the alkaline earth metals that increase from Be to Ba include which of the following?

(P) Atomic radius (Q) Ionization energy

(R) Nuclear charge

A. P and Q only

B. P and R only

C. Q and R only

D. P,Q and R

Answer: B

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69. Of the atoms listed, which has the largest third ionization energy?

A. Ca

B. Mg

C. AI

D. Si

Answer: B

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70. The successive ionization energies (in kJ/mol) for an element are shown below.

E_1	E_2	E_3	E_4	E_5
577	1820	2740	11600	14800

What is the electron configuration of this element?

A. $1s^2 2s^2 2p^6 3s^1$

B. $1s^2 2s^2 2p^6 3s^2 3p^1$

C. $1s^2 2s^2 2p^6 3s^2 3p^3$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$

Answer: B

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71. Of the elements listed, which has the highest first ionization energy?

A. Li

B. Be

C. Na

D. Mg

Answer: B

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72. Ionization energies vary from left to right across the periodic table. Factors that contribute to this variation include which of the following?

(P) Changes in the nuclear charge

(Q) Differences in shielding by valence electrons

(R) Differences in shielding by core electrons

A. P only

B. R only

C. P and Q only

D. P,Q and R

Answer: C

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73. Which group best illustrates the transition from non-metallic to metallic behavior with increasing atomic numbers?

A. Be, Mg, Ca, Sr

B. N, P, As, Sb

C. F, CI, Br, I

D. Fe, Ru, Os, Hs

Answer: B

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74. Process $Na^{2+}_{(g)} \xrightarrow{I} Na^{+}_{(g)} \xrightarrow{II} Na_{(g)}$

A. In (I) energy is released, (II) energy is absorbed

B. In both (I) and (II) energy is absorbed

C. In both (I) and (II) energy is released

D. In (I) energy is absorbed, (II) energy is released

Answer: C

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75. How does th reducing ability of the elements vary across the period from N to At? It:

A. decreases steadily

B. increases steadily

C. decreases then increases

D. increases then decreases

Answer: A

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76. Of the elements given, which has the lowest ionization energy?

A. N

B. P

C. S

D. Cl

Answer: C

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

A. Their ionisation potential would increase with the increasing atomic number

B. Y would have an ionisation potential in between those of X and Z

C. Z would have the highest ionisation potential

D. Y would have the highest ionisation potential

Answer: B

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78. Which element has the lowest first ionization energy?

A. B

B. C

C. Al

D. Si

Answer: C

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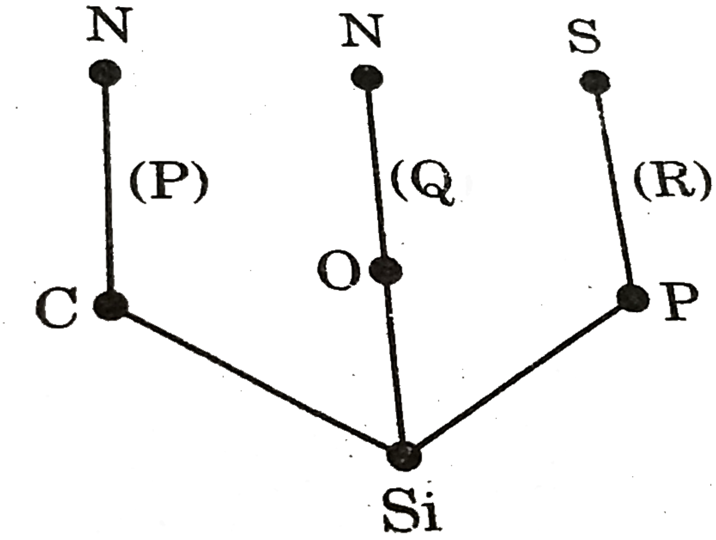
79. If we move from centre towards end points through three different paths (P),(Q),(R) in following figure, then which path is correct increasing order of IE_1?



[N, S, C, O, P, Si represent various elements of periodic table]

A. P only

B. Q and R

C. R only

D. P and R

Answer: A

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80. First, second and third I.P. values are $10eV$, $15eV$ and $150eV$. Element can be:

A. Be

B. B

C. F

D. Na

Answer: A

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81. The third ionisation energy will be maximum for:

A. nitrogen

B. boron

C. phosphorus

D. aluminium

Answer: A

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82. Find the highest ratio of IP values of given pair of elements:

A. $He : Ne$

B. $Ne : Ar$

C. $He : Xe$

D. $Kr : Xe$

Answer: C

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83. Given the correct order of initials T (true) of F (false) for following statement.

(I) Top positions of Lother-Mayer's atomic volume curve are occupied by

Alkali metals

(II) Number of elements presents in the fifth period of the periodic table are 32.

(III) $2^{nd} I.P.$ of Mg is less than the 2^{nd} I.P. of Na.

(IV) A p-orbital can take maximum of six electrons.

A. TFTF

B. TFFT

C. FFTF

D. TTFF

Answer: A

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84. Which of the following transitions involves maximum amount of energy?

A. $M^-(g) \to M(g) + e$

B. $M(g) \rightarrow M^{+}(g) + e$

C. $M^{+}(g) \rightarrow M^{+2}(g) + e$

D. $M^{+2}(g) \rightarrow M^{+3}(g) + e$

Answer: D

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85. The first five inization energies of an element are $9.1, 16.2, 24.5, 35$ and $205.7eV$ respectively then, number of valence electrons in the atom is:

A. 2

B. 3

C. 4

D. 5

Answer: C

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86. The incorrect option out of the following is:

A. IP_2 of $Li > IP_2$ of Be

B. EA_1 of $F > EA_1$ of Br

C. IP_1 of $Pb < IP_1$ of Sn

D. $N_2O_5 > CO_2$ (acidic nature)

Answer: C

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87. The third ionization energy is least for:

A. nitrogen

B. phosphorus

C. aluminium

D. boron

Answer: C

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88. Ionisation energy is highest for:

A. F

B. CI^{-}

C. Be^{-}

D. S^{-}

Answer: A

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89. Ionisation energies of CI^{-}, CI and CI^{+} are respectively (in kJ/mol):

A. $1251, 349, 2300$

B. $2300, 349, 1251$

C. $349, 1251, 2300$

D. $349, 2300, 1251$

Answer: C

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90. Which of the following order is correct for indicated property?

A. $I_1 > Br_2 > CI_2 > F_2$ (Reactivity)

B. $Li(aq) > Na(aq) > K^+(aq)$ (electrical conductivity)

C. $Na > Mg > Cu$ (Electropositive character)

D. $N^{-3} > O^{-2} > Mg^{+2} > Na^+$ (Ionic size)

Answer: C

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91. Mg cannot exhibit $+3$ oxidation state, because its:

A. $IE_3 < < IE_2$

B. $IE_1 \approx IE_2$

C. $IE_3 > > IE_2$

D. $IE_3 = 0$

Answer: C

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92. Electronic configuration of valence shell of four elements, A, B, C and D are?

(A) ns^2, np^2 (D) ns^2, np^3

(B) ns^2, np^4 (D) ns^2, np^5

Arrange them in increasing order of IE_2:

A. $A < B < C < D$

B. $A < B < D < C$

C. $B < A < D < C$

D. $B < A < C < D$

Answer: B

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93. Which of the following order is incorrect?

A. $Cd < Hg(IE_1)$

B. $Ag < Au(IE_1)$

C. $Y < La(IE_1)$

D. None of these

Answer: C

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D. Electron Gain Enthalpy (Electron Affinity)

1. The correct order of electron affinity is:

A. $Be < B < C < N$

B. $Be < N < B < C$

C. $N < Be < C < B$

D. $N < C < B < Be$

Answer: B

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2. Which of the following will have the most negative electron gain enthalpy and which the least negative? P, S, Cl, F. Explain your answer.

A. F, CI

B. CI, F

C. CI, S

D. CI, P

Answer: D

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3. Arrange S, O and Se in acending order of electron affinity?

A. $O > S > Se$

B. $S > Se > O$

C. $Se > O > S$

D. $S > O > Se$

Answer: B

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4. Fluorine has the highest electronegativity among the ns^2np^5 group on the Pauling scale, but the elctron affinity of fluorine is less than that of chlorine because :

A. the atomic number of fluorine is less than that of chlorine

B. fluorine being the first member of the family behaves in an unusual manner

C. chlorine can accommodate an electron better than fluorine by utilising its vacant 3d-orbital

D. of small size, high electron density and an increased electron repulsion makes addition of an electron to fluorine less favourable than that in the case of chlorine in isolated stage

Answer: D

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

A. $S < O < CI < F$

B. $O < S < F < CI$

C. $CI < F < S < O$

D. $F < CI < O < S$

Answer: B

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6. For the process

$X(g) + e^{-} \rightarrow X^{-}(g), \Delta H = x$ and

$X^{-}(g) \rightarrow X(g) + e^{-}, \Delta H = y$ Select correct alternate :

A. ionisation energy of $X^{-}(g)$ is y

B. electron affinity of $X(g)$ is x

C. electron affinity of $X(g)$ is y

D. all are correct statements

Answer: D

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7. Considering the elements F, CI, O and $S,$ the correct order of their electron affinity values is:

A. $F > CI > O > S$

B. $F > I > CI > S$

C. $CI > F > S > O$

D. $O > F > S > CI$

Answer: C

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8. Which will have the maximum value of electron affinity O^x, O^y, O^z [x,y and z respectively are $0, \ -1$ and -2]?

A. O^x

B. O^y

C. O^z

D. All have equal

Answer: A

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9. The electron gain enthalpies of halogens are as given below:

$F = \ -332, CI = \ -349, Br = \ -324, I = \ -295kJmol^{-1}$. The less negative value for F as compared to that of Cl is due to:

A. string electron-electron repulsions in the compact 2-p sub shell of F

B. strong electro-electron repulsion in the bigger 3-p sub shell of Cl

C. higher electronegativity value of Cl

D. higher effective nuclear charge of F

Answer: A

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10. The formation of the oxide ion $O^{2-}_{(g)}$ requires first an exothermic and then an endothermic step as shown below.

$O_{(g)} + e^{-} = O^{-}_{(g)} \Delta H^{\circ} = -142 kJmol^{-1}$

$O^{-}_{(g)} + e^{-} = O^{2-}_{(g)} \Delta H^{\circ} = 844 kJmol^{-1}$ This is because of :

A. O^{-} ion will tend to resist the addition of another electron of account of same charge

B. Oxygen has high electron affinity

C. Oxygen is more electronegative

D. O^{-} ion has comparatively larger size than oxygen atom.

Answer: A

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11. For the electron affinity of halogens (with $-ve$ sign), which of the following is correct?

A. $Br > F$

B. $F > CI$

C. $Br > I$

D. $F^{-} > I$

Answer: C

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12. Which of the following has minimum electron affinity?

A. O

B. S

C. Se

D. Te

Answer: A

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13. The correct order of electron affinity is:

A. $N > P > S > CI$

B. $P > N > S > CI$

C. $CI > N > P > S$

D. $CI > S > P > N$

Answer: D

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14. Which of the following statement is wrong?

A. van der Waals' radius of iodine is more than its covalent radius.

B. All isoelectronic ions belong to same period of the periodic table

C. I.E (I) of N is higher than that of O while I.E (II) of O is higher than that of N

D. The electron affinity of N is less than that of P

Answer: B

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15. Which one of the following statements is incorrect?

A. Greater is the nuclear charge, greater is the negative electron gain enthalpy

B. Nitrogen has almost zero electron gain enthalpy

C. Negative electron gain enthalpy decreases from fluorine to iodine in the group

D. Chlorine has highest negative electron gain enthalpy

Answer: C

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16. Which of the following electron affinity order is incorrect?

A. $C < N$

B. $Na^{+} > Li^{+}$

C. $O^{+} < S^{+}$

D. All of these

Answer: D

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17. Select the equation is endothermic in nature?

A. $Na^{+}(g) + CI^{-}(g) \rightarrow NaCI(s)$

B. $Li^{+}(g) + (aq) \rightarrow Li^{+}(aq)$

C. $N^{-}(g) + N \rightarrow (g)e^{-}$

D. $S^{-}(g) + e^{-} \rightarrow S^{-2}(g)$

Answer: D

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18. Which one of the following statements is correct?

A. The elements like F,CI,Br,O etc. having high values of electron affinity act as strong oxidising agent.

B. The elements having low values of ionisation energies act as strong reducing agent

C. The formation of $S^{2-}(g)$ is an endothermic process

D. All of the above

Answer: D

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19. Electron affinity of first element in which of the following pairs is higher?

A. CI, F

B. Se, S

C. O, F

D. S, CI

Answer: A

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20. The least stable in amongst the following is :

A. Li^{-}

B. Be^{-}

C. B^{-}

D. C^{-}

Answer: B

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21. In which of the following arrangements the order is NOT according to the property indicated against it ?

A. $Ai^{3+} < Mg^{2+} < Na^{+} < F^{-}$ increasing ionic size

B. $B < C < N < O < P$-increasing first ionisation enthalpy

C. $I < Bt < F < CI$ increasing electron gain enthalpy (with negative sign)

D. $Li < Na < K < Rb$-increasing metallic radius

Answer: B

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22. Electron gain enthalpy is positive when:

A. O^{-} is formed form O

B. O^{2-} is formed from O^{-}

C. O^{+} is formed form O

D. electron affinity is always a negative value

Answer: B

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23. Following are the values of the electron gain enthalpy (in kJ mol^{-1}) of the formation of O^{-} and O^{2-} from O:

A. $-142, \ -744$

B. $-142, 744$

C. $142, 744$

D. $-142, \ -142$

Answer: B

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24. Electron addition would be easier in:

A. S

B. S^{+}

C. S^{-}

D. S^{2+}

Answer: D

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25. The electron affinities of N, O, S and Cl are such that:

A. $N < O < S < CI$

B. $O < N < CI < S$

C. $O = CI = N = S$

D. $O < S < CI < N$

Answer: A

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26. Consider the following statements.

Statement-1: Fluorine does not form any polyhalide as it has low F-F bond energy.

Statement-2: The chlorine has the most negative electron gain enthalpy.

Statement-3: The first ionization potentials of N and O atoms are 14.6 and 13.6eV respectively.

Which of the above statements are correct?

A. Statements 1,2 and 3

B. Statement 1 and 2

C. Statement 1 and 3

D. Statements 2 and 3

Answer: A

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27. In which of the following process, maximum amount of energy involved?

A. $CI \rightarrow CI^{-}$

B. $Br^{-} \rightarrow Br$

C. $F^{-} \rightarrow F$

D. $I^{-} \rightarrow I$

Answer: A

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28. The increasing order of electron affinity is

A. $N < O < CI < AI$

B. $O < N < AI < CI$

C. $AI < N < O < CI$

D. $CI < N < O < AI$

Answer: C

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29. Which of the following has least first electron affinity ?

A. O

B. S

C. F

D. Cl

Answer: A

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30. Which of the following processes is endoergic in nature?

A. $O^{-} + e \rightarrow O^{2-}$

B. $CI + e \rightarrow CI^{-}$

C. $S + e \rightarrow S^{-}$

D. $F + e \rightarrow F^{-}$

Answer: A

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31. Which of the following is not the correct arrangement according to the property indicated against it ?

A. $Li < Na < K < Cs$ (metallic radius)

B. $I < Br < F < CI$ (electron affinity)

C. $B < C < N < O$ (first ionisation energy)

D. $Ai^{3} < Mg^{2+} < Na^{+} < F^{-}$ (ionic radius)

Answer: C

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32. Electronic configuration of four elements p,q,r and s are given below

(p) $1s^{2}2s^{2}2p^{6}$ (q) $1s^{2}2s^{2}2p^{4}$

(r) $1s^2 2s^2 3s^1$ (s) $1s^2 2s^2 2p^5$

Correct order of increasing tendency of gain electron is

A. $A < C < B < D$

B. $A < B < C < D$

C. $D < B < C < A$

D. $D < A < B < C$

Answer: A

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33. Among halogens, the correct order of amount of energy released in electron gain (electron gain enthalpy) is:

A. $F > CI > Br > I$

B. $F < CI < Br < I$

C. $F < CI > Br > I$

D. $F < CI < Br < I$

Answer: C

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34. The first ionisation potential of Na is $5.1eV$. The value of eectrons gain enthalpy of Na^{+} will be

A. $-2.55eV$

B. $-5.1eV$

C. $-10.2eV$

D. $2.55eV$

Answer: B

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35. The incorrect statement is :

A. The formation of $O^{2-}(g)$ from $O(g)$ is exothermic process

B. Phosphorous has more electron affinity than nitrogen

C. Ne has larger radius than N

D. $|\Delta H_{eg}$ of $Na^{\oplus}| = |I.E.$ of $Na|$

Answer: A

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36. Which of the following atom has towest negative electron gain enthalpy?

A. O

B. S

C. Se

D. Te

Answer: A

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37. Which of the following series correctly match relationship between elements as indicated

$A \rightarrow B$

A. $F \rightarrow IEA$ decreases

B. $C \rightarrow F$ 2nd IE increases

C. $He \rightarrow Xe$ noble character decreases

D. $Sc \rightarrow Zn$ atomic radii decreases regularly

Answer: C

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38. Select the incorrect order about halogen.

A. $E.A. = CI > F > Br > I$

B. $B.E. = CI_2 > F_2 > Br_2 > I_2$

C. $I.E. = F > CI > Br > I$

D. Oxiding strength $= F_2 > CI_2 > Br_2 > I_2$

Answer: B

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39. Most easily Fe^{2+} ions can be produced from Fe atom be absorbing energy from which of the following process. Consider equal no of given species.

A. Formation of O^- from O-atom

B. Formation of F^- from F-atom

C. Formation of CI^- from Cl-atom

D. Formation of S^- from S-atom

Answer: C

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40. Which of the following process is associated with best possibility of the energy release?

A. $Li \rightarrow Li^{+} + e^{-}$

B. $O^{-} + e^{-} \rightarrow O^{2-}$

C. $CI^{+} + e^{-} \rightarrow CI$

D. $Be + e^{-} \rightarrow Be^{-}$

Answer: C

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41. The correct order of electron affinity for the different families is:

A. Halogen $>$ carbon $>$ nitrogen $>$ oxygen

B. Halogen $>$ oxygen $>$ nitrogen $>$ carbon

C. Halogen $>$ nitrogen $>$ carbon $>$ oxygen

D. Halogen $>$ oxygen $>$ carbon $>$ nitrogen

Answer: D

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42. $N_0/2$ atoms of X(g) are converted into X^+ (g) by energy E_1. $N_0/2$ atoms of X(g) are converted into X^- (g) by the energy E_2. Hence ionisation potential and electron affinity of X(g) are :

A. $\frac{2E_1}{A_0}, \frac{2(E_1-E_2)}{A_0}$

B. $\frac{2E_1}{A_0}, \frac{2E_2}{A_0}$

C. $\frac{(E_1-E_2)}{A_0}, \frac{2E_2}{A_0}$

D. none of these

Answer: B

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43. Which of the following statements is correct?

A. Mg^{+2} has greater ionic radius than Li^{+}

B. Shielding constant value for us and $3de^{-}$ is same in scandium

C. H^{-} is the smallest anion in periodic table

D. F has highest negative $\Delta H_{eg}(I)$

Answer: B

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44. Which of the following process is exothermic?

A. $F^{-} \rightarrow F$

B. $N \rightarrow N^{2-}$

C. $O \rightarrow O^{2-}$

D. $2CI^{+} \rightarrow CI_2$

Answer: D

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45. Which of the following processes is exothermic?

A. $O \rightarrow O^{-}$

B. $O^{-} \rightarrow O^{2-}$

C. $S^{-} \rightarrow S^{2-}$

D. $Li \rightarrow Li^{+}$

Answer: A

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46. Arrange N,O and S in order of increasing electron affinity.

A. $S < O < N$

B. $N < S < O$

C. $N < O < S$

D. $O < N < S$

Answer: C

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47. Which of the following statements is incorrect?

A. ΔH_{eg} value of noble gases are negative

B. Si is diagonally related to B

C. The element which have higher $-\Delta H_{eg}$ act as strong oxidising agent.

D. H^+ and Cs^+ are the smallest and largest cation in periodic table respectively

Answer: A

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48. Which enthalpy is not associated with following change ?

Elemental chlorine $\rightarrow$ chloride ion

A. Bond dissociation enthalpy

B. First ionisation enthalpy

C. First electron gain enthalpy

D. None of the above

Answer: B

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49. Consider the electronic configuration of 2 elements:

(P) $1s^2, 2s^2 2p^6, 3s^2 3p^3$ (Q) $1s^2, 2s^2 2p^6, 3s^2 3p^4$

Choose the incorrect option:

A. (P) has more IE than (Q)

B. (P) has more EA than (Q)

C. Electron addition would be easier in (Q) than (P)

D. Removal of electron would be easier in (Q) then (P)

Answer: B

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50. Which of the following would require least energy?

A. $Si^{-}(g) \rightarrow Si(g) + e^{-}$

B. $P^{-}(g) \rightarrow P(g) + e^{-}$

C. $S^{-}(g) \rightarrow S(g) + e^{-}$

D. $CI^{-}(g) \rightarrow CI(g) + e^{-}$

Answer: B

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E.Electronegativity

1. The electronic configuration of the outemost shell of the most electronegative element is

A. $2s^2 2p^5$

B. $3s^2 3p^5$

C. $4s^2 4p^5$

D. $5s^2 5p^5$

Answer: A

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2. Following the Mulliken scale, what parameters are required to evaluate electronegativity ?

A. Only electronegativity

B. Only electron affinity

C. Electron affinity and ionization energy

D. Ionic potential and electronegativity

Answer: C

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3. The electronegativity values of the elements are useful in predicting:

A. bond energy of a molecule

B. polarity of a molecule

C. nature of an oxide

D. all of the above

Answer: D

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4. In C, N, O and F the electronegativity

A. increase from carbon to fluorine

B. decrease from carbon to fluorine

C. increase up to oxygen and is minimum at fluorine

D. is minimum at nitrogen and then increase continuously

Answer: A

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5. If x,y and z are Mulliken electronegativity, ionisation potential and electron-affinity respectively. Then the electron affinity (z) in the terms of electronegativity (x) and ionisation potential (y) will be:

A. $z = \frac{x + y}{2}$

B. $z = \frac{x - y}{2}$

C. $z = \frac{x^2 - y^2}{2}$

D. $z = 2x - y$

Answer: D

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6. The EN of the elements C, N, Si and P increases in the order of ______ .

A. $N < P < C < Si$

B. $B > C > Si > P$

C. $N = P > C = Si$

D. $N > C > P > Si$

Answer: D

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7. If electro negativity of x be 3.2 and that of y be 2.2 , the percentage ionic character of xy is

A. 19.5

B. 18.5

C. 9.5

D. 29.5

Answer: A

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8. Which of the following relation is correct-

A. $2IP - EA - EN = 0$

B. $2EN - IP - EA = 0$

C. $2EA - IP - EA = 0$

D. $EN - IP - EA = 0$

Answer: B

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9. As one moves down the group from top to bottom then which of the following will not be observed?

A. Ionisation energy increases

B. Electron affinity decreases

C. Electronegativity decreases

D. Atomic radii increase

Answer: A

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10. Which is a true statement?

A. Larger is the value of ionisation energy easier is the formation of cation

B. Larger is the value of electron affinity easier is the formation of anion

C. Larger is the value of ionisation energy as well as electron affinity the smaller is the electronegativity of atom

D. Larger is the Z_{eff} larger is the size of atom

Answer: B

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11. The correct order of electronegativity is:

A. $F > CI > Br > I$

B. $F > O > N > C$

C. $S < O < Se < Te$

D. All of these

Answer: A,B

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12. The electronegativity of the following elements increases in the order

A. C, B, Si, P

B. N, Si, C, P

C. Si, P, C, N

D. P, Si, N, C

Answer: C

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13. Fluorine is more electronegativity than nitrogen. The best explanation is that:

A. the valency electrons in F are on the average, a little farther to the nucleus than in N

B. the charge on a F nucleus is $+9$, while that on N nucleus is $+7$

C. the nitrogen has half filled valence shell electron configuration, ns^2np^3 where as fluorine has partially filled electron configuration ns^2np^5

D. the electronegativity decreases from top to bottom in each of the group as the effect nuclear charge remains constant.

Answer: B

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14. Consider the following statements.

(P) $IE(I)$ of nitrogen atom is ore than $IE(I)$ of oxygen atom.

(Q) Electron affinity of oxygen is less than sulphur atom.

(R) Electronegativity of an atom has no relation with its ionization enthalpy and electron gain enthalpy.

Which of the above statements are correct?

A. P,Q

B. P,R

C. Q,S

D. P,Q and R

Answer: A

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15. Choose the incorrect statement.

A. H^{+} is the smallest size cation in the periodic table.

B. H^{-} is the smallest size anion in the periodic table,

C. F is the most electronegative element on the Pauling scale in the periodic table.

D. [He] has highest I.E. in the periodic table.

Answer: B

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16. With respect to oxygen maximum oxidation state is shown by:

A. halogen family

B. oxygen family

C. nitrogen family

D. boron family

Answer: A

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17. Which of the following statements is incorrect?

A. The tendency to attract bonded pair of electron in case of hybridorbitals follow the order: $sp > sp^2 > sp^3$

B. Alkali metals generally have negative value of electron gain enthalpy

C. The average oxidation number of S in $Na_2S_4O_6$ is greater than in the case of $Na_2S_2O_3$.

D. The electronegativity values for 2p-series elements is less than that for 3p-series elements on account of small size and high inter electronic repulsions.

Answer: D

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18. The group state electronic configuration of some elements, P, Q, R, S and T (these symbols represent the some of the known elements given in the periodic table) are as follows. ltbr. (P) $: 1s^2 2s^2 2p^6 3s^2 3p^2$

(Q) $: 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

(R) $: 1s^2 2s^2 2p^6 3s^2 3p^1$

(S) $: 1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

(T) $: 1s^2 2s^2 2p^{\hat{}} 3s^2 3p^6 3s^{10} 4s^2 4p^6$

Match the electronic configurations of the elements with the properties given below and select the correct sequence by choosing the correct codes given.

(i) Element forms a cation which is isoelectronic with P^{3-}.

(ii) Element which in its compounds can show a maximum oxidation state of $+6$ and that is coloured too.

(iii) Element has largest atomic radius and highest first ionisation energy in the respective period.

(iv) Element which has intermediate value of electronegativity and its oxide forms salts with strong acids and bases.

A. Q R T P

B. Q S T R

C. Q R S T

D. P Q R S

Answer: B

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19. In which case bond length is shortened?

A. When miltiplication occurs between atoms

B. When electronegativities are different

C. In both cases

D. In none of the cases

Answer: C

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20. Which of the following is incorrect?

A. E.N. of $F > CI$

B. E.A. of $S > O$

C. E.A of $O > Se$

D. Atomic radius of $Li > Be$

Answer: C

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21. Calculate the % ionic character for molecule AB when E.N. different is 2.0:

A. $46\ \%$

B. $36\ \%$

C. $30\ \%$

D. $50\ \%$

Answer: A

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22. A student went to meet his friend, where he saw that his friend was doing the study of a particular chemistry book. But he could not find the theoretical value of bond length in H-F but the found that r_H and r_F are 0.37Å and 0.72Å respectively and electronegativity of F and H are 4.0 and 2.1 respectively. what is bond length of H-F bond?

A. 1.09

B. 1.784

C. 0.92

D. 0.46

Answer: C

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23. Which of the following options is incorrecr?

A. Ist ionisation potential : $Na < Mg < Si < P$

B. Electron affinity: $N < C < O < F < CI$

C. Hydrated radius : $Ba^{2+}(aq) < Sr^{2+}(aq) < Mg^{2+}(aq)$

D. Polarity order: $N - H < Sb - H < As - H < P - H$

Answer: D

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24. Calculate the % ionic character for metal fluoride where the electronegativity of electropositive element is 2.1:

A. $43.03\ \%$

B. $56.8\ \%$

C. 50%

D. 12%

Answer: A

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25. The most predominantly ionic compounds will obtianed from the combination of elements belonging to

A. I and VII

B. II and VI

C. IV and VIII

D. III and V

Answer: A

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26. The electronegativity of H and Cl are 2.1 and 3.0 respectively. The correct statement (s) about the nature of HCI is/are:

A. HCI is 17% ionic

B. 83% ionic

C. 50% ionic

D. 100% ionic

Answer: A

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27. Which of the following set has the strongest tendency to form anions?

A. Ga, In, Fe

B. Na, Mg, AI

C. N, O, F

D. V, Cr, Mn

Answer: C

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28. Which of the following is correct option?

(p) Same number of electron in d-subshell (Mn, Cr)

(q) Same value of $Z_{eff}(Li^{+}, B^{+})$

(r) Same value of σ, shielding constant (Li^{+}, Be^{2+})

(s) Same value of electronegativity (P,H)

(t) Same value of electron affinity (F,Cl)

A. (p),(r),(t)

B. (r),(s),(t)

C. (p),(r),(s)

D. All are correct statement

Answer: C

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29. The correct relation given by Pauling to calculate electronegativity of an element X is (with respect to hydrogen). Given EN of $X > EN$ of H

A. $EN(X) - EN(H) = 0.208\sqrt{BE_{H-X} - \sqrt{BE_{X_X} \times BE_{H-H}}}$

B. $EN(X) - EN(H) = 0.102\sqrt{BE_{H-X} - \sqrt{BE_{X-X} \times BE_{H-H}}}$

C. $EN(X) - EN(H) = 0.102\sqrt{BE_{H-X} - \sqrt{BE_{X-X} \times BE_{H-H}}}$

where bond energies (BE) are in kJ/mole.

D. Both (a) and (c) are correct

Answer: C

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30. If $E_1^{\delta -} - E_2^{\delta +}$ bond has given polarity, which of the following is/are correct about polarity? (Electronegativity of $E_1 = 2.4, Q = 3.1, R = 2.6$ respectively)

A. $E_1^{\delta} - Q^{\delta+}$

B. $Q^{\delta-} - R^{\delta+}$

C. $R^{\delta+} - E_2^{\delta-}$

D. $Q^{\delta+} - E_2^{\delta-}$

Answer: B

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31. % Ionic character in the covalent bond A-B is: (Given that $X_A = 2, X_B = 3)$

A. $12.5\ \%$

B. $30\ \%$

C. $19.5\ \%$

D. data is insufficient

Answer: C

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32. Which of the following does not represent the correct order of the properties indicated?

A. $F > CI > Br > I(EN)$

B. $Sc^{3+} > Ti^{2+} > Cr^{1+} > Mn$ (size)

C. $O < S > Se > Te(EA)$

D. $Fe^{2+} > Co^{2+} > Ni^{2+} > Cu^{2+}$ (unpaired electron)

Answer: B

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33. Which element's electronegativity is closest to that of S?

A. O

B. P

C. Cl

D. Se

Answer: D

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34. Which atom has the highest electronegativity?

A. Na

B. P

C. CI

D. Br

Answer: C

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35. Which family of elements has solid, liquid and gaseous members at $25^{\circ}C$ and 1 atm pressure?

A. Alkali metals $(Li - Cs)$

B. Phinctogens $(N - Bi)$

C. Chalcogens $(O - Te)$

D. Halogens $(F - I)$

Answer: D

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36. In which molecule does the chlorine have the most positive partial charge?

A. HCI

B. $BrCI$

C. OCI_2

D. SCI_2

Answer: C

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37. Electronegativities change both down a group and across a period. In general these changes are to:

A. Down a group increase, Across a period from legt to right increase

B. Down a group increase, Across a period from legt to right decrease

C. Down a group decrease, Across a period from legt to right increase

D. Down a group decrease, Across a period from legt to right decrease

Answer: C

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38. Which has the largest bond dissociation energy?

A. $H - F$

B. $H - CI$

C. $H - Br$

D. $H - I$

Answer: A

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39. Which of these properties increase across the period from N to Cl?

(P) Atomic radius

(Q) Density

(R) Electronegativity

A. P only

B. R only

C. P and Q only

D. Q and R only

Answer: D

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40. What is the correct order when the substances O_2, H_2O, OF_2 and H_2O_2 are arranged in order of increasing oxidation number for oxygen?

A. O_2, H_2O, OF_2, H_2O_2

B. H_2O, H_2O_2, O_2, OF_2

C. H_2O_2, O_2, H_2O, OF_2

D. OF_2, O_2, H_2O_2, H_2O

Answer: B

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41. Which list includes elements in order of increasing metallic character?

A. Si, P, S

B. As, P, N

C. AI, Ge, Sb

D. Br, Se, As

Answer: D

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42. Which bond is expected to be the least polar?

A. $O - F$

B. $P - F$

C. $Si - N$

D. $B - CI$

Answer: A

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43. Which of these elements has the greated electronegativity?

A. Br

B. N

C. O

D. S

Answer: C

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44. Select the group where EN increases down the group

A. Ca, Sr, Ba

B. Zn, Cd, Hg

C. F, CI, Br

D. Li, Na, K

Answer: B

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45. Which of the following is incorrect?

A. An element which has high electronegativity always has higher electron gain enthalpy

B. Electron gain enthalpy is the property of an isolated gaseous atom

C. Electronegativity is the property of bonded atom

D. Both electronegativity and electron gain enthalpy are generally directly related to nuclear charge and inversely related to atomic size

Answer: A

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46. The pair of elements which on combination is most likely to form an ionic compound is:

A. Na and Ca

B. K and O_2

C. O_2 and CI_2

D. AI and I_2

Answer: B

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47. Two elements A and B have values of electronegativity respectively as 4 and 1.2, then the compound A-B will be:

A. predominantely covalent

B. predominantely ionic

C. % covalent character less than 50%

D. both (b) and (c)

Answer: D

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48. Identify the only incorrect statement.

A. Fe^{3+} has greater electron affinity than Fe^{2+}

B. Between F and CI, formation of CI^{-} is more exothermic than formation of F^{-}

C. IE_1 of CI^{-} $=$ electron affinity of CI

D. Electronegativity depends only on electron affinity

Answer: D

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49. According to theory of electronegativity, most suitable name for F_2O molecule will be:

A. oxygen fluoride

B. difluorine oxide

C. oxygen difluoride

D. both (b) and (c)

Answer: C

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50. Define the general formula of non-polar compound on the basis of given information, where the electronic configuration of valence shell for A and B are as follows (a) ns^2np^3 (b) ns^2np^5:

(P) AB_3 (Q) AB_4

(R) AB_5 (S) AB_6^-

A. P,Q,R

B. Q,R,S

C. R,S,P

D. S,P,Q

Answer: B

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51. Using the periodic table predict the formula of compound which might be formed by the following pair of elements: silicon and bromine

A. $SiBr_2$

B. $SiBr_4$

C. $Si_2Br_8^{4-}$

D. $Si_3Br_8^{2-}$

Answer: B

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52. In which of the following compound Mn shows maximum radius?

A. MnO_2

B. $KMnO_4$

C. MnO

D. $K_3[Mn(CN)_6]$

Answer: C

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53. Which one is not correct statement?

A. $IE(I)$ of He is maximum among all elements.

B. $E_{\alpha}(I)$ for noble gases is zero/positive

C. Electronegativity is maximum for fluorine

D. $IE(I)$ for nitrogen is less than that of oxygen.

Answer: D

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54. Which of the following is affected by the stable electron configuration of an atom?

(P) Electronegativity (Q) Ionisation energy (Q) Electron affinity

Correct answer is:

A. only electronegativity

B. only ionisation potential

C. electron affinity and ionisation energy both

D. all of the above

Answer: C

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F.Acidic-Basic Character, Hydration etc.

1. The order of basic character of given oxides is:

A. $Na_2O > MgO > CuO > SiO_2$

B. $MgO > SiO_2 > CuO > Na_2O$

C. $SiO_2 > MgO > CuO > Na_2O$

D. $CuO > Na_2O > MgO > SiO_2$

Answer: A

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2. Amphoteric behaviour is shown by the oxide of:

A. Al and Ca

B. Pb and Ba

C. Cr and Mg

D. Sn and Zn

Answer: D

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3. An element X occurs in short period having configuration ns^2np^1. The formula and nature of its oxide is:

A. XO_3, basic

B. XO_3, acidic

C. X_2O_3, amphoteric

D. X_2O_3, basic

Answer: C

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4. Aqueous solution of two compounds $M_1 - O - H$ and $M_2 - O - H$ are prepared in two different beakers . If electronegativity of $M_1 = 3.4, M_2 = 1.2, 0 = 3.5$ and $H = 2.1$, then the nature of two solution will be respectively

A. acidix, basic

B. acidic, acidic

C. basic, acidic

D. basic, basic

Answer: A

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5. which one of the following oxides is neutral?

A. CO

B. SnO_2

C. ZnO

D. SiO_2

Answer: A

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6. The correct order of acidic strength is

A. $CI_2O_7 > SO_3 > P_4O_{10}$

B. $CO_2 > N_2O_5 > SO_3$

C. $Na_2O > MgO > AI_2O_3$

D. $K_2O > CaO > MgO$

Answer: A

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7. Identify the correct order of acidic strength of CO_2, CuO, CaO and H_2O.

A. $CaO < CuO < H_2O < CO_2$

B. $H_2O < CuO < CaO < CO_2$

C. $CaO < H_2O < CuO < CO_2$

D. $H_2O < CO_2 < CaO < CuO$

Answer: A

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8. Which one of the following is an amphoteric oxide?

A. ZnO

B. Na_2O

C. SO_2

D. B_2O_3

Answer: A

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9. Which of the following is the most acidic in nature?

A. SiO_2

B. P_4O_{10}

C. CO_2

D. SO_3

Answer: D

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10. Among Al_2O_3, SiO_2, P_2O_3 and SO_2 the correct order of acidic strength is:

A. $AI_2O_3 < SiO_2 < SO_3 < P_2O_3$

B. $SiO_2 < SO_3 < AI_2O_3 < P_2O_3$

C. $SO_3 < P_2O_3 < SiO_2 < AI_2O_3$

D. $AI_2O_3 < SiO_2 < P_2O_3 < SO_3$

Answer: D

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11. Which of the following oxides is amphoteric in nature?

A. CaO

B. CO_2

C. SiO_2

D. SnO_2

Answer: D

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12. In which of the following arrangements, the sequence is not strictly according to the property written against it?

A. $HF < HCI < HBr < HI$: increasing acid strength

B. $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing basic strength

C. $B < C < O < N$: increasing first ionization enthalpy

D. $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

Answer: B

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13. Find the incorrect acidic strength order:

A. $K_2O > Rb_2O > Cs_2O$

B. $N_2O < NO_2 < N_2O_3$

C. $Li_2O < BeO < N_2O_5$

D. $CI_2O_7 > P_2O_5 > SiO_2$

Answer: B

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14. The correct order of acidic nature of the oxides of chlorine is

A. $CI_2O < CIO_2 < CI_2O_6 < CI_2O_7$

B. $CIO_2 < CI_2O < CI_2O_6 < CI_2O_7$

C. $CI_2O < CIO_2 < CI_2O_7 < CI_2O_6$

D. $CI_2O_7 < CI_2O_6 < CIO_2 < CI_2O$

Answer: A

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15. The most acidic oxide is:

A. SO_3

B. P_2O_5

C. CI_2O_7

D. P_2O_3

Answer: C

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16. The correct order of basic nature is

A. $B_2O_3 < AI_2O_3 < In_2O_3 < TI_2O$

B. $B_2O_3 > AI_2O_3 > In_2O_3 > TI_2O$

C. $B_2O_3 < TI_2O < AI_2O_3 < In_2O_3$

D. $B_2O_3 < In_2O_3 < TI_2O < AI_2O_3$

Answer: A

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17. Select the amphoteric oxide.

A. Na_2O

B. AI_2O_3

C. CI_2O_7

D. CO

Answer: B

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18. Select the correct statement.

A. E.N. of atom X is 2.5 on Pauling scale if IE of X is $2eV\,EA$ of X is $3eV$

B. $|IE \text{ of } X(g)| = |EA \text{ of } X(g)^-|$

C. $F^-(aq) < CI^-(aq) < Br^-(aq) < I^-(aq)$ (ionic mobility)

D. $Li^+(aq) < Na^+(aq) < K^+(aq) < Rb^+(aq)$ (size)

Answer: C

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19. Which of the following option is incorrect

A. $\begin{array}{ll} List-I & List-II \\ Ist\text{Ionisation potential} & Na < Mg < Si < P \end{array}$

B. $\begin{array}{ll} List-I & List-II \\ \text{Electron affinity} & N < C < O < F < CI \end{array}$

C. $\begin{array}{ll} List-I & List-II \\ \text{Hydrated radius} & Ba^{2+}(aq) < Sr^{2+}(aq) < Mg^{2+}(aq) \end{array}$

D. $\begin{array}{ll} List-I & List-II \\ \text{Polarity order} & N-H < Sb-H < As-H < P-H \end{array}$

Answer: D

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20. What property of the oxygen atom is represented by the equation $O(g) + e^{-} \rightarrow O^{-}(g)$?

A. Electronegativity

B. First electron affinity

C. First ionization energy

D. Lattice energy

Answer: B

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21. Which element forms a compound with the formula H_3XO_4?

A. As

B. CI

C. N

D. S

Answer: A

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22. Which forms the most alkaline solution when added to water?

A. AI_2O_3

B. B_2O_3

C. CO_2

D. SiO_2

Answer: A

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23. The oxide of which element is the most ionic?

A. AI

B. B

C. C

D. Si

Answer: A

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24. The incorrect statement among the following is:

A. density increases across the period from left to right while decreases down the group

B. ionization energy depends upon the type of orbital (of same energy level) from which electron is being removed

C. generally electron affinity decreases down the group

D. moving diagonally, the charge to size ratio remains nearly same for 2 and 3rd period elements upto 14th group.

Answer: A

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25. Which of these compounds is amphoteric ?

(P) $AI(OH)_2$ (Q) $Ba(OH)_2$

(R) $Zn(OH)_2$

A. P only

B. Q only

C. P and R only

D. Q and R only

Answer: C

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26. Which oxide produces the most acidic solution when 0.1 mol is added to $1L$ of H_2O?

A. BaO

B. BaO_2

C. SO_2

D. SO_3

Answer: D

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27. Element P,Q, R and S belong to the same group. The oxide of P is acidic, oxide of Q and R are amphoteric while the oxide of S is basic. Which of the following elements is the most electropositive ?

A. R

B. Q

C. P

D. S

Answer: C

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28. Increasing order of basic character of NO_2K_2O and ZnO is

A. $NO_2 < ZnO < K_2O$

B. $K_2O < ZnO < NO_2$

C. $NO_2 < K_2O < ZnO$

D. $K_2O < NO_2 < ZnO$

Answer: A

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29. Which of the following options is correct regarding periodic properties?

A. Ionic radii order $CI^{-} > H^{-}$

B. Electropositivity order of elements $Li > Na > K > Rb$

C. Z_{eff} order $Li < Na < K < Rb$

D. Hydration energy order $Fe^{+3} > Fe^{+2} > Fe^{+4}$

Answer: D

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30. Condition suitable for high solubility of ionic compound in solvent should be:

A. High lattice energy and low hydration energy

B. Low lattice energy and high hydration energy

C. Lattice energy must be equal to hydration energy

D. Solubility is independent of lattice or hydration energy

Answer: B

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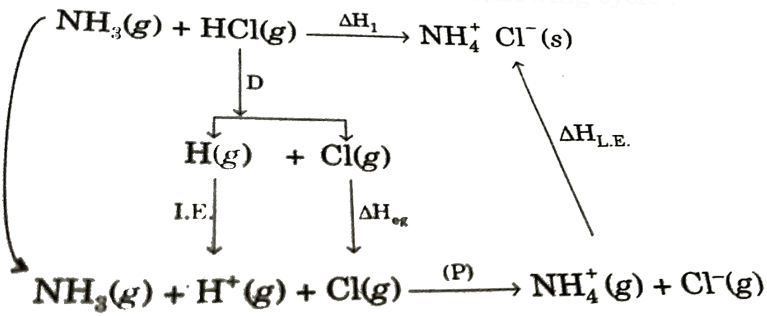
31. Find out the value of (P) in the following cycle:



Given

$\Delta H_1 = -400kJ, I.E. = +50kJ, D = +50kJ, \Delta H_{eg} = -30kJ$

lattice energy $- \; -100kJ$

A. $-400kJ$

B. $-300kJ$

C. $-370kJ$

D. $-310kJ$

Answer: C

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32. Which terms are exothermic for the formation of $NaF(s)$?

(P) $Na(g) \rightarrow Na^{+}(g) + e^{-}$

(Q) $F(g) + e^{-} \rightarrow F^{-}(g)$

(R) $Na^{+}(g) + F^{-}(g) \rightarrow NaF(s)$

A. P only

B. Q only

C. P and R only

D. Q and R only

Answer: D

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33. In order to calculate the lattice energy of $NaCI$ using a Born-Haber cycle, which value is not needed?

A. enthalpy of sublimation of $Na(s)$

B. first ionization energy of $CI(g)$

C. bond dissociation energy of $CI_2(g)$

D. enthalpy of formation of $NaCI(s)$

Answer: B

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34. Which of the following represent correct of hydration energy released in aqueous state?

A. $N^{-3} > O^{-2} > F^{-}$

B. $F^{-} < CI^{-} < Br^{-} < I^{-}$

C. $Li^{+} < K^{+} < Cs^{+}$

D. $AI^{+3} > Mg^{+2} > Na^{+}$

Answer: D

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35. The following order are given along with their metioned properties:

(P) $Mg < Na < Sr < Ba$ [order of atomic size]

(Q) $M^{+} > M^{+2} > M^{+3}[M =$ hypothetical element, order of IP_1 of respective ion]

(R) $F > CI > Br > I$ [order of electronegativity]

(S) $AI_2O_3 < P_2O_5 < So_3 < CI_2O_7$ [order of basic nature]

(T) $F^{-} > CI^{-} > Br > I^{-}$ [order of ionic mobility in aqueous solution]

Which option represents group incorrect order?

A. P,R,T

B. Q,R,T

C. Q,R,S

D. R,S,T

Answer: D

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36. Which of the following order is/are correct ?

A. $Li^{+} < Na^{+} < K^{+}$: Hydrated radius

B. $Na^{+} < Mg^{+2} < AI^{+3}$: Ionic radius

C. $F < CI > Br$: Electron affinity

D. $CI - OH < Br - OH < I - OH$: Acidic character

Answer: C

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37. The following acid have arrange in the order of decreasing strength. Identify the correct order. $CIOH(I) BrOH(II) IOH(III)$

A. $P > Q > R$

B. $Q > P > R$

C. $R > Q > P$

D. $P > R > Q$

Answer: A

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38. Which of the following is/are correct statement(s)?

A. Electron affinity of oxygen is more than that of sulphur

B. If spin quantum number was assigned three different values, the 6th period would have maximum 48 elements

C. Acidic nature of oxides of group XIII elements increases down the group

D. All of the above

Answer: B

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39. Which of the following is an amphoteric oxide?

A. CO

B. NO

C. BeO

D. N_2O_3

Answer: C

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40. Which is an amphoteric oxides?

A. BeO

B. SnO

C. ZnO

D. All of these

Answer: D

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41. The order of basic strength of given oxide:

A. $Na_2O > MgO > AI_2O_3 > CuO$

B. $MgO > AI_2O_3 > CuO > Na_2O$

C. $AI_2O_3 > MgO > CuO > Na_2O$

D. $CuO > Na_2O > MgO > AI_2O_3$

Answer: A

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42. Which of the following is neutral oxide?

A. SnO

B. PbO

C. PbO_2

D. N_2O

Answer: D

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43. The high oxidising power of fluorine is due to :

A. high electron affinity

B. high ionisation energy

C. both (a) and (b)

D. none of the above

Answer: A

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44. The correct statement is:

A. F has more electron affinity than $O^{\oplus}$

B. $Ai^{3\oplus}$ ion has more hydration energy than $Mg^{2\oplus}$ ion

C. noble gases have positive electron affinity

D. all of the above

Answer: B

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45. A,B and C are oxides of elements X,Y and Z respectively. X,Y and Z are in the same period of the periodic table. A gives an aqueous solution which turns blue litmus red. B reacts with both strong acids and strong alkalies. C gives an aqueous solution which is strongly alkaline. Which of the following statement is/are true ?

(P) All the three elements are metals.

(Q) The electronegativites decreases from X to Y to Z.

(R) The atomic radius increases in the order $X < Y < Z$.

(S) X,Y and Z could be phosphorus, aluminium and sodium respectively.

A. P,Q,R only correct

B. P,R only correct

C. Q,S only correct

D. Q,R,S only correct

Answer: D

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Reasoning Type

1. Assertion: Electron gain enthalpy value of the 3rd peirod p-block elements of the mordern periodic table are generally more negative than the 2nd period element of the same group.

Reason: Due to smaller atomic size of the 2nd peirod element, its electron density is high which eases the addition of electron.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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2. Statement-1: 'He' has owest ionisation energy among all the elements.

Statement-2: Electron affinity values of metals are generally low white those of non-metals are high.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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3. Statement-1: In a period, noble gas has largest atomic radius.

Statement-2: In case of noble gases van der Waal's radius is defined and there is much inter electronic repulsions.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-3

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-3

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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4. Statement-1: The 5^{th} period of periodic table contains 18 elements are 32.

Statement-1: $n = 5, l = 0, 1, 2, 3$. The order in which the energy of available orbitals $4d, 5s$ and 5p increases is $5s < 4d < 5p$ and the total number of orbitals avaiable are 9 and thus 18 electrons can be accommodated.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-4

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-4

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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5. Assertion: the $4f^{-}$ and $5f^{-}$ inner transition series of elements are placed separately at the bottom of the modern periodic table.

Reason : (i) Position of f-block elements prevents the undue expansion of the mordern periodic table, ie, maintains its structure.

(ii) Position of f-block elements preserves the principle of classification by keeping elements with similar properties in a single column.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-5

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-5

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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6. Statement-1: Manganese (atomic number 25) a less favourable electron affinity than its neighbours on either side.

Statement-2: The magnitude of an element's electron affinity only depends on the element's valence shell elecronic configuration.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-6

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-6

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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7. Assertion: In general, for an element, $IE_1 < IE_2 < IE_3....$

Reason: After the removal of each succesive electron remaining electrons are held more tightly by the nucleus so removal of next electorn becomes difficult.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-7

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-7

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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8. Statement-1: Second electron gain enthalpy of halogens is always positive.

Statement-2: Fluorine has most negative electron gain enthalpy.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-8

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-8

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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9. Statement-1: Third ionisation energy of phosphorous is larger than sulphur.

Statement-2: There is a larger amount of stability associated with filled s- and p-sub-shells (a noble gas electron configuration) which corresponds to having eight electrons in the valence shell of an atom or ion.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-9

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-9

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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10. Statement-1: First ionisation energy of $O^{+}(g)$ is greater than that of $N(g)$ whereas vice versa is true for the first ionisation energy of $N^{+}(g)$ and $N(g)$ respectively.

Statement-2: Electronic configuration of $N(g)$ is more stable than that of $N^{+}(g)$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-10

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-10

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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11. Statement-1: Down the group, electronegativity decreases from B to Tl.

Statement-2: Electronegativity of an element depends on its electron affinity and ionisation energy.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-11

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-11

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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12. Statement-1: $Sc(Z = 21)$ is placed as d-block element.

Statement-2: Last filling electron goes into 3d-subshell.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-12

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-12

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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13. Statement-1: Na^{+} and AI^{3+} are isoelectronic but the magnitude of ionic radius or AI^{3+} is less than that of Na^{+}.

Statement-2: The magnitude of effective nuclear charge of the outer most shell electrons in AI^{3+} is greater than that of Na^{+}.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-13

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-13

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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14. Statement-1: The atomic radii of the elements of the oxygen family are smaller than the atomic radii of the corresponding elements of the nitrogen family.

Statement-2: The members of the oxygen family are more electronegative and thus have lower values of nuclear charge than those of the nitrogen family.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-14

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-14

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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15. Statement-1: Metallic character of first group metals increases down the group with the decreasing ionisation energy.

Statement-2: The loss and gain of electron(s) can be used in explaining the reducing and oxidising behaviour of the element respectively.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-15

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-15

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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16. Statement-1: Fluorine has a less negative electron gain enthalpy than chlorine.

Statement-2: There is relative greater effectivebess of 2p-electrons in the small F atom to repel the additional electron entering the atom than to 3p-electrons in the large Cl atom.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-16

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-16

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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17. Statement-1: Fluorine forms only one oxoacid, HOF,

Statement-2: Fluorine has small size and high electronegativity.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-17

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-17

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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18. Statement-1: Li and Mg shows diagonal relationship.

Statement-2: Li and Mg are diagonal to each other in the periodic table.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-18

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-18

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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19. Statement-1: The decreasing order of acidi character of CO_2, N_2O_5, SiO_2 and SO_3 is $SO_3 > N_2O_5 > CO_2 > SiO_2$.

Statement-2: Oxides of the metals are generally basic and oxides of the non-metals are acidic.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-19

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-19

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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20. Statement-1: Oxidising property of F_2 is greater than Cl_2.

Statement-2: $(\Delta H)_{eg}$ (electron gain enthalpy) of F is greater than Cl.

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A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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21. Statement-1: Generally, ionisation enthalpy increases from left to right in a period.

Statement-2: 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.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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22. Statement-1: Boron has a smaller first ionisation enthalpy than beryllium.

Statement-2: 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.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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23. Assertion: Electron gain enthalpy always becomes less negative as we go down a group in Modern periodic table.

Reason: The size of the atom increase on going down the group in Modern periodic table and the added electron would be farther from the nucleus.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-23

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-23

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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24. Assertion: The first ionisation energy of Be is greater than that of B.

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

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-24

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-24

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: C

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25. Statement-1: The acidic strength order of hydra acids is $HF < HCI < HBr < HI$

Statement-2: The E.N. of halogens are $F > CI > Br > I$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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26. Statement-1: The decreasing order of acidic character of CO_2, N_2O_5, SiO_2 and SO_3 is $SO_3 > N_2O_5 > CO_2 > SiO_2$.

Statement-2: As electronegativity difference (E-O) decreases, acidic character of the oxide increases.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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27. Statement-1: The ionisation potential of Sn is greater than Pb.

Statement-2: Usually, ionisation energy decreases down the group.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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28. Statement-1: $(I.E.)_n$ of an atom is always greater than $(I.E)_{n-1}(n \in I^+)$

Statement-2: ne/Z ratio decreases on successive elimination of electrons.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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29. Statement-1: Nitrogen atom has higher ionization energy than fluorine atom.

Statement-2: Nitrogen atom has extra stable electronic configuration due to half filled p-subshell.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: D

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Multiple Objective Type

1. Which of the following statements is/are true about the modern form of periodic table?

A. Third group of periodic table accommodates maximum number of elements.

B. Due to presence of half filled and fully filled sub shells in electronic configuration electronegativity of atom increases

C. The element of 13 th group and 7th period will have atomic number 113.

D. Diagonal relationship in 2nd and 3rd period element is found due to similar charge to size ratio

Answer: A::C::D

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2. Which of the following orders is correct for the size ?

A. $Mg^{2+} < Na^{+} < F^{-} < AI$

B. $Te^{2-} > I^{-} > Cs^{+} > Ba^{2+}$

C. $Fe^{3+} < Fe^{2+} < Fe^{4+}$

D. $Mg > AI > Si > P$

Answer: A::B::D

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3. In which of the following arrangements, the order is not correct according to the property indicated against it.

A. Increasing size: $Cu^{2+} < Cu^{+} < Cu$

B. Increasing $IE_1 : B < C < N < O$

C. Increasing $IE_1 : Na < AI < Mg < Si$

D. Increasing $IE_1 : Li < Na < K < Rb$

Answer: B::D

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4. Which of the following statement(s) is/are correct?

A. Ionization energy may be negative for some elements

B. Second electron gain enthalpy always remains positive for all the elements

C. Negative value of electron gain enthalpy of fluorine is minimum in its group

D. Ionization energy of Ga is slightly more than Al

Answer: B::D

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5. Ionisation energy of atoms A and B are 350 and $250 kcal mol^{-}$ respectively. The electron affinities of these atoms are $70 kcal mol^{-1}$ and $90 kcal mol^{-1}$ respectively then:

A. Electron cloud is more attracted by A

B. Electron cloud is more attracted by B

C. Electronegativity of A is more than B

D. Electronegativity of A is less than B

Answer: A::C

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6. Which of the following statements is/are true for the long form of the periodic table?

A. it reflects the sequence of filling the electrons in the order of sub energy level, s,p,d and f

B. it helps to predict the stable valency states of the elements

C. it reflects trends in physical and chemical properties of elements

D. it helps to predict the relative ionicity of the bond between any two elements

Answer: A::B::C

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7. Which of the following statements is/are true about the modern form of periodic table?

A. Properties of the elements are the periodic functions of their atomic number

B. There are 7 periods

C. There are 8 groups

D. It has separate positions for the isotopes

Answer: A::B

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8. The factors that influence the ionisation energies are:

A. the size of the atom

B. the charge on the nucleus

C. how effectively the inner electron shell screen the nuclear charge

D. stability of electronic configuration

Answer: A::B::C::D

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9. Which of the following statement(s) is/are correct?

A. The second ionization energy of sulphur is greater than that of chlorine

B. The third ionization energy of phosphorus is greater than that of aluminium

C. The first ionization energy of aluminium is nearly the same as that of gallium

D. The second ionization energy of boron is greater than that of carbon.

Answer: A::B::C::D

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10. Ionization energy of an element is:

A. equal in magnitude but opposite in sign to the electron gain enthalpy of the cation of the element

B. same as electrin affinity of the element

C. energy required to remove one valence electron from an isolated gaseous atom in its ground state

D. equal in magnitude but opposite in sign to the electron gain enthalpy of the anion of the element

Answer: A::C

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11. The properties which are common to both groups 1 and 17 elements in the periodic table are:

A. metallic character increases down the groups

B. reactivity decreases from top to bottom in groups

C. atomic radii increases as the atomic number increases

D. electronegativity decreases on moving down a group

Answer: A::C::D

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12. Select the incorrect statement(s).

A. $IE(I)$ of nitrogen atom is less than $IE(I)$ of oxygen atom.

B. Electron affinity of oxygen is less than selenium atom.

C. Electronegativity on Pauling scale is 2.8 times greater than electronegativity on Muliken scale.

D. The Cr^{6+} is smaller than Cr^{3+}

Answer: A::C

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13. Which of the following order(s) is/are correct?

A. $O^{2-} < F^{-} < Na^{+} < Mg^{2+}$ increasing $Z_{\text{effective}}$

B. $Mg^{2+} < Na^{+} < O^{2-} < F^{-}$ increasing size

C. $O^{2-} < F^{-} < Na^{+} < Mg^{2+}$ increasing ionisation energy

D. $O^{2-} < F^{-} < Na^{+} < Mg^{2+}$ increasing electron affinity

Answer: A::C::D

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14. Which of the following is/are true order (s)?

A. $B^{+} < B < B^{-}$ Size

B. $I < Br < CI < F$ Electron affinity

C. $O^{2-} < O^{-} < O^{+}$ $Z_{\text{effective}}$

D. $Na < AI < Mg < SI$ Ionisation potential

Answer: A::C::D

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15. Poor shielding of nuclear charge by d or f-orbital elements is responsible for which of the following facts?

A. Atomic radius of Nb(4-d series) is comparable to that of Ta(5-d series)

B. The 1st ionisation energy of copper is less than that of zinc

C. The value of electron gain enthalpy is more negative for sulphur than for oxygen.

D. The 1st ionisation energy for gold is greater than that of silver.

Answer: A::D

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16. Select equations having endothermic step:

A. $S^{-}(g) + e^{-}(g) \rightarrow S^{2-}(g)$

B. $Ne(g) + e^{-}(g) \rightarrow Ne^{-}(g)$

C. $N(g) + e^{-}(g) \rightarrow N^{-}(g)$

D. $AI^{2+}(g) \rightarrow AI^{3+}(g) + e^{-}(g)$

Answer: A::B::C::D

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17. Which is not correct order for the properties specified ?

A. $I > Br > CI > F$ (oxidising character)

B. $K > Mg > AI > B$ (metallic character)

C. $Li < B < Be < C < O < N < F < Ne$ (first ionisation enthalpy)

D. $Li > Na > K > Rb > Cs$ (chemical reactivity)

Answer: A::C

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18. Select the correct statement(s).

A. The normal oxide formed by the element on extreme left is the most basic

B. The tendency of group IA (i.e., 1st group) to form oxygen rich compounds increases from top to bottom

C. Oxides of metals are called as basic anhydrides

D. In general metallic oxides (O^{2-}) peroxides (O_2^{2-}) and super oxides (O_2^-) are ionic

Answer: A::B::C::D

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19. Degenerate orbital have:

A. n same

B. l same

C. m different

D. s different

Answer: A::B::C

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20. Which of the following pairs were incorrectly arranged in Mendeleev's Periodic table?

A. $Ar - K$

B. $Te - I$

C. $Th - Pa$

D. $Co - Ni$

Answer: A::B::C::D

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21. Which option is correct for atomic radius?

A. $Ne > F$

B. $Ar > CI$

C. $F > Ne$

D. $CI > Ar$

Answer: A::B

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22. Choose the correct order of ionic size:

A. $Na^{+} > Mg^{2+} > AI^{3+}$

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

C. $N^{3-} > O^{2-} > F^{-}$

D. $Pb^{2+} > Pb > Pb^{4+}$

Answer: A::C

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23. The ionic radii depends upon the following factors:

A. charge of cation

B. charge of anion

C. shell number of valence shell electron(s) of the ion

D. number of atoms for multiatomic ion

Answer: A::B::C::D

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24. Which of the following is correct order of EA.

A. $N < C < O < F$

B. $F > CI > Br > I$

C. $CI > F > Br > I$

D. $C < N < O < F$

Answer: A::C

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25. Which of the following is/are correct?

A. For $A(g) + e^{-} \rightarrow A^{-}(g) \Delta H$ mat be negative

B. For $A^{-}(g) + e^{-} \rightarrow A^{2-}(g) \Delta H$ may be negative

C. For $A^{-}(g) + e^{-} \rightarrow A^{2-}(g) \Delta H$ must be positive

D. For $A^{+3}(g) + e^{-} \rightarrow A^{+2}(g) \Delta H$ must be negative

Answer: A::C::D

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26. According to Slater's rule, which of the following has correct order of Z_{eff}?

A. $Na > K$

B. $Li > Na$

C. $Na < Mg$

D. $Li < Be$

Answer: C::D

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27. Which of the following is/are correctly matcged?

A. $E > O$ (Electronegativity)

B. $Mg > AI$ (1st ionisation energy)

C. $HCI > HI$ (Thermal stability)

D. Diamond $>$ Graphite (Electrical conductance)

Answer: A::B::C

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28. Which of the following statements is/are incorrect ?

A. Ionisation energy of A^{-} is greater than A when A is a halogen atom.

B. Ionisation energy of A^{+} is greater than that of A^{2+} when A is the number of alkali metals

C. Successive ionisation energy is always increasing for 1st and 2nd period element

D. Electron affinity value of A^{+} is numerically identical with the ionisation potential of A^{-} [for any atom]

Answer: A::B::D

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29. Mendleev left the space for elements in periodic table for the elements:

A. Ga

B. Sc

C. Ge

D. Tc

Answer: A::B::C::D

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30. Which of the following properties are the properties of metal?

A. They are sonorous

B. They are in general poor conductor of heat and electricity

C. They are malleable and ductile

D. They are hard

Answer: A::C::D

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31. For which of the following species the contribution of s electron to the shielding constant is 0.3 ?

A. H^{+}

B. He

C. Li^{+}

D. H^{-}

Answer: B::C::D

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32. Which of the following represents the correct order of the properties indicated ?

A. $F > O > N > C \quad (\text{Electronegativity})$

B. $Sc^{3+} > Ti^{4+} > K^{+} \quad (\text{Size})$

C. $Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+} \quad (\text{Unpaired electron})$

D. $HNO_3 > HNO_2 \quad (\text{Acidic strength order})$

Answer: A::C::D

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33. Select the element (s) which belongs to d-block but not transition elements:

A. Zn

B. Cd

C. Hg

D. P^{+}

Answer: A::B::C

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34. The species having 4 or more unpaired electrons are:

A. Fe^{2+}

B. Co^{3+}

C. Mn^{2+}

D. Ni^{2+}

Answer: A::B::C

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35. Which option is/are correct?

A. Atomic radius decreases with increase in Z_{eff}

B. The atomic number of 50 elements is present in 5th period

C. Alkaline earth elements are IA group elements

D. Alkali metals are IIA group elements

Answer: A::B

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36. The elements $Z = 116$ and 119 have been discovered. In which family/group, would you place these elements and also give the electronic configuration in each case?

A. $Z = 116$, oxygen family, configuration $= [Rn]5f^{14}6d^{10}7s^2 7p^4$

B. $Z = 119$, alkali metal, configuration $= [Uuo]8s^1$

C. $Z = 116$, halogen family, configuration $= [Rn]5f^{14}6d^{10}7s6(2)7p^4$

D. $Z = 119$, alkali metal , configuration $= [Uuo]8s^2$

Answer: A::B

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37. Those elements impart colour to the flame on heating in it, the atoms of which require low energy for the ionisation (i.e., absorb energy in the visible region of spectrum). The elements of which of the following groups will impart colour to the flame?

A. 2

B. 13

C. 1

D. 17

Answer: A::C

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38. Which of the following sequences contain atomic numbers of only representative elements?

A. 3,33,53,87

B. 2,10,22,36

C. 7,17,25,37,48

D. 9,35,51,88

Answer: A::D

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39. 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. $CI(g)$

Answer: A::D

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40. Which of the following statements are correct?

A. Helium has the highest first ionisation enthalpy in the periodic table

B. Chlorine has less negative electron gain enthalpy than fluorine

C. Mercury and bromine are liquids at room temperature

D. In any period, atomic radius of alkali metal is the highest

Answer: A::C::D

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

A. $Zn^{2+}, Ca^{2+}, Ga^{3+}, AI^{3+}$

B. $K^{+}, Ca^{2+}, Sc^{3+}, CI^{-}$

C. $P^{3-}, S^{2-}, CI^{-}, K^{+}$

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

Answer: B::C

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

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

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

C. $I < Br < CI < F$ (increasing electron gain enthalpy)

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

Answer: B::C

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43. Which of the following have no unit?

A. Electrongativity

B. Electron gain enthalpy

C. Ionisation enthalpy

D. Metallic character

Answer: A::D

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44. Ionic radii vary in

A. inverse proportional to the effective nuclear charge

B. inverse proportional in the square of effective nuclear charge

C. direct proportional to the screening effect

D. direct proportional to the square of screening effec

Answer: A::C

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45. 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

Answer: A::C

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46. Which of the following statements are correct?

A. F is the most electronegative and Cs is the most electropositive element

B. The EN of halogens decreases from F to I

C. The E.A of Cl is higher than that of F through their EN values are in the reverse order

D. The E.A of noble gases is low

Answer: A::B::C::D

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47. Which of the following statements (s)is/are true?

A. Ionisation energy $\propto \dfrac{1}{\text{Screening effect}}$

B. The first ionisation energies of Be and Mg are more than ionisation energies of B and Al respectively

C. Atomic and ionic radii of niobium and tantanium are almost some

D. Metallic and covalent radii of potassium are 2.3Å and 2.03Å respectively.

Answer: A::B::C::D

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48. Which of the following statement(s) is/are true for IA elements?

A. Na is regarded as a typical/representative element

B. Basic character of their oxides increases down the group

C. Among alkali metal ions, degree of hydration is highest in Li

D. In general, electron affinity values decreases from top to bottom in the group

Answer: A::B::C::D

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49. The process(es) requiring the absorption of energy is/are:

A. $CI \rightarrow CI^{-}$

B. $S \rightarrow S^{2-}$

C. $H \rightarrow H^{-}$

D. $Ar \rightarrow Ar^{-}$

Answer: B::D

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50. Predict block of element whose outer electron set of quantum number n,l,m is 6,0,0 respectively:

A. s-block

B. p-block

C. d-block

D. f-block

Answer: A::C::D

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51. Which of the following are neutral oxide?

A. N_2O

B. NO

C. CO

D. H_2O

Answer: A::B::C::D

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52. Which of the following statement(s) is/are correct?

A. Th' is transuranic element

B. He' has highest first ionization energy among all elements

C. Li' is lighest metal

D. F' has positive second electron gain enthalpy

Answer: B::C::D

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53. In which of the following pairs, the first atom is larger than the second ?

A. Br, CI

B. Na, Mg

C. Sr, Ca

D. N, P

Answer: A::B::C

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54. Among the given elements, select those, which are not at the peack of Lother Meyer's curves?

A. La

B. K

C. CI

D. Xe

Answer: A::C::D

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55. An element has electronic configuration as $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2, 3d^7$.

Correct statement regarding element is:

A. Element must be Co

B. Element belongs to group number '9' according to the long form of periodic table

C. Maximum number of electrons in element having $m = +1$ are 6

D. Element has magnetic moment $\sqrt{15} BM$

Answer: A::B::C::D

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56. The correct order of radii is:

A. $N < Be < B$

B. $F^{-} < O^{2-} < N^{3-}$

C. $Na > Li < K$

D. $Fe^{2+} > Fe^{3+} > Fe^{4+}$

Answer: B::C::D

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57. Choose the correct statement.

A. Be and Al are not in same group

B. All the transition metals correspond to d-block

C. Be and Al are having lot of similarities in their properties

D. The atomic radius gradually decreases from Sc to Zn.

Answer: A::B::C

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58. Which of the following pair of elements are not of same group of periodic table?

A. Li, Na

B. Be, B

C. N, As

D. O, At

Answer: B::D

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59. Which of the following statements are incorrect?

A. The elements after thorium are called transuranium elements

B. $P < Si < Be < Mg < Na,$ the order of increasing metallic character

C. The f-block elements are called transition elements

D. Zn, Cd and Hg are called transition elements

Answer: A::C::D

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60. Which of the following processes involve absorption of energy?

A. $S(g) + e^{-} \rightarrow S^{-}(g)$

B. $Xe(g) + e^{-} \rightarrow Xe^{-}(g)$

C. $O^{-}(g) + e^{-} \rightarrow O^{2-}(g)$

D. $CI^{-}(g) \rightarrow CI(g) + e^{-}$

Answer: B::C::D

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61. In which of the following arrangements the order which is correct according to the property indicated against it.

A. $AI^{+3} < Mg^{+2} < Na^{+} < F^{-}$: Increasing ionic size

B. $B < C < N < O$: Increasing first ionisation enthalpy

C. $I < Br < F < CI$: Increasing electron gain enthalpy (magnitude only)

D. $Li < Na < K < Rb$: Increasing metallic radius

Answer: A::C::D

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62. which of the following order of ionisation energy is correct?

A. $Li > Be(III.\,E.)$

B. $N > O(III.\,E.)$

C. $Be < B(III.\,E.)$

D. $F < O(III.\ E.\ )$

Answer: A::C::D

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63. Which of the following statements is/are correct?

A. Elements Ce to Lu are called lanthanides

B. $P < Si < Be < Mg < Na$ in the increasing order of metallic character

C. Mg has the largest size and AI^{3+} has smallest size among $Mg.\ Mg^{+2}, AI, AI^{+3}$

D. Among P, S, CI, F, phosphorous has least negative electron gain enthalpy.

Answer: A::B::C::D

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64. Which of the following are endothermic process?

A. $S^{-}(g) \rightarrow S^{-2}(g)$

B. $AI^{2+}(g) \rightarrow AI^{3+}(g)$

C. $N(g) \rightarrow N^{-1}(g)$

D. $NaCI(s) \rightarrow Na^{+}(g) + CI^{-}(g)$

Answer: A::B::C::D

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Comprehension 1

1. The periodicity is related to the electronic configuration. That is, all chemical and physical properties are a manifestation of the electronic configuratio of the elements. The atomic and ionic radii generally decrease in a period from left to right. As a consequence, the ionization enthalpes generally increase and electron gain enthalpies become more negative across a period. In order words, the ionization enthalpy of the extreme left element in a period is the least and the electron gain enthalpy of the element on the extreme right is the highest negative. This results into high chemical reactivity at the two extremes and the lowest in the centre. Similary, down the group, the increase in ionization enthalpies and a regular decrease (with exception in some third period elements) in electron gain enthalpies in the case of main group elements. The loss and gain of electrons can be co-related with the reducing and oxidising behaviour, and also with metallic and non-metallic character respectively of the elements.

The correct order of the metallic character is:

A. $Na > Mg > AI > Si$

B. $Mg > Na > AI > Si$

C. $AI > Mg > Na > Si$

D. $Si > AI > Na > Mg$

Answer: A

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Comprehension

1. The periodicity is related to the electronic configuration. That is, all chemical and physical properties are a manifestation of the electronic configuratio of the elements. The atomic and ionic radii generally decrease in a period from left to right. As a consequence, the ionization enthalpes generally increase and electron gain enthalpies become more negative across a period. In order words, the ionization enthalpy of the extreme left element in a period is the least and the electron gain enthalpy of the element on the extreme right is the highest negative. This results into high chemical reactivity at the two extremes and the lowest in the centre. Similary, down the group, the increase in ionization enthalpies and a regular decrease (with exception in some third period elements) in electron gain enthalpies in the case of main group elements. The loss and gain of electrons can be co-related with the reducing and oxidising behaviour, and also with metallic and non-metallic character respectively of the elements.

The correct order of the non-metallic character is:

A. $B > C > Si > N > F$

B. $Si > C > B > N > F$

C. $F > N > C > B > Si$

D. $F > N > C > Si > B$

Answer: C

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2. The periodicity is related to the electronic configuration. That is, all chemical and physical properties are a manifestation of the electronic configuratio of the elements. The atomic and ionic radii generally decrease in a period from left to right. As a consequence, the ionization enthalpes generally increase and electron gain enthalpies become more negative across a period. In order words, the ionization enthalpy of the extreme left element in a period is the least and the electron gain enthalpy of the element on the extreme right is the highest negative. This results into high chemical reactivity at the two extremes and the lowest in the centre. Similary, down the group, the increase in ionization enthalpies and a regular decrease (with exception in some third period elements) in electron gain enthalpies in the case of main group elements. The loss and gain of electrons can be co-related with the reducing and oxidising behaviour, and also with metallic and non-metallic character respectively of the elements.

Which of the following statements is incorrect?

A. Oxide of aluminium (AI_2O_3), and arsenic (As_2O_3) are amphoteric

B. Oxide of chlorine (CI_2O_7) is less acidic than oxide of nitrogen (N_2O_5)

C. Oxide of carbon (CO_2) is more acidic than oxide of silica (SiO_2).

D. The correct increasing order of basic character of various oxides is $H_2O < CuO < MgO < CaO$

Answer: B

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3. The amount of energy required to remove, an electron from the last orbit of an isolated (free) atom in gaseous state is known as ionisation energy or first ionisation of the element. Similarly the energy required for the removal of the electron from the unipositive ion (M^{+} produced above) is referred to as second ionization energy and thus the third, fourth etc. The ionisation energy depends on various factors like nuclear charge, size of atom, type configurations, screening effect and penetration power of the electrons.

The domination factor responsible for the decreasing ionisation energies of the elements of moving down the group is:

A. atomic radius

B. type of electron to be removed

C. the valence sheel electron configuration

D. all of the above

Answer: A

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4. The amount of energy required to remove, an electron from the last orbit of an isolated (free) atom in gaseous state is known as ionisation energy or first ionisation of the element. Similarly the energy required for the removal of the electron from the unipositive ion (M^{+} produced above) is referred to as second ionization energy and thus the third, fourth etc. The ionisation energy depends on various factors like nuclear charge, size of atom, type configurations, screening effect and penetration power of the electrons.

Which of the following order is not correct?

A. $IE(l)$ of $Be > IE(l)$ of B but $IE(II)$ of $Be < IE(II)$ of B

B. $IE(l)$ of $Be < IE(l)$ of B but $IE(II)$ of $Be < IE(II)$ of B

C. $IE(II)$ of $O > IE(II)$ of N

D. $IE(l)$ of $Mg > IE(l)$ of Al

Answer: B

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5. Numerous forms of the periodic table have been revised from time to time. A modern verion, which is most convenient and widely used is the long or extended from the periodic table. The aufbau principle (electrons are filled in the progressive order of their increasing energy i.e., by n + l rule) and the electronic configuration of atom provides a theoretical foundation for the periodic classification. The horizontal rows are called periods. There are altogether seven periods. The first period consists of 2 elements. The subsequent periods consist of 8, 8, 18 and 32 elements respectively. The seventh maximum of 32 elements. Elements having similar outer electronic configurations in their atoms are grouped in vertical columns. These are referred to as groups or famillies. According to the recommendation of IUPAC, the groups are numbered 1 to 18 replacing the older notation of groups 0, IA, IIA ..... VIIA, VIII, IB, ... VII B. Each successive period in the periodic table is associated with the filling up of next higher principal energy level following aufbua sequence. The number of elements in each period is twice the number of atomic orbitals avaliable in the energy level that is being filled. All the elements are classified into four blocks, i.e., s-block, p-block, d-block and f-block depending on the type of atomic orbitals that are being filled with the last electron of the element.

Elements a,b,c,d and e have the following electronic configurations.

(a) $1s^2, 2s^2 2p^1$

(b) $1s^2, 2s^2 2p^{)}(6), 3s^2 3p^1$

(c) $1s^2, 2s^2 2p^6, 3s^2 3p^1$

(d) $1s^2, 2s^2 2p^6, 3s^2 3p^5$

(e) $1s^2, 2s^2 2p^6, 3s^2 3p^5$

Which among these will belong to the same group in periodic table?

A. a and c

B. a and b

C. a and b

D. d and e

Answer: B

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6. Numerous forms of the periodic table have been revised from time to time. A modern verion, which is most convenient and widely used is the long or extended from the periodic table. The aufbau principle (electrons are filled in the progressive order of their increasing energy i.e., by n + l rule) and the electronic configuration of atom provides a theoretical foundation for the periodic classification. The horizontal rows are called periods. There are altogether seven periods. The first period consists of 2 elements. The subsequent periods consist of 8, 8, 18 and 32 elements respectively. The seventh maximum of 32 elements. Elements having similar outer electronic configurations in their atoms are grouped in vertical columns. These are referred to as groups or famillies. According to the recommendation of IUPAC, the groups are numbered 1 to 18 replacing the older notation of groups 0, IA, IIA ..... VIIA, VIII, IB, ... VII B. Each successive period in the periodic table is associated with the filling up of next higher principal energy level following aufbua sequence. The number of elements in each period is twice the number of atomic orbitals avaliable in the energy level that is being filled. All the elements are classified into four blocks, i.e., s-block, p-block, d-block and f-block depending on the type of atomic orbitals that are being filled with the last electron of the element.

If aufbau rule is not followed, Ca-20 will be placed in........block.

A. s

B. p

C. d

D. f

Answer: C

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7. Numerous forms of the periodic table have been revised from time to time. A modern verion, which is most convenient and widely used is the long or extended from the periodic table. The aufbau principle (electrons are filled in the progressive order of their increasing energy i.e., by n + l rule) and the electronic configuration of atom provides a theoretical foundation for the periodic classification. The horizontal rows are called periods. There are altogether seven periods. The first period consists of 2 elements. The subsequent periods consist of 8, 8, 18 and 32 elements respectively. The seventh maximum of 32 elements. Elements having similar outer electronic configurations in their atoms are grouped in vertical columns. These are referred to as groups or famillies. According to the recommendation of IUPAC, the groups are numbered 1 to 18 replacing the older notation of groups 0, IA, IIA ..... VIIA, VIII, IB, ... VII B. Each successive period in the periodic table is associated with the filling up of next higher principal energy level following aufbua sequence. The number of elements in each period is twice the number of atomic orbitals avaliable in the energy level that is being filled. All the elements are classified into four blocks, i.e., s-block, p-block, d-block and f-block depending on the type of atomic orbitals that are being filled with the last electron of the element.

What is the position of the element in the periodic table satisfying the electronic configuration $(n1)d^1ns^2$ for $n = 4$?

A. 3rd period and 3rd group

B. 4th period and 4th group

C. 3rd period and 2nd group

D. 4th period and 3rd group

Answer: D

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8. Numerous forms of the periodic table have been revised from time to time. A modern verion, which is most convenient and widely used is the long or extended from the periodic table. The aufbau principle (electrons are filled in the progressive order of their increasing energy i.e., by n + l rule) and the electronic configuration of atom provides a theoretical foundation for the periodic classification. The horizontal rows are called periods. There are altogether seven periods. The first period consists of 2 elements. The subsequent periods consist of 8, 8, 18 and 32 elements respectively. The seventh maximum of 32 elements. Elements having similar outer electronic configurations in their atoms are grouped in vertical columns. These are referred to as groups or famillies. According to the recommendation of IUPAC, the groups are numbered 1 to 18 replacing the older notation of groups 0, IA, IIA ..... VIIA, VIII, IB, ... VII B.

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In Mendeleev's periodic table, silver belongs to IB group. The group to which silver belongs in long form of periodic table is (Atomic number =47):

A. first

B. tenth

C. sixteenth

D. eleventh

Answer: D

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9. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

$$Z^* = Z - \sigma$$

Where σ=sum of the shielding contributions. The rules for estimating contributions to σ are as follows (Slater's rule) Contribution to shielding by each electron is :

Electron Grpoup	All Higher Group	Same Group	Group $n-1$	Group$\leq$ $n-2$
$1s$	0	0.30	—	—
(ns, sp)	0	0.35	0.85	1.00
(nd) or (nf)	0	0.35	1.00	1.00

According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

Z^* for a 1st electron in Fe atom is:

A. 2.85

B. 25.70

C. 25.65

D. 3.75

Answer: B

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10. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

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$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

The magnitude of first ionisation energy for Na (according to formula given) is equal to:

A. energy of its 3s electron

B. energy of its 1s electron

C. energy of its 2s electron

D. energy of its 2p electron

Answer: A

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11. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

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$1s$	0	0.30	$-$	$-$
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(nd) or (nf)	0	0.35	1.00	1.00

According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

The size of isoelectronic species $-F^-$, Na^+ and Mg^{2+} is effected by:

A. nuclear charge

B. valence principal quantum number (n)

C. electron-electron interaction in the outer orbitals

D. none of the above

Answer: A

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12. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

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According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

The correct order of radii is:

A. $Na < Li < K$

B. $O > S > Se$

C. $CI < F < Li$

D. $Fe^{3+} < Fe^{2+} < Fe$

Answer: D

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13. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

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According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

Atomic radii of the noble gases are larger than the precedent elements of the same periods because:

A. atomic radius of noble gas is expressed as van der Waals' radius

B. valence shell electrons are completely filled so there is interelectronic repulsions

C. both (a) and (b)

D. none of the above

Answer: C

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14. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

$Z^* = Z - \sigma$

Where σ=sum of the shielding contributions. The rules for estimating contributions to σ are as follows (Slater's rule) Contribution to shielding by each electron is :

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According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

Which of the following statements is correct?

A. Metallic radius refer to metals only is greater than covalent radius.

B. Metallic radius refer to metals only and is smaller than covalent radius

C. Generally covalent radius refer to non-metals as well as metals in bonded state (covalent bond).

D. Atomic radii of noble gases are expressed as van der Waal's radii which are smaller than metallic radii.

Answer: A

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15. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

$Z^* = Z - \sigma$

Where σ=sum of the shielding contributions. The rules for estimating contributions to σ are as follows (Slater's rule) Contribution to shielding by each electron is :

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(nd) or (nf)	0	0.35	1.00	1.00

According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

Which one among the following sets of ions represents the collection of isoelectronic species?

A. $S^{2-}, CI^-, K^+, Ca^{2+}, Sc^{3+}$

B. $N^{3-}, O^{2-}, Na^+, Mg^{2+}, AI^{3+}$

C. $K^+, CI^-, Mg^{2+}, AI^{3+}, Sc^{3+}$

D. (a) and (b) both

Answer: D

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16. The amount of energy required to remove the most loosely bound electron from an isolated gaseous atom is called as first ionization energy (IE_1). Similarly the amount of energies required to knock out second, third etc. electrons from the isolated and $IE_3 > IE_2 > IE_1$.

(i) Nuclear charge (ii) Atomic size (iii) penetration effect of the electrons (iv) shielding effect of the inner electrons and (b) electronic configurations (exactly half filled and completely filled configurations are extra stable) are the important factors which affect the ionisation energies. Similarly, the amount of energy released when a neutral isolated gaseous atom accepts an extra electron to from gaseous anion is called electron affinity.

$\left(X(g) + e^{-}(g) \rightarrow X^{-}(g) + \text{ energy}\right.$

A positive elecrton affinity idicates that the ion X^{-} has a lower more negative energy than the neutral atom X. The second electron affinity for the addition of a second electron to an initially neutral atom is negative because the electron replusion outweights the nuclear attraction, e.g.,

$$O(g) + e^{-} \xrightarrow{\text{Exothermic}} O^{-}(g), E_a = +141kJmol^{-} \text{ ....(i)}$$

$$O^{-}(g) + e^{-} \xrightarrow{\text{Excothermic}}, E_a = -780kJmol^{-} \text{ ...(ii)}$$

The electron affinity of an element depends upon (i) atomic size (ii) nuclear charge and (iii) electronic configuration. In general, in a group, ionisation energy and electron affinity decrease as the atomic size increases. The members of third period have some higher (e.g., S and Cl) electron affinity values than the members of second period (e.g., O and F) because second period elements have very small atomic size. Hence, there is tendency of electron-electron repulsion, which resultss in less evolution of energy in the formation of correcsponding anion.

The first ionisation energy of Na, Mg, AI and Si are in the order of:

A. $Na < Mg > AI < Si$

B. $Na > Mg > AI > Si$

C. $Na < Mg < AI < Si$

D. $Na > Mg > AI > Si$

Answer: A

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17. The amount of energy required to remove the most loosely bound electron from an isolated gaseous atom is called as first ionization energy (IE_1). Similarly the amount of energies required to knock out second, third etc. electrons from the isolated and $IE_3 > IE_2 > IE_1$.

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Which one of the following statements is incorrect in relation to ionisation enthalpy?

A. Ionization enthalpy increase for each successive electron.

B. The greatest increase in ionization enthalpy is experienced on removal of electron from core of noble gas configuration

C. End of valence electrons is marked by a big jump in ionization enthalpy

D. Removal of electron from orbitals bearing lower n value is easier than from orbital having higher n value.

Answer: D

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18. The minimum amount of energy which is required to remove an outermost electron from any isolated neutral gaseous atom is known as first ionisation energy. These are the following factors which effect ionisation energy.

(i) Ionisation energy $\propto \frac{1}{\text{Principal quantum number}}$

(ii) Ionisation energy $\propto Z_{eff}$

(iii) If orbitals are fully filled or half filled so stability will be more and ionisation energy will be high.

(iv) If penultimate electron will effectively shield the nucles, ionisation energy will be less and vice versa.

Which of the following has maximum Ist ionisation energy?

A. He

B. Mg

C. N

D. Na

Answer: A

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19. The ionisation energy (IE_1) of an atom is defined as the energy needed to remove an electron from gaseous atom in its ground state. The 2nd ionisation energy (IE_2) is the additional energy needed to remove the 2nd electron and so on. The successive ionisation energy of any species is increasing always.

Which represents the correct order of first ionisation potential of third period elements?

A. $Na > Mg > Ai > Si$

B. $Na < Mg < AI < Si$

C. $Na < Si < AI < Mg$

D. $Na < AI < Mg < Si$

Answer: D

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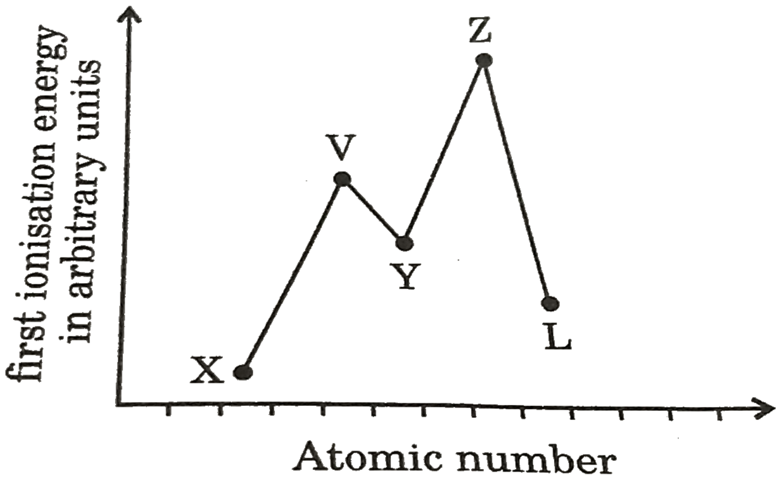
20. The ionisation energy (IE_1) of an atom is defined as the energy needed to remove an electron from gaseous atom in its ground state. The 2nd ionisation energy (IE_2) is the additional energy needed to remove the 2nd electron and so on. The successive ionisation energy of any species is increasing always.

In the graph below elements of period given with their ionisation energy.

Select the one which represents an alkali metal:



A. X

B. Y

C. Z

D. L

Answer: A

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21. An atom is assumed to tbe spherical in shape and thus, the size of atom is generally given in terms of radius of the sphere and is called atomic radius. It is usually defined as the distance between the centre of the nucleus and outermost shell where electron are present. The exact measure of atomic radius is not easy due to following reasons:

(i) The atom does not have well defined boundary. the probability of finding the electron is never zero even at large distance from the nucleus.

(ii) It is not possible to get an isolated atom. the electron density around an atom is affected by the presence of neighbouring atoms, i.e., the size of the atom changes in going from one set of environement to another.

(iii) the size of an atom is very small, of the order of about 1.2 Å,i.e., $1.2 \times 10^{-10} m$.

An estimate of the size of the atom can, however, be made by knowing the distance betweent he atoms in the combined state. the distance between the atoms, i.e., bond length are generally measured by the application of techniques such as X-ray differaction, electron diffraction, infrared spectroscopy, nuclear magnetic resonance spectroscopy, etc. However, bond lengths change with different type of bonding. Three types of radius are commonly used, i.e.,

(a) Covalent radius (b) crystals radius (c) Vander waal's radius

Choose incorrect option regarding atomic radius

A. $F^{-} < CI^{-} < H^{-}$

B. $N^{3-} > O^{2-} > F^{-}$

C. $Cr^{2+} < Cr^{3+}$

D. $Fe^{2+} > Fe^{3+}$

Answer: C

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(a) Covalent radius (b) crystals radius (c) Vander waal's radius

Atomic radius of atoms in a period decreases with the increases in Z_{eff} which of the following is incorrect order of atomic radius ?

A. $Li > Be > B > C$

B. $Na < Mg < AI < Si$

C. $Si > P > S > CI$

D. $K > Ca$

Answer: B

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23. An atom is assumed to tbe spherical in shape and thus, the size of atom is generally given in terms of radius of the sphere and is called atomic radius. It is usually defined as the distance between the centre of the nucleus and outermost shell where electron are present. The exact measure of atomic radius is not easy due to following reasons:

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(a) Covalent radius (b) crystals radius (c) Vander waal's radius

Choose incorrect option regarding atomic size

A. $Zr = Hf$

B. $Fe = Co = Ni$

C. $Y = La$

D. All of these

Answer: C

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24. An atom is assumed to be spherical in shape and thus, the size of atom is generally in term of radius of the sphere and is called atomic radius. It is usually defined as the distance between the centre of the nucleus and outermost shell where electron or electrons are present. The exact measure of atomic radius is not easy due to following reasons :

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However, bond length change with different type of bonding. Three types of radius are commonly used, i.e.,

(a) Covalent radius (b) Crystal radius

(c) van der Waal's radius

Which of the following set of ions have the same value of screening constant for the valence electron, calculated from Slater's rule?

A. Li^{+}, Na^{+}, K^{+}

B. Na^{+}, Mg^{2+}, AI^{3+}

C. F^{-}, CI^{-}, Br^{-}

D. F^{-}, O^{2-}, S^{2-}

Answer: B

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25. Some of the properties which depend on electronic configuration elements are - atomic radii, ionisation potential, and electronegativity etc. In period, the ionisation energy is lowest for the:

A. noble gases

B. halogens

C. alkaline earth metals

D. alkali metals

Answer: D

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26. Some of the properties which depend on electronic configuration elements are - atomic radii, ionisation potential, and electronegativity etc. The values of electronegativity of atoms A and B are 1.20 and 4 respectively. The percentage ionic character of A-B bond is:

A. 50%

B. 72.2%

C. 55.3%

D. 43.0%

Answer: B

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27. In the modern period table, elements are arranged in order of increasing atomic number which is related to the electric configuration. Depending upon the type of orbitals receving the last electron, the elements in the periodic table have been diviced into four blocks viz s,p,d and f. The modern periodic table consists of 7 periods and 18 groups. Each period being with the filling of a new energy shell. In according with the Aufbua principle, the seven periods (1 to 7) have 2,8, 8, 18, 18, 32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanodis and actionoids are placed at the bottom of the main body of the periodic table.

The last element of p-block in 6th period is represented by the outermost electronic configuration.

A. $7s^2 7p^6$

B. $5f^{14}6d^{10}7s^{2}7p^{0}$

C. $4f^{14}5d^{10}6s^{2}6p^{6}$

D. $4f^{14}5d^{10}6s^{2}6p^{4}$

Answer: C

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28. In the modern period table, elements are arranged in order of increasing atomic number which is related to the electric configuration. Depending upon the type of orbitals receving the last electron, the elements in the periodic table have been diviced into four blocks viz s,p,d and f. The modern periodic table consists of 7 periods and 18 groups. Each period being with the filling of a new energy shell. In according with the Aufbua principle, the seven periods (1 to 7) have 2,8, 8, 18, 18, 32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanodis and actionoids are placed at the bottom of the main body of the periodic table.

Which of the elements whose atomic numbers are given below, cannot be accommodated in the present set up of the long form of the pariodic table?

A. 107

B. 118

C. 126

D. 102

Answer: C

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29. In the modern periodic table, elements are arranged in order of increasing atomic numbers, which is related to the electornic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, viz, p,d and f. The modern periodic table consists of 7 periods and

18 groups. Each period begins with the filling of a new energy shell. in accordance with the Aufbau principal, the seven periods (1 to 7) have 2,8,8,18,18,32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanoids and actinoids, are placed at the bottom of the main body of the periodic table

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

A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^3 4p^6$

C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$

Answer: A

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30. In the modern periodic table, elements are arranged in order of increasing atomic numbers, which is related to the electornic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, viz, p,d and f. The modern periodic table consists of 7 periods and 18 groups. Each period begins with the filling of a new energy shell. in accordance with the Aufbau principal, the seven periods (1 to 7) have 2,8,8,18,18,32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanoids and actinoids, are placed at the bottom of the main body of the periodic table

The elements with atomic numbers 35,53 and 85 are all

A. noble gases

B. halogens

C. heavy metals

D. light metals

Answer: B

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31. Ionisation energies three hypothetical elements are given below (in kJ/mole) :

	I	II	III
X	122	340	1890
Y	99	931	1100
Z	118	1220	16552

Which of the following pairs represents elements could be of the same group?

A. Y,Z

B. X,Y

C. X,Z

D. X,Y,Z

Answer: A

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32. Ionisation energies three hypothetical elements are given below (in kJ/mole) :

	I	II	III
X	122	340	1890
Y	99	931	1100
Z	118	1220	16552

What could be the value of the first electron affinity of Z^{++} in $KJmol^{-1}$?

A. 118

B. 1220

C. 1652

D. 734

Answer: B

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33. Ionisation energies three hypothetical elements are given below (in kJ/mole) :

	I	II	III
X	122	340	1890
Y	99	931	1100
Z	118	1220	16552

Energy (in kJ/mole) required for the process $Z \rightarrow Z^{2+} + 2e^{-}$ will be:

A. 118

B. 1220

C. 1338

D. 2872

Answer: C

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34. In 1931, Pauling defined the electronegativity of an atom as the tendency of the atom to attract electrons to itself when combined in a compound. The implication is that when a covalent bond is formed, the electrons used for bonding need not be shared equally by both atoms. If the bonding electrons spend more time around one atom, that atom will have a $\partial -$ charge, and consequently the other atom will have a $\partial +$ charge. In the extreme case, where the bonding electrons are round one atom all of the time, the bond is ionic. Pauling and others have attempted to relate the electronegativity difference between two atoms to the amount of ionic character in the bond between them.

Mulliken

In 1934, Mulliken suggested an alternative approach to electronegativity based on the ionization energy and electron affinity of an atom. Consider two atoms A and B. If an electron is transferred from A to B, forming ions A^+ and B^-, then the energy change is the ionization energy of atom $A(I_A)$ minus the electron affinity of atom $B(E_B)$, that is $I_A - E_B$. Alternatively, if the electron was transferred the other way to give B^+ and A^- ions, then the energy changed would be $I_B - I_A$. If A^+ and B^- are actually formed, then this process require less energy , and

$(I_A - E_B) < (I_B - E_A)$

Rerranging $(I_A + E_A) < (I_A - E_B)$

Now with respect to electronegativity for the same change,

$E.N_A < E.N_B$.

Thus Mulliken suggested that electronegativity is proportional to $I.E + E.A$ and could be regarded as the average of the ionization energy and the electron affinity of an atom.

Electronegativity $= \dfrac{(I + E)}{2}$

Mulliken used I and E values measured in electron volts, and the values were about 2.8 times alrger than the Pauling values. It is to be noted that $I.E.$ and $E.A$ values are defined for singular gaseous atoms.

For the reaction $A(g) + e^- \rightarrow A^+(g) \Delta H_r = \Delta H_{eg}$. The enthalpy change will be equal to (magnitude wise):

A. ΔH_{eg} of $A^-(g)$

B. $\Delta H_{I.E}$ of $A(g)$

C. $\Delta H_{E.N}$ of $A(g)$

D. $\Delta H_{I.E}$ of $A^-(g)$

Answer: D

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35. In 1931, Pauling defined the electronegativity of an atom as the tendency of the atom to attract electrons to itself when combined in a compound. The implication is that when a covalent bond is formed, the electrons used for bonding need not be shared equally by both atoms. If the bonding electrons spend more time around one atom, that atom will have a $\partial -$ charge, and consequently the other atom will have a $\partial +$ charge. In the extreme case, where the bonding electrons are round one atom all of the time, the bond is ionic. Pauling and others have attempted to relate the electronegativity difference between two atoms to the amount of ionic character in the bond between them.

Mulliken

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were about 2.8 times alrger than the Pauling values. It is to be noted that

$I.\ E.$ and $E.\ A$ values are defined for singular gaseous atoms.

For a reaction $A(g) + B(g) rar AB(S)$ the enthalpy change for the

recation will be [assuming $AB(s)$ to be an ionic compound] If

$I.\ E_A + E.\ A_A < I.\ E_B + E.\ A_B$

A. $\Delta H_{I.E.A} + \Delta H_{eg_A} + \Delta H_{I.E_{AB(s)}}$

B. $\Delta H_{eg_A} + \Delta H_{I.E_B} + \Delta H_{L.E_{AB(s)}}$

C. $I.\ E_A + E.\ A_B + \Delta H_{L.E_{AB_s}}$

D. $I.E_B + E.A_B + \Delta_{L.E_{AB(s)}}$

Answer: C

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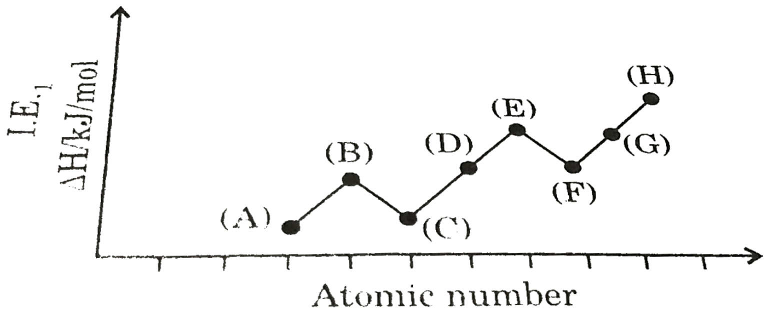

36.

In above graph element F is:

A. oxygen

B. nitrogen

C. fluorine

D. neon

Answer: A

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37. The amount of energy released when an electron is added to an isolated gaseous atom to produce a monovalent anion is called electron affinity of first electron affinity or electron gain enthalpy. The first electron affinity is given a negative sign as the addition of an electron to a neutral atom is an exoergic process. The addition of electron to A^{-} requires energy to overcome the force of repulsion. Thus, the second electron affinity is an endoergic process. The magnitude of electron affinity depends on a number of factors such as (i) atomic size (ii) effective nuclear charge (iii) screening effects (iv) half and fully filled orbitals and (v) shape of orbital. In general, electron affinity increase as the atomic radii decrease in a period. However, there are exceptions when the atoms have stable configuration. In a group, electron affinity decreases as the size increases. However, the members of 3rd period have somewhat higher values than the members in the 2nd period of the same subgroups.

Which of the following has least electron affinity?

A. Oxygen

B. Argon

C. Nitrogen

D. Boron

Answer: B

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38. The amount of energy released when an electron is added to an isolated gaseous atom to produce a monovalent anion is called electron affinity of first electron affinity or electron gain enthalpy. The first electron affinity is given a negative sign as the addition of an electron to a neutral atom is an exoergic process. The addition of electron to A^- requires energy to overcome the force of repulsion. Thus, the second electron affinity is an endoergic process. The magnitude of electron affinity depends on a number of factors such as (i) atomic size (ii) effective nuclear charge (iii) screening effects (iv) half and fully filled orbitals and (v) shape of orbital. In general, electron affinity increase as the atomic radii decrease in a period. However, there are exceptions when the atoms have stable configuration. In a group, electron affinity decreases as the size increases. However, the members of 3rd period have somewhat higher values than the members in the 2nd period of the same subgroups.

The electron affinities of halogens are:

$F = -332, CI = -349, Br = -324, I = -295 kJmol^{-1}$ The higher value of CI as compared to that of F^{-} is due to:

A. higher atomic radius of F

B. smaller electronegativity of F

C. weaker electron repulsion in CI

D. more vacant p-subshell in CI

Answer: C

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39. The amount of energy released when an electron is added to an isolated gaseous atom to produce a monovalent anion is called electron affinity of first electron affinity or electron gain enthalpy. The first electron affinity is given a negative sign as the addition of an electron to a neutral atom is an exoergic process. The addition of electron to A^{-} requires energy to overcome the force of repulsion. Thus, the second electron affinity is an endoergic process. The magnitude of electron affinity depends on a number of factors such as (i) atomic size (ii) effective nuclear charge (iii) screening effects (iv) half and fully filled orbitals and (v) shape of orbital. In general, electron affinity increase as the atomic radii decrease in a period. However, there are exceptions when the atoms have stable configuration. In a group, electron affinity decreases as the size increases. However, the members of 3rd period have somewhat higher values than the members in the 2nd period of the same subgroups.

Which of the following species has the highest electron affinity?

A. F^{-}

B. O^{-}

C. Na^{+}

D. O

Answer: D

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40. The properties of the elements (atomic/ionic radii, electron gain enthalpy, ionization enthalpy, electronegativity, valence, oxidising/reducing power, acid/base character, etc.) which are directly or indirectly related to their electronic configirations are called periodic properties. These properties show a regular gradation on moving from left to right in a period or form top to bottom in a group. Down a group, the atomic/ionic radii, metallic character and reducing character increase while ionization enthalpy and electronegativity decrease. Along a period from left to right, atomic/ionic and metallic character decrease while ionization enthaloy, electronegativity, non-metallic character and oxiding power increase. However, electron gain enthalpy becomes less negative down a group butmore negative along a period. In contrast, inert gases have positive electron gain enthalpies which do not show may regular trend.

Which of the following isoelectronic ions has the lowest first ionization enthalpy?

A. K^+

B. Ca^{2+}

C. CI^-

D. S^{2-}

Answer: D

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41. The properties of the elements (atomic/ionic radii, electron gain enthalpy, ionization enthalpy, electronegativity, valence, oxidising/reducing power, acid/base character, etc.) which are directly or indirectly related to their electronic configirations are called periodic properties. These properties show a regular gradation on moving from left to right in a period or form top to bottom in a group. Down a group, the atomic/ionic radii, metallic character and reducing character increase while ionization enthalpy and electronegativity decrease. Along a period from left to right, atomic/ionic and metallic character decrease while ionization enthaloy, electronegativity, non-metallic character and oxiding power increase. However, electron gain enthalpy becomes less negative down a group butmore negative along a period. In contrast, inert gases have positive electron gain enthalpies which do not show may regular trend.

The outermost electronic configuration of the most electronegative elements is:

A. ns^2np^3

B. ns^2np^4

C. ns^2np^5

D. ns^2np^6

Answer: C

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42. The properties of the elements (atomic/ionic radii, electron gain enthalpy, ionization enthalpy, electronegativity, valence, oxidising/reducing power, acid/base character, etc.) which are directly or indirectly related to their electronic configirations are called periodic properties. These properties show a regular gradation on moving from left to right in a period or form top to bottom in a group. Down a group, the atomic/ionic radii, metallic character and reducing character increase while ionization enthalpy and electronegativity decrease. Along a period from left to right, atomic/ionic and metallic character decrease while ionization enthaloy, electronegativity, non-metallic character and oxiding power increase. However, electron gain enthalpy becomes less negative down a group butmore negative along a period. In contrast, inert gases have positive electron gain enthalpies which do not show may regular trend.

Amomgst the following elements (whose electronic configurations are given below) the one having the highest ionization enthalpy is :

A. $[Ne]3s^2 3p^1$

B. $[Ne]3s^2 3p^3$

C. $[Ne]3s^2 3p^2$

D. $[Ar]3d^{10} 4s^2 4p^3$

Answer: B

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43. The properties of the elements (atomic/ionic radii, electron gain enthalpy, ionization enthalpy, electronegativity, valence, oxidising/reducing power, acid/base character, etc.) which are directly or indirectly related to their electronic configirations are called periodic properties. These properties show a regular gradation on moving from left to right in a period or form top to bottom in a group. Down a group, the atomic/ionic radii, metallic character and reducing character increase while ionization enthalpy and electronegativity decrease. Along a period from left to right, atomic/ionic and metallic character decrease while ionization enthaloy, electronegativity, non-metallic character and oxiding power increase. However, electron gain enthalpy becomes less negative down a group butmore negative along a period. In contrast, inert gases have positive electron gain enthalpies which do not show may regular trend.

Tick the correct order of second ionization enthalpy in the following:

A. $F > O > N > C$

B. $O > F > N > C$

C. $O > N > F > C$

D. $C > N > O > F$

Answer: B

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44. A quantitative measure of the tendency of an element to lose electron is given by its ionization enthalpy. It represents the energy required to remove an electron from an isolated gaseous atom (X) in its ground state. In other words, the first ionization enthalpy for an element X is the enthalpy change $(\Delta_i H)$ for the reaction depicted.

$X(g) \rightarrow X^{+}(g) + e^{-}$

The ionization enthalpy is expressed in units of $kJmol^{-1}$. We can define the second ionization enthalpy as the energy required to remove the second most loosely bound electron: it is the energy required to carry out the reaction,

$X^{+}(g) \rightarrow X^{2+}(g) + e^{-}$

Consider following statements for the two uncharged gaseous species

Species -1 $= 1s^2, 2s^1$ Species -2 $= 1s^2, 2p^1$

(P) Species-1 is ground state, species-2 is excited state of same atom

(Q) Species-1 is excited state, species-2 is ground state of same atom

(R) Ionization of species-1 is easier as compared to species-2

(S) Ionization of species-2 is easier as compared to species-1

Select correct statement(s)

A. P and R

B. Q and R

C. P and S

D. Q and S

Answer: C

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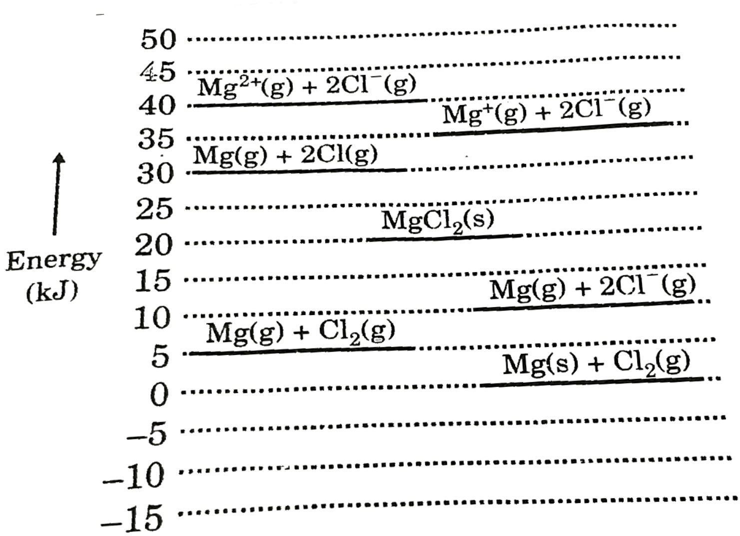
45. Born Haber cycle helps to determine lattice enthalpy of ionic compound as well as electron gain enthalpy of different elements. Based on the diagram drawn, answer the questions given below.



What is the value of IE_1 of $Mg + IE_1$ of Mg^+?

A. 25 kJ

B. 5 kJ

C. 30 kJ

D. 20 kJ

Answer: C

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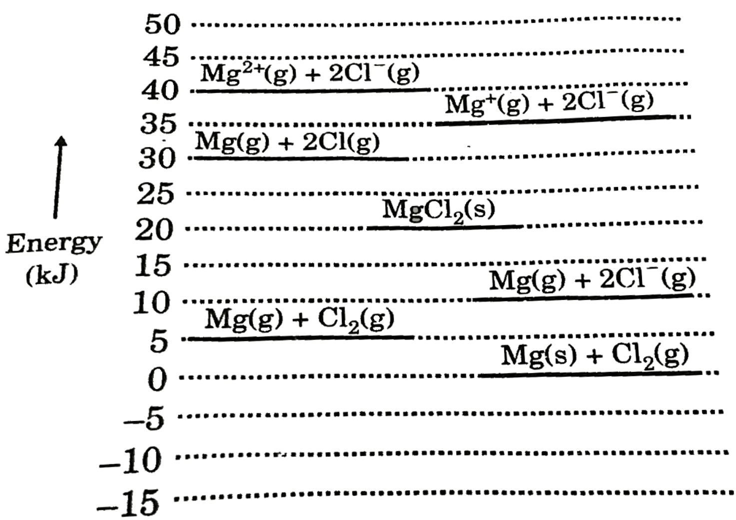
46. Born Haber cycle helps to determine lattice enthalpy of ionic compound as well as electron gain enthalpy of different elements. Based on the diagram drawn, answer the questions given below.



What is the electron gain enthalpy of $CI(g)$?

A. $-5kJ$

B. $-25kJ$

C. $-20kJ$

D. $-10kJ$

Answer: D

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47. Nitrogen can form many oxides with oxygen, and thus is said to exhibit variable valency. Similary, sulphur, phosphours and carbon can exhibit variable valency.

Which sequence of compounds is according to the increasing order of the oxidation state of chlorine?

A. $CI_2, CI_2O, CI_2O_3, CI_2O_5, CI_2O_7, NH_4CI$

B. $CI_2, CI_2O, CI_2O_3, CI_2O_7, CI_2O_5$

C. $CI_2, CI_2O, CI_2O_3, CI_2O_5, CI_2O_7$

D. $CI_2, CI_2O_3, CI_2O_7, CI_2$

Answer: C

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48. The size of any species depends on various factors such as nature of charge, magnitude of charge/oxidation state, effective nuclear charge, electronic configuration etc.

It has been observed that size of Indium (In) $\approx$ Thallium (TI). This can be attributed to:

A. actinoid contraction

B. lanthanoid contraction

C. both (a) and (b)

D. scandide contraction

Answer: B

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49. Ionisation energies of unknown elements are given below :

Element	IE(in kcal/mol)		
	I	II	III
M	209	548	919
N	100	735	1101
O	119	1092	1653
P	1500	2017	2320

Which amongst them is expected to be a noble gas?

A. M

B. N

C. O

D. P

Answer: D

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Comprehension 2

1. The amount of energy required to remove, an electron from the last orbit of an isolated (free) atom in gaseous state is known as ionisation energy or first ionisation of the element. Similarly the energy required for the removal of the electron from the unipositive ion (M^+ produced above) is referred to as second ionization energy and thus the third, fourth etc. The ionisation energy depends on various factors like nuclear charge, size of atom, type configurations, screening effect and penetration power of the electrons.

Which of the following statements is correct?

A. Ionisation energies of elements decrease along the period.

B. Ionisation energies of the II A group element are less than that of the corresponding IIIA group elements

C. Ionisation energies of group 15 elements are less than that of the corresponding group 16 elements.

D. Ionisation energy of Ga is greater than Al.

Answer: D

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Comprehension 3

1. Numerous forms of the periodic table have been revised from time to time. A modern verion, which is most convenient and widely used is the long or extended from the periodic table. The aufbau principle (electrons are filled in the progressive order of their increasing energy i.e., by n + l rule) and the electronic configuration of atom provides a theoretical foundation for the periodic classification. The horizontal rows are called periods. There are altogether seven periods. The first period consists of 2 elements. The subsequent periods consist of 8, 8, 18 and 32 elements respectively. The seventh maximum of 32 elements. Elements having similar outer electronic configurations in their atoms are grouped in vertical columns. These are referred to as groups or famillies. According to the recommendation of IUPAC, the groups are numbered 1 to 18 replacing the older notation of groups 0, IA, IIA ..... VIIA, VIII, IB, ... VII B. Each successive period in the periodic table is associated with the filling up of next higher principal energy level following aufbua sequence. The number of elements in each period is twice the number of atomic orbitals avaliable in the energy level that is being filled. All the elements are classified into four blocks, i.e., s-block, p-block, d-block and f-block depending on the type of atomic orbitals that are being filled with the last electron of the element.

The element with atomic number 56 is likely to have the same outer shell configuration as the element with atomic number.

A. 12

B. 18

C. 14

D. 20

Answer: A::D

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Comprehension 4

1. The reducing effect of the nuclear charge by the inner electrons for on outer electron is termed aas shielding (or screening). As a result of shielding, the outer electrons in an atom always experience less nnuclear charge than the actual nuclear charge Z. The effective nuclear charge (Z^*) as experienced by an electron is then obtained by subtracting the total shielding contributions from alll the other electrons (i.e., except the one under consideration) from the actual nuclear charge.

$$Z^* = Z - \sigma$$

Where σ=sum of the shielding contributions. The rules for estimating contributions to σ are as follows (Slater's rule) Contribution to shielding by each electron is :

Electron Grpoup	All Higher Group	Same Group	Group $n-1$	Group$\leq$ $n-2$
$1s$	0	0.30	—	—
(ns, sp)	0	0.35	0.85	1.00
(nd) or (nf)	0	0.35	1.00	1.00

According to Slater's treatment, the energy of an electron in nth shell of an atom having atomic number Z is given by the empirical equation

$$E = -13.6\left(\frac{Z^*}{n}\right)^2 eV$$

Z^* = effective nuclear charge

Among the following, which electron of Fe atom experience minimum attraction from nucleus? (Atomic number of $Fe = 26$)

A. 3d

B. 4s

C. 2s

D. 2p

Answer: B

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Comprehension 5

1. The amount of energy required to remove the most loosely bound electron from an isolated gaseous atom is called as first ionization energy (IE_1). Similarly the amount of energies required to knock out second, third etc. electrons from the isolated and $IE_3 > IE_2 > IE_1$.

(i) Nuclear charge (ii) Atomic size (iii) penetration effect of the electrons

(iv) shielding effect of the inner electrons and (b) electronic configurations (exactly half filled and completely filled configurations are extra stable) are the important factors which affect the ionisation energies. Similarly, the amount of energy released when a neutral isolated gaseous atom accepts an extra electron to from gaseous anion is called electron affinity.

$(X(g)+e^{-}(g)\rightarrow X^{-}(g)+$ energy

A positive elecrton affinity idicates that the ion X^{-} has a lower more negative energy than the neutral atom X. The second electron affinity for the addition of a second electron to an initially neutral atom is negative because the electron replusion outweights the nuclear attraction, e.g.,

$O(g)+e^{-}\xrightarrow{\text{Exothermic}} O^{-}(g), E_a = +141 kJmol^{-}$ ....(i)

$O^{-}(g)+e^{-}\xrightarrow{\text{Excothermic}}, E_a = -780 kJmol^{-}$ ...(ii)

The electron affinity of an element depends upon (i) atomic size (ii) nuclear charge and (iii) electronic configuration. In general, in a group, ionisation energy and electron affinity decrease as the atomic size increases. The members of third period have some higher (e.g., S and Cl) electron affinity values than the members of second period (e.g., O and F) because second period elements have very small atomic size. Hence, there is tendency of electron-electron repulsion, which resultss in less evolution of energy in the formation of correcsponding anion.

Identify the least stable ion amongst the following:

A. Li^{-}

B. Be^{-}

C. B^{-}

D. C^{-}

Answer: B

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Comprehension 6

1. The minimum amount of energy which is required to remove an outermost electron from any isolated neutral gaseous atom is known as first ionisation energy. These are the following factors which effect ionisation energy.

(i) Ionisation energy $\propto \frac{1}{\text{Principal quantum number}}$

(ii) Ionisation energy $\propto Z_{eff}$

(iii) If orbitals are fully filled or half filled so stability will be more and ionisation energy will be high.

(iv) If penultimate electron will effectively shield the nucles, ionisation energy will be less and vice versa.

Choose the correct order of Ist ionisation energy

A. $Ne < F$

B. $O > N$

C. $Na > AI$

D. $Mg > AI$

Answer: D

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Comprehension 7

1. The ionisation energy (IE_1) of an atom is defined as the energy needed to remove an electron from gaseous atom in its ground state. The 2nd ionisation energy (IE_2) is the additional energy needed to remove the 2nd electron and so on. The successive ionisation energy of any species is increasing always.

Generally, the first ionisation energy increase along a period. But there are some exceptions. One which is not an exception is:

A. N and O

B. Na and Mg

C. Mg and Al

D. Be and B

Answer: B

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Comprehension 8

1. An atom is assumed to tbe spherical in shape and thus, the size of atom is generally given in terms of radius of the sphere and is called atomic radius. It is usually defined as the distance between the centre of the nucleus and outermost shell where electron are present. The exact measure of atomic radius is not easy due to following reasons:

(i) The atom does not have well defined boundary. the probability of finding the electron is never zero even at large distance from the nucleus.

(ii) It is not possible to get an isolated atom. the electron density around an atom is affected by the presence of neighbouring atoms, i.e., the size of the atom changes in going from one set of environement to another.

(iii) the size of an atom is very small, of the order of about 1.2 Å,i.e., $1.2 \times 10^{-10} m.$

An estimate of the size of the atom can, however, be made by knowing the distance betweent he atoms in the combined state. the distance between the atoms, i.e., bond length are generally measured by the application of techniques such as X-ray differaction, electron diffraction, infrared spectroscopy, nuclear magnetic resonance spectroscopy, etc. However, bond lengths change with different type of bonding. Three types of radius are commonly used, i.e.,

(a) Covalent radius (b) crystals radius (c) Vander waal's radius

The correct order of effective nuclear charge Z_{eff} is

A. $B < C < N < O < F$

B. $B = C = N = O = F$

C. $B > C > N > O > F$

D. none of these

Answer: A

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Comprehension 9

1. Some of the properties which depend on electronic configuration elements are - atomic radii, ionisation potential, and electronegativity etc. The element with maximum electrongativity belongs to :

A. period 2, group 17

B. period 3, group 18

C. period 4, group 17

D. period 2, group 16

Answer: A

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Comprehension 10

1. In the modern period table, elements are arranged in order of increasing atomic number which is related to the electric configuration. Depending upon the type of orbitals receving the last electron, the elements in the periodic table have been diviced into four blocks viz s,p,d and f. The modern periodic table consists of 7 periods and 18 groups. Each period being with the filling of a new energy shell. In according with the Aufbua principle, the seven periods (1 to 7) have 2,8, 8, 18, 18, 32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanodis and actionoids are placed at the bottom of the main body of the periodic table.

The element with atomic number 57 belongs to:

A. s-block

B. p-block

C. d-block

D. f-block

Answer: C

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Comprehension 11

1. Ionisation energies three hypothetical elements are given below (in kJ/mole) :

	I	II	III
X	122	340	1890
Y	99	931	1100
Z	118	1220	16552

Which of the following is likely to be 2nd group element?

A. X

B. Z

C. Y

D. X and Y

Answer: A

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Comprehension 12

1. In 1931, Pauling defined the electronegativity of an atom as the tendency of the atom to attract electrons to itself when combined in a compound. The implication is that when a covalent bond is formed, the electrons used for bonding need not be shared equally by both atoms. If the bonding electrons spend more time around one atom, that atom will have a $\partial -$ charge, and consequently the other atom will have a $\partial +$ charge. In the extreme case, where the bonding electrons are round one atom all of the time, the bond is ionic. Pauling and others have attempted to relate the electronegativity difference between two atoms to the amount of ionic character in the bond between them.

Mulliken

In 1934, Mulliken suggested an alternative approach to electronegativity based on the ionization energy and electron affinity of an atom. Consider two atoms A and B. If an electron is transferred from A to B, forming ions A^+ and B^-, then the energy change is the ionization energy of atom $A(I_A)$ minus the electron affinity of atom $B(E_B)$, that is $I_A - E_B$. Alternatively, if the electron was transferred the other way to give B^+ and A^- ions, then the energy changed would be $I_B - I_A$. If A^+ and B^- are actually formed, then this process require less energy , and

$(I_A - E_B) < (I_B - E_A)$

Rerranging $(I_A + E_A) < (I_A - E_B)$

Now with respect to electronegativity for the same change,

$E.\ N_A < E.\ N_B.$

Thus Mulliken suggested that electronegativity is proportional to $I.\ E + E.\ A$ and could be regarded as the average of the ionization energy and the electron affinity of an atom.

Electronegativity $= \dfrac{(I+E)}{2}$

Mulliken used I and E values measured in electron volts, and the values were about 2.8 times alrger than the Pauling values. It is to be noted that $I.\ E.$ and $E.\ A$ values are defined for singular gaseous atoms.

We have X atoms of A. if all the atoms gain one electron each the energy released is aeV. If Y atoms of A lose one electron each, then the energy absorbed is beV. Then the electronegativity of A on the Mulliken scale will be:

A. $\dfrac{a+b}{2}$

B. $\dfrac{1}{2}\left(\dfrac{a}{X}+\dfrac{b}{Y}\right)$

C. $\dfrac{1}{2}(a+b)\times N_a$

D. $\dfrac{1}{2}\left(\dfrac{a}{X}+\dfrac{b}{Y}\right)\times N_a$

Answer: B

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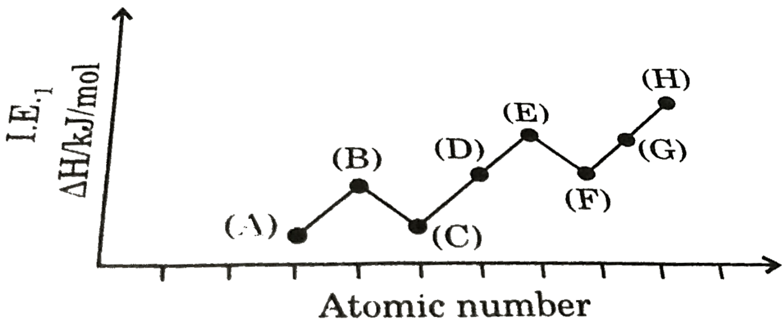
Comprehension 13

1. 

Find the number of non metals in above graph, except noble gas. If A,B,C,E,F,G and H are 2nd period-elements.

A. 5

B. 6

C. 7

D. 8

Answer: A

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Comprehension 14

1. The amount of energy released when an electron is added to an isolated gaseous atom to produce a monovalent anion is called electron affinity of first electron affinity or electron gain enthalpy. The first electron affinity is given a negative sign as the addition of an electron to a neutral atom is an exoergic process. The addition of electron to A^- requires energy to overcome the force of repulsion. Thus, the second electron affinity is an endoergic process. The magnitude of electron affinity depends on a number of factors such as (i) atomic size (ii) effective nuclear charge (iii) screening effects (iv) half and fully filled orbitals and (v) shape of orbital. In general, electron affinity increase as the atomic radii decrease in a period. However, there are exceptions when the atoms have stable configuration. In a group, electron affinity decreases as the size increases. However, the members of 3rd period have somewhat higher values than the members in the 2nd period of the same subgroups.

Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative spin) of the given atomic species?

A. $F < CI < O < S$

B. $S < O < CI < F$

C. $O < S < F < CI$

D. $CI < F < S < O$

Answer: C

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Comprehension 15

1. The properties of the elements (atomic/ionic radii, electron gain enthalpy, ionization enthalpy, electronegativity, valence, oxidising/reducing power, acid/base character, etc.) which are directly or indirectly related to their electronic configigrations are called periodic properties. These properties show a regular gradation on moving from left to right in a period or form top to bottom in a group. Down a group, the atomic/ionic radii, metallic character and reducing character increase while ionization enthalpy and electronegativity decrease. Along a period from left to right, atomic/ionic and metallic character decrease while ionization enthaloy, electronegativity, non-metallic character and oxiding power increase. However, electron gain enthalpy becomes less negative down a group butmore negative along a period. In contrast, inert gases have positive electron gain enthalpies which do not show may regular trend.

If the ionic radii of K^+ and F^- are about 1.34Å each, then the expected value of atomic radii of K and F should be respectively:

A. 2.31 and 0.64Å

B. 2.31 and 1.34Å

C. 0.64 and 2.31Å

D. 1.34 and 1.34Å

Answer: A

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Comprehension 16

1. A quantitative measure of the tendency of an element to lose electron is given by its ionization enthalpy. It represents the energy required to remove an electron from an isolated gaseous atom (X) in its ground state. In other words, the first ionization enthalpy for an element X is the enthalpy change $(\Delta_i H)$ for the reaction depicted.

$X(g) \rightarrow X^+(g) + e^-$

The ionization enthalpy is expressed in units of $kJmol^{-1}$. We can define the second ionization enthalpy as the energy required to remove the second most loosely bound electron: it is the energy required to carry out the reaction,

$X^+(g) \rightarrow X^{2+}(g) + e^-$

Largest energy is required for which change?

A. $Sc_{(g)} \rightarrow Sc^+_{(g)}$

B. $Sc^+_{(g)} \rightarrow Sc^{+2}_{(g)}$

C. $Sc^{+2}_{(g)} \rightarrow Sc^{+3}_{(g)}$

D. $Sc^{+3}_{(g)} \rightarrow Sc^{+4}_{(g)}$

Answer: D

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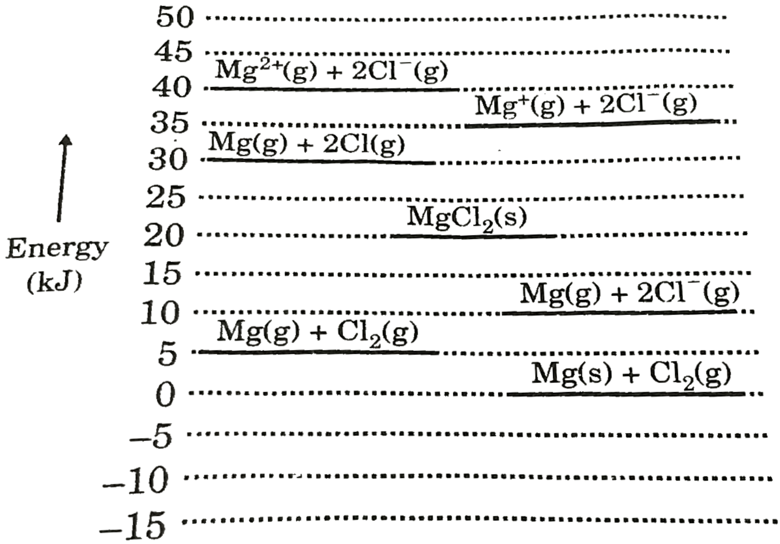
Comprehension 17

1. Born Haber cycle helps to determine lattice enthalpy of ionic compound as well as electron gain enthalpy of different elements. Based on the diagram drawn, answer the questions given below.



What is the lattice enthalpy for the formation of $MgCI_2$?

A. $-20kJ$

B. $-40kJ$

C. $-15kJ$

D. $+40kJ$

Answer: A

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Comprehension 18

1. Nitrogen can form many oxides with oxygen, and thus is said to exhibit variable valency. Similary, sulphur, phosphours and carbon can exhibit variable valency.

Amongst the following, select those which are most likely to be neutral.

A. CO, N_2O, NO

B. CO_2, NO_2, N_2O_3

C. SO_2, CO, N_2O_4

D. SO_3, N_2O_5, CO_2

Answer: A

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Comprehension 19

1. The size of any species depends on various factors such as nature of charge, magnitude of charge/oxidation state, effective nuclear charge, electronic configuration etc.

Select the order of size which are correct?

A. $O > O^{-} > O^{2-}$

B. $B > Be > Li$

C. $Mg > Mg^{+} > Mg^{2+}$

D. $Sc < Ti$

Answer: C

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Comprehension 20

1. Ionisation energies of unknown elements are given below :

Element	IE(in kcal/mol)		
	I	II	III
M	209	548	919
N	100	735	1101
O	119	1092	1653
P	1500	2017	2320

Which pair of elements may represent same group?

A. M,N

B. N,O

C. O,P

D. M,P

Answer: B

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Match The Column Type

1. Match the following columns

	Column-I		Column-II
(a)	ns^2, np^5	(p)	Chromium
(b)	$(n-1)d^{10}, ns^1$	(q)	Copper
(c)	$(n-1)d^5, ns^1$	(r)	Krypton
(d)	$(n-1)d^{10}, ns^2, np^6$	(s)	Bromine

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2. Match the following columns

Column-I		Column-II	
(a)	Metalloid	(p)	Sulphur
(b)	Radioactive	(q)	Gold
(c)	Transition metal	(r)	Arsenic
(d)	Chalcogen	(s)	Uranium

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3. Match the following columns

Column-I		Column-II	
(a)	Representative element	(p)	Cerium
(b)	Lanthanide	(q)	Aluminium
(c)	Coinage metal	(r)	Thorium
(d)	Actinide	(s)	Gold

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4. Match the following columns

Column-I		Column-II	
(a)	Isoelectronic species	(p)	$A^{+}(g) + \text{energy} \rightarrow A^{++}(g) + e^{-}(g)$
(b)	Half filled orbital	(q)	Ar, K^{+}, Ca^{++}
(c)	Second ionisation energy	(r)	Lutetium
(d)	Inner transition element	(s)	Antimony

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5. Match the following columns

Column-I		Column-II	
(a)	Highest 1^{st} ionisation energy	(p)	Technetium
(b)	Highest electronegativity	(q)	Lithium
(c)	Synthetic element	(r)	Helium
(d)	Strongest reducing agent	(s)	Fluorine

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6. Match the Column-I to Column-II :

Column-I (element / elements)		Column-II (group number)	
(a)	An element whose fourth shell contains two p-electrons	(p)	8th group
(b)	An element whose valence shell contains one unpaired p-electron	(q)	12th group
(c)	An element which receives last electron in $(n-1)$ d-subshell	(r)	14th group
(d)	An element with the ground-state electron configuration $[Ar]4s^2 3d^{10}$	(s)	17th group

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7. The first (ΔH_1) and second (ΔH_2) ionisation enthalpies (in $kJmol^{-1}$) and the (ΔH_{eg}) electron gain enthalpy (in $kJmol^{-1}$) of a elements are given below:

	Element	ΔH_1	ΔH_2	$\Delta_{eg}H$
1.	P	520	7300	–60
2.	Q	419	3051	–48
3.	R	1681	3374	–328
4.	S	1008	1846	–295
5.	T	2372	5251	+48
6.	U	738	1451	–40

Based on the above information match the following columns.

	Column-I		Column-II
(a)	The least reactive element	(p)	R
(b)	The most reactive metal is	(q)	S
(c)	The most reactive non-metal is	(r)	T
(d)	The non=metal with least oxidising power(other than zero group element)	(s)	Q

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8. Match the following columns

	Column-I		Column-II
(a)	$1s^2$	(p)	shows highest negative oxidation state
(b)	$1s^2 2s^2 2p^5$	(q)	shows highest first ionisation energy
(c)	$1s^2 2s^1$	(r)	shows highest reducing power in aqueous solution
(d)	$1s^2 2s^2 2p^3$	(s)	shows highest electron affinity
		(t)	shows highest electronegativity

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9. Column-I contains some increasing orders of various species and column-II has the properties of the elements/ions.

	Column-I		Column-II
(a)	$Na^+ < F^- < O^{2-} < N^{3-}$	(p)	Electronegativity
(b)	$Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$	(q)	Mobility of hydrated ions
(c)	$O < S < F < Cl$	(r)	Ionisation energy
(d)	$Cl^- < K^+ < Ca^{2+} < Sc^{3+}$	(s)	Electron affinity
		(t)	Ionic radii

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10. Column-I contains the atomic number of few elements and column-II has the properties of the elements/salts.

	Column-I		Column-II
(a)	$Z = 19$	(p)	Diamagnetic and has higher atomic radius than $Z = 29$
(b)	$Z = 17$	(q)	Lower density than either side of the elements in the same group
(c)	$Z = 30$	(r)	Acts as metal as well as non-metal
(d)	$Z = 20$	(s)	Oxide is amphoteric
(e)	$Z = 51$	(t)	More negative electron gain enthalpy than $Z = 9$

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11. Match the following columns

Column-I (Properties)		Column-II (Magnitude)	
(a)	Ionisation energy (IE_1)	(p)	Highest in halogens in their respective periods
(b)	Electron affinity (EA_1)	(q)	Highest in noble gas in their respective periods
(c)	Electronegativity	(r)	Highest in alkali metals in their respective periods
(d)	Electropositive character	(s)	Lowest in noble gases in their respective periods.

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12. Match the values of 1st and 2nd ionisation energy and electron gain enthalpy given in the column-I with types of elements/compounds given in column-II

	Column-I				Column-II
	$\Delta_1 H_1$,	$\Delta_1 H_2$,	$\Delta_{eg} H$ (in kJ mol^{-1})		
(a)	2372	5251	+48	(p)	Element which exists as a strong reducing agent
(b)	419	3051	– 49	(q)	Element which exists as a monoatomic molecule
(c)	1681	3374	– 333	(r)	Least reactive non-metal
(d)	1008	1846	– 295	(s)	Element which acts as a strong oxidising agent
				(t)	Element whose oxide is strongly basic in nature

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13. Match the following columns

	Column-I		Column-II
(a)	Fe(III) > Fe(II)	(p)	Electronegativity
(b)	Al > Na	(q)	Basic character of their oxides
(c)	Cl > F	(r)	Electron gain enthalpy ($-\Delta_{eg}H$)
(d)	N > C	(s)	Degree of hydration

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14. Match the following columns

	Column-I		Column-II
(a)	NO_3^-, CO_3^{2-}	(p)	Semi-metals
(b)	Si, Ge, As, Sb	(q)	Isoelectronic species
(c)	He, Ne, Ar, Kr, Xe	(r)	van der Waals' radii
(d)	Na, Mg, Al, Si, P, S	(s)	Typical elements

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15. Match the following columns

	Column-I (Element)		Column-II (Property)
(a)	Mg	(p)	*s*-block element
(b)	Be	(q)	Bridge element
(c)	Sc	(r)	Transition element
(d)	N	(s)	*p*-block element
		(t)	Alkaline earth elements

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16. Match the following Columns

	Column-I (Characteristic involved in the given process of Column II)		Column-II (Process described)
(a)	Energy released	(p)	$S \longrightarrow S^-$
(b)	Energy absorbed	(q)	$O^- \longrightarrow O^{2-}$
(c)	Inert gas configuration is achieved	(r)	$Sr \longrightarrow Sr^{2+}$
(d)	Half filled configuration is achieved	(s)	$N^- \longrightarrow N$
		(t)	$Na^+ \longrightarrow Na$

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17.

	Column-I		Column-II
(a)	Noble gas	(p)	Uranium
(b)	Transition element	(q)	Radon
(c)	Lanthanide	(r)	Cerium
		(s)	Copper

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18. Match the following columns

Column-I (Element)		Column-II [Atomic radius (pm)]	
(a)	Be	(p)	74
(b)	C	(q)	88
(c)	O	(r)	111
(d)	B	(s)	77
(e)	N	(t)	66

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19. Match the correct ionisation enthalpies electron gain enthalpies of the following elements.

Column-I		Column-II			
Elements			ΔH_1	ΔH_2	$\Delta_{eg}H$
(a)	Most reactive non-metal	(p)	419	3051	−[illegible]
(b)	Most reactive metal	(q)	1681	3374	−328
(c)	Least reactive element	(r)	738	1451	−40
(d)	Metal forming binary halide	(s)	2372	5251	+48

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20. Match the following columns

	Column-I (Electronic configuration)		Column-II (Electron gain enthalpy / kJ mol^{-1})
(a)	$1s^2 2s^2 2p^6$	(p)	–53
(b)	$1s^2 2s^2 2p^6 3s^1$	(q)	–328
(c)	$1s^2 2s^2 2p^5$	(r)	–141
(d)	$1s^2 2s^2 2p^4$	(s)	+48

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21. Match the following columns

	Column-I		Column-II
(a)	Li, Na, K, Rb	(p)	Increase in radius
(b)	Li, B, C, N	(q)	Decrease in ionisation energy
(c)	Mg^{++}, Na^{+}, F^{-}, O^{--}	(r)	Increase in Z_{eff}
(d)	F, Cl, Br, I	(s)	Decrease in Z_{eff}

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22. Match the order of species in column-I with properties in column-II.

Column-I		Column-II	
(a)	$Na^+ > K^+ > Rb^+$	(p)	Ionic mobility in aqueous solvent
(b)	$B < C < O < N$	(q)	Electronegativity of respective atom
(c)	$Mg^{2+} < Li^+ < K^+ < Cs^+$	(r)	Hydration energy
(d)	$S > Se > O$	(s)	1st Electron affinity
		(t)	1st Ionisation energy

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23. Match the following columns

Column-I (Correct characteristics)		Column-II (Elements)	
(a)	Radioactive lanthanide element	(p)	Beryllium
(b)	Shows diagonal relationship	(q)	Promethium
(c)	Transition element	(r)	Cadmium
(d)	Ground state electronic configuration [Kr] $4d^{10}5s^2$	(s)	Osmium

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24. Match column-II (atomic number of elements) with column-II (position of element in periodic table).

Column-I		Column-II	
(a)	19	(p)	*p*-block
(b)	22	(q)	*f*-block
(c)	32	(r)	*d*-block
(d)	64	(s)	s-block

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25. Match the following columns

Column-I (Electronic configuration of element)		Column-II (Correct description)	
(a)	$1s^1, 2s^2 2p^2, 3s^1$	(p)	s or p block element
(b)	$1s^2, 2s^2 2p^6, 3s^2 3p^1$	(q)	III period element
(c)	$1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5, 4s^1$	(r)	Group number VI in the long form periodic table
(d)	$1s^2, 2s^1 2p^3, 3s^1 3p^3, 4s^1$	(s)	d-block element
		(t)	Valence shell electron ≥ 3

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26. Match the following columns

Column-I (Atomic Number)		Column-II	
(a)	52	(p)	s-block
(b)	56	(q)	p-block
(c)	57	(r)	d-block
(d)	60	(s)	f-block

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Subjective Type

1. 0.5 moles of gaseous non-metallic X^{-} anions (having positive electron affinity) requires 806.4 kJ energy to get completely converted into gaseous X^{+} ions. Calculate Pauling's electronegativity of the elements X. Use Avogardo's no $= 6 \times 10^{23}$ and $1eV = 1.6 \times 10^{-19} J$.

[Use the fact that, Pauling's electronegativity $= \dfrac{\text{Mulliken's electronegativity}}{2.8}$ and Mulliken's electronegativity $= \dfrac{\text{Ionisation energy} + \text{Electron affinity}}{2}$]

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2. $1.0g$ of Mg atom $(\text{atomic mass} = 24.0\text{amu})$ in the vapour phase absorbs $50.0kJ$ energy. Find the composition of the final magnesium, if the first and the second IE of Mg are $740kJmol^{-1}$ and $1450kJmol^{-1}$ respectively.

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3. Find the sum of total number of 5f-electrons in Th and Ac.

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4. Find the total number of species having two unpaired electrons from the following species $Fe^{2+}, Cr, Cr^{3+}, Ti^{2+}, Mn^{2+}, V^{3+}$

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5. If internuclear distance between A atoms in A_2 is 10Å and between B atoms in B_2 is 2Å, then calculate internuclear distance between A and B (Electronegativity difference between A and B has negligible value).

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6. Find the number of p-block elements from the following atomic numbers given below. $83 \quad 79 \quad 42 \quad 64 \quad 37 \quad 54 \quad 34$

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7. Find the total number of 6^{th} period elements from the given atomic numbers? $81, 63, 80, 50, 54, 48, 86$

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8. Find the total number of paramagnetic species among the following?

$Sc^{3+}, Fe^{3+}, Mn^{2+}, Co^{4+}, Co^{3+}, Cr^{+}, Fe^{2+}, Mn^{3+}, Cr^{3+}, Zn^{2+}, Ti^{+4}$

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9. What is the group number of Ba in periodic table?

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10. Select the number of elements which are called transition metals.

$B, Sc, AI, Pd, Os, Zr, Rb, Ba, Fr$

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11. Among the following species, how many have their ionic size greater than O^{2-}?

$Se^{2-}, F^{-}, N^{3-}, P^{3-}$

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12. Among the following find out the total number of d-block elements.

$La, Pd, Ni, Cd, Cs, Bi, Sn, Zr, K$

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13. Number of oxides which is/are more basic as compared to Na_2O.

$Li_2O, K_2O, Cs_2O, Rb_2O, MgO$

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14. Bond length of A-A bond is 124 pm and bond length of B-B bond is 174 pm. Calculate the bond length (in pm) of A-B bond in AB molecule if percent ionic character of A-B bond is $19.5\,\%$

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15. Find the number of chemical species in which outer shell 'd' orbital is having more than five electrons.

$Ac, Cd, Zn, Sn, Cr, Pt, Ag$

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16. Find the number of transition elements in the following:

Zn, Cd, Hg, Pt, U, Sn

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17. According to Hannay-Smith formula, if E.N difference between A and B is 2.1, then A-B molecule is expected to have x% ionic character, find $\frac{x}{10}$ value to the next integer.

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18. The element with the lowest atomic number that has a ground-state electronic configuration of $(n-1)d^5ns^2$ is located in.......period.

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19. Find the total number of correct orders among the following.

(a) Order of electron affinity : $S > O^-$

(b) Order of ionic radius: $AI^{3+} < Mg^{2+} < O^{2-}$

(c) Order of electronegativity: $Si < P < C < N$

(d) Order of atomic radius: $O < C < S < Se$

(e) Order of second ionization energy: $C < N < F < O$

(f) Order of ionic radii : $S^{2-} < CI^- < K^+ < Ca^{2+}$

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20. Period number of $Sc = x$

Modern periodic table group number of $TI = x$ (according to 1 to 18 convention) Find the value of y-x

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21. $A^{+}(g) \rightarrow A(g) \Delta H = -2eV$

$2A(g) \rightarrow 2A^{+}(g) \Delta H = x$ Find the value of x in eV.

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22. Number of unpaired electrons in $Mn^{+7} = a$

Number of d-subshell electrons in $Cr = b$

Number of f-subshell electrons in Hf (Atomic no = 72) = c Find the value of

$C - b + a$

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23. The oxidation state of fluorine in F_2 is x. Find value of |x|.

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24. Among the following number of elements, which are transition elements are:

$Ce, Nd, Sm, Yb, Ru, Th, U, Np, Am$

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25. The number of different possible oxidation states of fluorine in the molecules $[F_2, OF_2, O_2F_2, HF] = t$ Find the value of t

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26. How many of the following species have lower IE_1 value compared to F^-?

CI^-, Br^-, O^-, I^-

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27. The number of oxides which are expected to be neutral amongst the oxides of nitrogen (viz. $N_2O, NO, NO_2, N_2O_4, N_2O_5) = x$ The number of oxides which are expected to be more basic with respect to NiO amongst $MgO, SrO, K_2O = y$. Find the value of x+y.

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28. What is the value of $(n + l)$ for the unpaired e^- in an atom of an element which is present in the 3rd period and seventeenth group of the periodic table.

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29. A monoatomic anion of unit charge contain 45 neutrons and 36 electrons. What is the atomic mass number of element and in which group of periodic table does it lie? Write your answer as 1002 if answer is 10,2.

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30. If $3e^-$ can be accomodated in each orbital then how many elements will be present in the 7th period of periodic table?

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31. How may elements will be present in the 12th period of periodic table.

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32. Identify the number of pairs which have higher electronegativity difference as compared to difference of Cs and F, Na and I, Li and F, H and F, I and Cl, Ca dn O, Ba and S, C and Si.

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