CHEMISTRY

PHYSICAL, INORGANIC, AND ORGANIC CHEMISTRY

PERIODIC TABLE & PERIODICITY

Solved Examples

1. 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: $1s^2 2s^2 2p^6 3s^2 3p^2$ D: $1s^2 2s^2 2p^6 3s^2 3p^5$

E: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

Which among these will belong to the same group in the periodic table?

A. A & B

B. B & C

C. C & D

D. D & E

Answer: A

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Example

1. An element X with $Z = 112$ has been recently discovered. What is the electronic configuration of the element? To which group and period will it belong?

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2. Atomic radius of $Liis 1.23\text{Å}$ and ionic radius of Li^+ is 0.76Å. Calculate the percentage of volume occupied by single valence electron in Li.

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3. Select from each group the species which has the smallest radius starting appriate reason.

(a) O, O^-, O^{2-} (b) P^{3+}, P^{4+}, P^{5+}

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4. Mg^{2+} is smaller than O^{2-} in size, throgh both have same electronic configuration. Explain?

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5. From each set, choose the atom which has the largest ionization enthalpy and explain your answer with suitable reasons. (a) F, O, N (b) Mg, P, Ar

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6. First and second ionisation energies of magnesium are $7.646eV$ and $15.035ev$ respectively. The amount of energy in kJ needed to convert all the atoms of magnesium intp Mg^{2+} ions present in $12mg$ of magnesium vapour will be? [Given $1eV = 96.5kJml^{-1}$]

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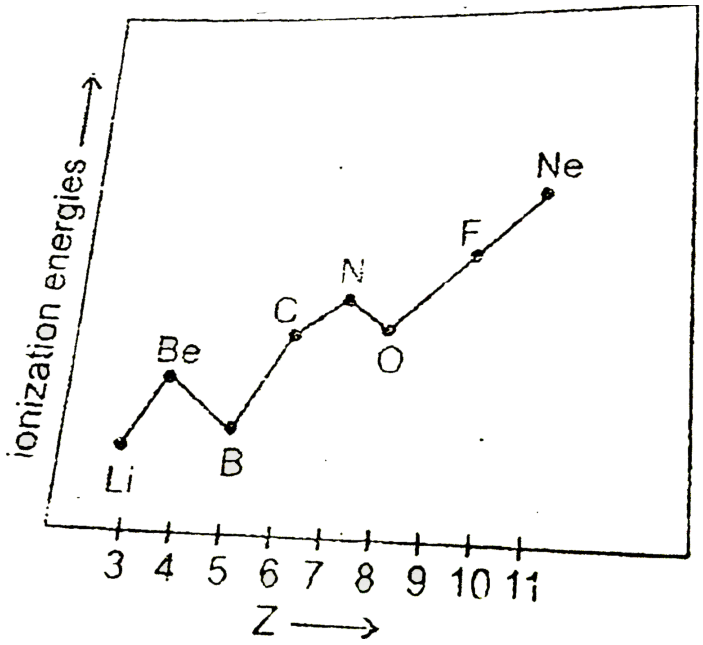
7. Following graph shows variation of ionization energies with atomis number in second period $(Li - Ne)$. Value of ionization energies of $Na(11)$ will

be-



A. above Ne

B. below Ne but above O

C. below Li

D. between N and O.

Answer:

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8. Consider the following ionization steps :

$M(g) \rightarrow M^+(g) + e^-, \Delta H = 100eV$

$M(g) \rightarrow M^{2+}(g) + 2e^-, \Delta H = 250eV$

Select correct statement(s) a)$I.E._1$ of $M(g)$ is 100eV b)$M^+(g) \rightarrow M^{2+}(g) + e^-, \Delta H = 150eV$ c) $I.E._2$ of $M(g)$ is 250eV d)$I.E._2$ of M(g) is 14=150eV

A. $IE_1 of Mgis 100eV$

B. $IE_1 of M^+(g) is 150eV.$

C. $IE_2 of M(g) is 250eV$

D. $IE_2 of M(g) is 150eV$

Answer:

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9. Consider the elements N, P, O and S and arrange them in order of increasing negative electron gain enthalpy,

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10. Why do halogens have high electron gain enthalpies (i.e. $-\Delta_{eg}H^{\odot}$)?

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11. 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:

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12. The amount of energy when millon atoms of iodine are completely converted into I^- ions in the vapour state according to the equation, $I(g) + e^-(g) \rightarrow I^-(g) is 5.0 \times 10^{-13} J.$

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13. Account for the large decrease in electron affinity between Li and Be despite the increase in nuclear charge.

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Miscellaneous Solved Problems

1. A M^{2+} ion derived from a metal in the first transition metal series has four electrons in $3d$ subshell. What element might M be?

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2. Following are the valence sheel electronic configurations of some elements.

Find out the blocks to which they belong in the periodic table?

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

B. $3d^{10} 4s^2$

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

D. $1s^2 2s^2$

Answer: B::C::D

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3. Find out the group of the element having the electronic configuration, $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$.

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4. Arrange the following ions in the order of increasing size : $Be^{2+}, Cl^-, S^{2-}, Na^+, Mg^{2+}, Br^-$

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5. The (IE_1) and the (IE_2) in $kJmol^{-1}$ of a few eiements designated by Roman numberals are shown below.

	I	II	III
IE_1	403	549	1142
IE_2	2640	1060	2080

Which of the above elements is likely to be a

(a) non-metal (b) alkali metal (c) alkaline earth metal?

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6. Ionisation energy and electron affinity of fluorine are respectively 17.42 and $3.45eV$. Calculate

electronegativity of fluorine atom.

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7. Why the electron gain enthalpy values of alkaline earth metals are lower (i.e. less negative) or positive?

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Board Level Exercise

1. What is the basic theme of organisation in the periodic table?

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2. What is the basic difference in approach between the Mendellev's peridic law and the Modern periodic law?

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3. Writen the atomic number of the element present in the fourth period and eighth group of the Modern periodic table.

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4. What would be the $IUPAC$ name nad symbol for the element with atomic number 109?

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5. Why do elements in the same period have different physical and chemical properties? What about elements in the same group?

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6. Are the oxidation state and covalency of Be in $\left[Be(H_2O)_3(OH)\right]^+$ same?

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7. Considering the atomic number and position in the Modern periodic table, arrange the following elements in the increasing order of metallic character: $P, Mg, Ca, K, Si.$

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8. In terms of block, period and group, where would you locate the element with $Z = 114$ in Modern periodic table?

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9. Write the general outer electronic configuration of $s-, p-, d-$ and $f-block$ elements.

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10. Use of Modern periodic table to answer the following questions:

(i) Identify an element with six electrons in the outermost shell.

(ii) Identify an element that would tend to lose one electron.

(ii) Identify an element that would tend to gain three electrons.

(iv) Identify the group having metal, non-metal, liquid as well as gas at $30^{\circ} C$ temperature.

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11. Explain why cations are smaller and anions larger in radii than their parent atoms?

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12. Consider the following species: $P^{3-}, S^{2-}, CI^{-}, K^{+}, Ca^{2+}$ and Sc^{3+}

(i) What is common in them?

(ii) Arrange them in the order of decreasing ionis radii.

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13. Which of the following species will have the largest and the smallest size? K, K^+, Ca, Ca^{2+}. Explain.

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14. Energy of an electron in the ground state of the hydrogen atom is $-5.19 \times 10^{-19} Cal$. Calculate the ionization enthalpy of atomic hydrogen in terms of $Kcal/mol$.

Hint: Apply the idea of mole concept to derive the answer.

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15. What are the various factors due to which the ionisation enthalpy of the main group elements tends to decrease down a group?

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16. The first ionization enthalpy $(\Delta_i H)$ values of the second period elements Li, Be and C are respectively $520, 899$ and $1086 kJmol^{-1}$. Predict whther the first $\Delta_i H$ value for B will be more close to 690 or $990 kJmol^{-1}$?

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17. Would you expect the first ionisation enthalpies for two isotopes of the same element to be the same or different? Justify your answer.

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18. Would you expect the second electron gain enthalpy of S as positive, more negative or less negative than the first? Justify your answer.

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19. What is the basic difference between the terms electron gain enthalpy and electronegativity?

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20. Using the Modern periodic table, predict the formules as compounds which might be formed by the following pairs of elements : (i) Boron & Oxygen (ii) Calcium & Fluorine.

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21. Which important property did Mendeleev use to classify the elements in his periodic table and did he stick to that?

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22. On the basis of quantum numbers, justify that the fourth period of the Modern periodic table should have 18 elements.

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23. What do atomic radius and ionic radius really mean to you?

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24. How do atomic radius generally vary in a period and in a group for s-and $p-$ block elements ? How do you explain the variation?

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25. Among the third period elements, the actual ionization enthalpies are in the order

$Na < AI < Mg < SI < S < P < CI < Ar$. Explain why:

(i) Mg has higher $\Delta_i H$ than AI. (ii) S has lower $\Delta_i H$ than P and CI.

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26. How would you explain the fact that the first ionization enthalpy of Lithium is lesser than that of Beryllium but its second ionization enthalpy is greater than that of Beryllium?

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27. The first ionisation enthalpy of group 13 elements are :

Element	Boron	Aluminium	Gallium	Indium	Thallium
Symbol	B	Al	Ga	In	Tl
IE_1 ($kJmol^{-1}$)	801	577	579	558	589

Explain this deviation from the general trend.

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28. What is the significance of the terms-'isolated gaseous atom' and 'ground state' while defining the ionisation enthalpy and electron gain enthalpy?

Hint: Requirements for comparison purposes.

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29. Which of the following will have the most negative electron gain enthalpy and which the least negative? O, S, F and CI. Explain.

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30. How would you react to the statement that the electronegativity of C on Pauling scale is 2.5 in all the carbon compounds?

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31. Assign the position of the element having outer electronic configuration (i) ns^2np^2f or $n=2$ (ii) $(n-1)d^5ns^1$ for $n=4$, and (iii) $(n-2)f^{14}(n-1)d^0ns^2$ for $n=6$ in the Modern periodic table.

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Exercise 1

1. Explain the following:

(i) Why argon (atomic mass $=39.94$) has been placed before potassium (atomic mass $=39.10$) in the

Modern periodic table?

(ii) There are only 14 anthanides and only 14 actinides in Modern peridoic table.

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Exercise

1. Why the third period of Modern periodic table contains 8 elements and not 18?

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2. Tell the relation between effective nuclear charge $\left(Z_{eff}\right)$ atomic number (Z) and shielding constant (σ). Explain it qualitatively.

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3. Which orbital electrons are known to shield the nuclear charge improperly? Does this enerate some irregularity in properties of elements?

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4. Ph^{+} compounds are very good oxidising agents. Explain.

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5. Arange the following in correct order of stability.

(i) Ga', In, TI' (ii) As^{+5}, Sb^{+5}, B^{+5}

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6. Explain why callions are smaller and anions larger in radii than their parent atoms?

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7. The atmoic radii of palladium and platinum are nearly same. Why?

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8. In the ionic compound KF, the K^+ and F^- ions are found to have practically identical radii, about 1.34Å each. What can you predict about the relative atomic radii of $K\&F$?

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9. Why second ionization enthalpy is always higher than the first ionisation enthalpy for every element?

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10. The first ionization enthalpy of carbon is greater than that of boron, whereas the reverse is true for second ionization enthalpy. Explain.

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11. Among the elements B, AI, C and Si,

(i) Which elements has the highest first ionisation

enthaloy?

(ii) When element has the most metallic character? Justify your answer in each case.

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12. Be and Ne have positive values of electron gain enthalpy against the general trend in their period in modern periodic table. Explain.

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13. Nitrogen has positive electron gain enthalpy whereas oxygen has negative. However, oxygen has

lower ionisation enthalpy than nitrogen. Explain.

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14. Among alkali metals, which element do you expect to be least electronegative?

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15. Explain the following according to Modern periodic table: ltbr. (a) Electronegativity of elements increase on moving from left to right in a paeiod.

(b) Ionisation enthalpy decrease in a group from top to bottom.

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16. 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 quantym number of any element of the period.

Answer: C

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17. 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 colums, because a maximum of 6 electrons can occupt all the orbitals in a p-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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18. The elements in which electrons are progressively filled in 4f-orbitals are calleD:

A. actinoids

B. transition elements

C. lanthanoids

D. halogens

Answer: C

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19. Which of the following statements is not correct regarding hydrogen:

A. It resembles halogens in some properties

B. It resembles alkali metals in some properties.

C. It can be placed in 17^{th} group of Modern periodic table.

D. It cannot be placed in 1^{st} group of Modern periodic table.

Answer: D

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20. Atomic number of Ag is 4.7. in the same group, the atomic numbers of elements placed above and below Ag in Long form of periodic table will be:

A. 26, 95

B. 39,79

C. 29,79

D. 39,65

Answer: C

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21. In modern periodic table, the element with atomic number $Z = 118$ will be:

A. Uuo, Ununoctium, alkaline earth metal

B. Uno, Unniloctium, transition metal

C. Uno, Unniloctium, alkali metal

D. Uuo, Ununoctium, nobles gas

Answer: D

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22. The order of screening effect of electrons of s, p, d and f orbitals of a given shell of an atom on its outer shell electrons is

* Thinking process

To solve question, keep in mind that shielding effect represent the repulsive force felt by the valnece shell from the electrons presents in the inner shells.

A. $s > p > d > f$

B. $f > d > p > s$

C. $p < d < s > f$

D. $f > p > s > d$

Answer: A

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23. Which of the following is generally true regarding effective nuclear charge $\left(Z_{eff}\right)$:

A. It increases on moving left to right in a period.

B. It remains almost constant on moving top to bottom in a group.

C. For isoelectronic species, as Z increases, Z_{eff} decreases.

D. Both (A) and (B)

Answer: D

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24. Among following species which of them have maximum Z_{eff}

A. Sn

B. Sn^{4+}

C. In

D. In^{+}

Answer: B

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25. From the given set of species, point out the species from each set having highest Z_{eff}

(a) O^{2-}, F^{-}, Na^{+} (b) Li, Be, Na (c) He, Li^{+}, H^{-}

A. $\begin{matrix} a & b & c \\ Na^{+} & Be & Li^{+} \end{matrix}$

B. $\begin{matrix} a & b & c \\ O^{2-} & Li & H^{-} \end{matrix}$

C. $\begin{matrix} a & b & c \\ F^{-} & Na & He \end{matrix}$

D. $\begin{matrix} a & b & c \\ Na^{+} & Be & He \end{matrix}$

Answer: A

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26. The atomic number of an element which can not show the oxidation state of $+3$ is-

A. 13

B. 32

C. 33

D. 17

Answer: B

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27. The most common oxidation state of an element is -2. the number of electrons present in its outer most shell is-

A. 2

B. 4

C. 6

D. 8

Answer: C

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28. Most stable oxidation state of gold is:

A. $+1$

B. $+3$

C. $+2$

D. zero

Answer: D

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29. Which can have both +ve and -ve oxdiation states in their compounds

A. F

B. I

C. Na

D. AI

Answer: B

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30. The oxidation state of nitrogen varies from:

A. -3 to $+5$

B. 0 + $+5$

C. -3 to 1

D. $+3$ to $+5$

Answer: A

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31. Which metal exhibits more than one oxidation states in their compounds

A. Na

B. Mg

C. AI

D. Fe

Answer: D

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32. Electrons of which subshell do not partcipate in bonding due to inert pair effect?

A. $6s$

B. $6p$

C. $5d$

D. $4f$

Answer: A

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33. Tnallium shows different oxidation states because:

A. of its high reactivity

B. of inert pair of electrons

C. of its amphoteric nature

D. its is a transition metal

Answer: B

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34. In which of the following elements $+3$ oxidation state is more stable than $+5$?

A. P

B. As

C. N

D. Bi

Answer: D

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35. Which of the following is correct order of stability:

A. $TI^{3+} > BI^{3+}$

B. $PbO_2 > PbO$

C. $BiI_5 < BiF_5$

D. $Sn^{2+} = Ge^{2+}$

Answer: C

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36. Select correct statement about radius of an atom:

A. Values of Vander waal's radii are larger than those of convalent radii because the Vander waal's forces are much weaker than the forces

operating between atoms in a covalently bonded molecule.

B. The matallic radii are smaller than the Vander waal's radii, since the bonding forces in the metallic crystal lattice are much stronger than the Vander waal's forces.

C. Both (A) & (B)

D. None of these

Answer: C

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37. Choose the correct order of atomis radii of Fluorine and Neon (in pm) out of the options give below:

A. 72, 160

B. 160, 160

C. 72,72

D. 160, 72

Answer: A

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38. The size of isoelectronic species $O^{-2}F^{-}$ and Na^{+} is 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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39. Which of the following order of atomic/ionic radius is not correct?

A. $F < CI < Br < I$

B. $Y^{3+} > Sr^{2+} > Rb^{+}$

C. $Nb \approx Ta$

D. $Li > Be > B$

Answer: B

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40. Which one of the following statements is incorrect in relation to ionisation enthalpy?

A. Ionization enthalpy increases 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 orbitals having higher n value.

Answer: D

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41. The first ionisation enthalpies (in eV) of N & O 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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42. 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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43. Which represents alkali metals (i.e. 1^{st} group metals) based on $(IE)_1$ and $(IE)_2$ value (in KJ/mol) ?

A.

	$(IE)_1$	$(IE)_2$
X	500	1000

B.

	$(IE)_1$	$(IE)_2$
Y	600	2000

C.

	$(IE)_1$	$(IE)_2$
Z	550	7500

D.

	$(IE)_1$	$(IE)_2$
M	700	1400

Answer: C

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44. Which of the following relation is correct with respect to first (I) and second (II) ionization enthalpies of potassium and calcium?

A. $I_{Ca} > II_K$

B. $I_K > I_{Ca}$

C. $II_{Ca} > II_K$

D. $II_K > II_{Ca}$

Answer: D

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

A. $F > CI > Br > I$

B. $F < CI < Bt < I$

C. $F < CI > Br > I$

D. $CI > Br > F > I$

Answer: C

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46. 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. P, CI

B. CI, F

C. CI, S

D. CI, P

Answer: D

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47. The order of electron gain enthalpy (magnitude) of O, S and Se is:

A. $O > S > Se$

B. $S > Se > O$

C. $Se > S > O$

D. $S > O > Se$

Answer: B

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48. Electronic configuratios of four elements A, B, C and D are given below:

(i) $1s^2 2s^2 2p^5$ (ii) $1s^2 2s^2 2p^4$ (iii) $1s^2 2s^2 2p^6 3s^1$ (iv) $1s^2 2s^2 2p^5$

Which of the following is the correct order of increasing tendency of gain electron:

A. $(i) < (ii) < (ii) < (iv)$

B. $(i) < (ii) < (iii) < (iv)$

C. $(iv) < (ii) < (iii) < (i)$

D. $(iv) < (i) < (ii) < (iii)$

Answer: A

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49. Which of the following statements is correct?

A. Electron gain enthalpy may be positive for some elements.

B. Second electron gain enthalpy always remains positive for all the elements.

C. $\Delta_{eg}H\left(K^{+}\right) = -IE(K)$

D. All of these

Answer: D

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

(a) Electronegativity (b) ionisation enthalpy (c) Electron gain enthalpy

Correct answer is:

A. Only electronegativity

B. only ionisation enthalpy

C. both electron gain enthalpy and ionisation enthalpy

D. all of the above

Answer: C

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51. The electronegativity values of C, N, O and F on Pauling scale:

A. decrease from carbon to fluorine.

B. increase from carbon to fluorine.

C. increase upto oxygen and then decrease upto fluorine.

D. decrease from carbon to nitrogen and then increase continuously.

Answer: B

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52. Correct order of electronegativity of N, P, C and Si on Pauling scale is:

A. $N > P > C > Si$

B. $C > Si > N > P$

C. $N < P < C < Si$

D. $N > C > P > Si$

Answer: D

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53. The correct order of electronegativity on Pauling scale is:

A. $F > CI > O > S$

B. $Li > Na > L > Rb > Cs$

C. $Be < B < N < C$

D. Both (A) and (B)

Answer: B

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54. Which of the following is most electronegative element.

A. Li

B. Mg

C. H

D. Na

Answer: C

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55. Which of the following is true about the element ${}_{33}As$ according to Modern periodic table:

A. it is a $5(th)$period element.

B. it is a p-block element.

C. it belongs to 16^{th} group

D. It is one among typical elements.

Answer: B

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56. Which of the following contains atomic number of only s-block

A. 55,12, 18, 53

B. 13, 33, 54, 83

C. 3, 20, 55, 87

D. 22, 33, 55, 66

Answer: C

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57. Screening effect is not observed in :

A. He^+

B. Li^{2+}

C. Be^{3+}

D. In all cases

Answer: D

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58. Which of the following have higher Z_{eff} than Fluorine.

A. CI

B. O

C. F^-

D. none of these

Answer: D

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59. The oxidation number that iron does not exhibit in its common compounds or in its elemental state is:

A. 0

B. $+1$

C. $+2$

D. $+3$

Answer: B

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60. Which of the following can show $+7$ oxidation state?

A. Mn

B. F

C. In

D. N

Answer: A

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61. Which of following does not exist:

A. TII_3

B. PbF_4

C. Both (A) and (B)

D. None of these

Answer: D

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62. Elements of which period show maximum inert pair effect:

A. 3

B. 4

C. 5

D. 6

Answer: D

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

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

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

Answer: D

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

A. MnO_2

B. $KMnO_4$

C. MnO

D. $K_3\left[Mn(CN)_6\right]$

Answer: C

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65. 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. 1,4

Answer: C

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66. Considering the elements B, Al, Mg and K, the correct order of their metallic character is

A. $B > AI > Mg > K$

B. $AI > Mg > B > K$

C. $Mg > AI > K > B$

D. $K > Mg > AI > B$

Answer: D

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67. Fluorine has the highest electronegativity among the ns^2np^5 group on the Pauling scale, but the

electron affinity opf 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 utillising its vacant $3d-$ orbital.

D. 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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68. Which one of the following arrangements represents the correct order of electron gain enthalpy of the given atomic species?

A. $CI < F < S < O$

B. $O < S < F < CI$

C. $S < O < CI < F$

D. $F < CI < O < S$

Answer: B

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69. Which of the following statement is incorrect?

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

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

C. $Cs^+(g)$ release more energy upon gain of en electron than $CI(g)$.

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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70. Identify the group (in Modern Peridic Table) and valency of a hypothetical elemt having atomic number 11.9. if group number is x and valency is y. Given the the value of $x + y$.

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71. An element belonging to $3d$series of modern periodic table has spin magnetic moment $= 5.92B.\ M \in +3$ oxidation state. Determine the atomic number of element.

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72. An element has atomic number 29. it belongs to x period any y group. Given value of $2x + y$:

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73. How many of the following have greater 7_{eff} than silicon atom:

$Na, Mg, AI, P, CI, S, N, O, C, F$

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74. How many stable oxidation state of chromium is $+n$. Given the value of 'n'

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75. How many of the following compounds are found to exist?

$BiF_5, TlCl_3, PbO_2, SnCI_2, Tl_2O_3, PbI_4, As_2O_3$

View Text Solution

76. The Lathandies are characterized by the uniform $[+n]$ oxidation state show by all the Lathanides. What is the value of 'n'

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77. Highest oxidation states shown by Chromium & Maganese are $+x \& +y$ respectively. Give the value of $x+y$?

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78. If internuclear distance between A atoms in A_2 is 10Å and between B atoms in B_2 is 6Å, then calculate internuclear distance between A and B in Å [Electronegativity difference between A and B has negligible value].

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79. Report atomic number of the element having largest size among the following: Ni, Cu, Zn

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80. Find the total number of elements which have higher ionisation energy than their both adjacent elements (either in a period or in a group in the long from of periodic table).

Be, B, N, P, Ga, S, Mg

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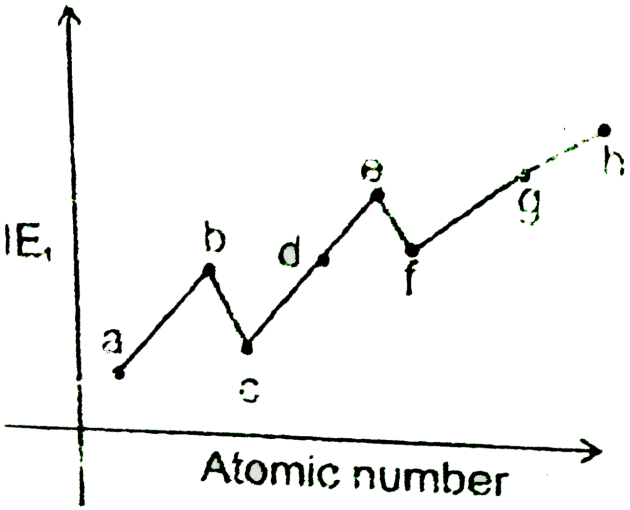

81.

Where a, b, c, d, e, f, g, h ar 3^{rd} period elements. If difference between atomic number of elements b and e is x and difference between atomic number of elements c and f is y. What is the value of $x - y$.

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82. Value of IE_1, IE_2, IE_3 of an element are $9.3, 18.2$ and $553.8eV$. Predict group number in Modern Periodic Table.

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83. Which one of the following elements has lowest ionisation energy:

H, Mg, Cs, B

Report the Atomic number of that element.

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84. $A^-(g) \rightarrow A^{2+}(g) \quad \Delta H = 1100 KJ/mol$
$A(g) \rightarrow A^{2+}(g) \quad \Delta H = 1200 KJ/mol$

Electron gain enthalpy of A is $P \times 10^2 KJ/mol$. What is the value of P?

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85. The electron affinity of a hypothetical element $'A'$ is $3eV$ per atom. How much energy in kcal is released when $10g$ of $'A'$ is completely converted of A^- ion in a gaseous state ?

$\left(1eV = 23 \text{ kcal mol}^{-1}, \text{Molar mass of } A = 30g\right)$

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86. What is atomic number of element which have maximum electron affinity in Modern Periodic table.

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87. How many of the following are more electronegativity than Boron. H, Li, Be, C, N, O, F

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88. The group in the modern periode table, in which all the elements do not have same number of electrons in their valence shell is :

A. 13^{th}

B. 11^{th}

C. 9^{th}

D. 18^{th}

Answer: C::D

Watch Video Solution

89. Element corresponding to which of these//this atomic number belongs to p-block in Modern Periodic Table:

A. 19

B. 35

C. 53

D. 83

Answer: B::C::D

View Text Solution

90. Which of the following have greater Z_{eff} than Zn:

A. Cu^{+}

B. Cu^{2+}

C. Fe^{3+}

D. Zn^{2+}

Answer: A::B::C::D

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91. Which of the following is/are correct regarding oxidation state of elements in their compounds:

A. All d-Block elements show multiple oxidation state.

B. All p-Block elements show multiple oxidation state.

C. All s-Block elements show single oxidation state.

D. Some of 18 group elements can show multiple oxidation state.

Answer: C::D

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92. Which of the following elements have $+3$ as most popular oxidation state?

A. AI

B. Xe

C. Cu

D. Sc

Answer: A::D

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93. Which of the following compounds are found to exist (General formula obtaining)?

A. MgF

B. Cu_2CI_2

C. NaF_2

D. K_2O

Answer: B::D

View Text Solution

94. Which of the following show non-zero multiple oxidation state?

A. S

B. O

C. Zn

D. H

Answer: A::B::D

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95. Which of the following pairs of elements show similar set of oxisation state?

A. O^{15}, O^{18}

B. Na, K

C. C, Be

D. Zn, Rb

Answer: A::B

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96. Which of the following elements have their lower oxidation state as more stable oxidation state.

A. O

B. Pb

C. Tl

D. Bi

Answer: A::B::C::D

View Text Solution

97. Which is /are the correct order/s of atomic radius?

A. $Li < B < Be$

B. $Be < B < Li$

C. $Li > Be > B$

D. $N > O > F$

Answer: C::D

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98. Which is/are the correct order/s of atomic radius?

A. $Mn > Fe > CO$

B. $Mn \approx Fe \approx Co$

C. $Sc > Ti > V$

D. $Zn < Cu < Ni$

Answer: B::C::D

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99. Which of the following orders is (are) correct for size:

A. $AI \approx Ga$

B. $Te^{2-} > I^{-} > Cs^{+} > Ba^{2+}$

C. $Cr^{3+} < Cr^{6+}$

D. $Pd \approx Pt$

Answer: A::B::D

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100. The ionic radii depends upon in the following factors:

A. Charge on cation

B. Charge on anion

C. Shell number of valence sheel electron (s) of the ion:

D. Effective nuclear charge

Answer: A::B::C::D

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101. Which of the following statements is/are correct?

A. The second ionization enthalpy of oxygen element is greater than that of fluorine element.

B. The third ionization enthalpy of phosphours is greater than that of aluminium.

C. The first ionization enthalpy of aluminium is slightly greater than that of gallium.

D. The second ionization enthalpy of copper is greater than that of zinc.

Answer: A::B::D

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102. 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 in Modern periodic table will impart colour to the flame?

A. 2

B. 13

C. 1

D. 17

Answer: A::C

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103. Which of the following elements will gain one electron radily in comparison to other elements of their group?

A. $S(g)$

B. $N(g)$

C. $O(g)$

D. $CI(g)$

Answer: A::D

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104. Which of the following is/are correct order/s of electron affinity.

A. $N < C < O < F$

B. $P < Si < S < CI$

C. $Si < P < StCI$

D. $C < N < O < F$

Answer: A::B

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105. Order of Electron affinity of the elements or ions shown correctly?

A. $S > O^-$

B. $P > N^-$

C. $O^- > S$

D. $N^- > P$

Answer: A::B

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106. Which of the following is correct order of Electron negativity:

A. $Cs > Rb > Na$

B. $Li < Be < B$

C. $C < N < O$

D. $CI > F > Br$

Answer: B::C

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107. Choose the correct statements(s):

A. In general more the ionisation energy more will be electronegativity.

B. Electronegativity increase means metallic character increases.

C. In general lower will be the ionisation energy, easier will be to remove electron.

D. Electron affinity of S is less than that of CI.

Answer: A::C::D

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108. 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 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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The last element of the 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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Which of the element whose atomic numbers are given below, cannot be accommodated in the present set up of the long form of the periodic table ?

A. 107

B. 118

C. 126

D. 102

Answer: C

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111. 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

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

C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$

D. $1s^2 2s^2 3s^2 3p^6 3d^7 4s^2$

Answer: A

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112. 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

113. It is not possible to measure the atomic radius prectsely since the electron cloub surrouding the atom does not have a sharp boundary. One practial approach to estimate the size of an atom of a non-metallic element is to measure the distance between two atoms when they are bound togther by a signle bond in a covalent molecule and then dividing by two. For metals we define the term "matellic radius" which is taken as half the internuclear distance separating the metal cores in the metallic crystal. Then van der waal's radius

represents the over all size of the atoms which includes its valence shell in a non bonded situation. It is the half of the distance between two similar atoms in separate molecules in a solid. The atomis radius decreases across a period and increases down the group. Same trends are observed in case of ionic radius. Ionic radius of the species having same number of electrons depends on the number of protons in their nuclei. Sometimes, atomic and ionic radii give unexpected trends due to poor shielding of nuclear charge by d- and $f-$ orbital electrons.

Now answer the following three questions:

Which of the following relations is correct, if considered for the same element.

A. $r_{\text{vandewaal}} > f_{\text{Covalent}} > r_{\text{Metallic}}$

B. $r_{\text{Covalent}} > T_{\text{Metallic}} > T_{\text{Vanderwaal}}$

C. $r_{\text{Vanderwaal}} > r_{\text{Metallic}} > r_{\text{Covalent}}$

D. $r_{\text{Metallic}} > r_{\text{Covalent}} > T_{\text{Vanderwaal}}$

Answer: C

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and $f-$ orbital electrons.

Now answer the following three questions:

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

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

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

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

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

Answer: B

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Now answer the following three questions:

Select the INCORRECT option regarding atomic//ionic sizes:

A. $Zn > Cu$

B. $Pb^{2+} > Pb^{4+}$

C. $Zr \approx Hf$

D. $N^{3+} < AI^{3+}$

Answer: D

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116. The periodicity is related to the electronic configuration. That is, all chemical and physical properties are a manifestation of the electronic configuration of the elements.

The atomic and ionic radii generally decrease in a period from left to right. As a consequence, the ionization enthalpies generally increase and electron gain enthalpies become more negative across a period.

In other words, the ionization enthalpy of the exterme left element in a period is the least and teh electron gain enthalpy of the element on the exterme right is the highest negative. This results into high chemical reactivity at the two extermes and the lowest in he centre. Similarly down the group, the increase in atomic and ionic radii result in gradual decrease 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 reducting and oxidising behaviour, and also with metallic and non-metallic character respectively, of the elements.

The correct order of the metallic character is:

A. $AI > Mg > Na > Si$

B. $Na > Mg < AI > Si$

C. $Na > Mg > AI > Si$

D. $AI > Mg > Si > Na$

Answer: C

Watch Video Solution

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metallic and non-metallic character respectively, of the elements.

Considering the elements B, C, N, F and Si, the correct order of their non-metallic character is:

A. $B > C > Si > N > F$

B. $Si > C > B > N > F$

C. $F > N > C > B > Si$

D. $F > N > C > Si > B$

Answer: C

Watch Video Solution

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The atomic and ionic radii generally decrease in a period from left to right. As a consequence, the ionization enthalpies generally increase and electron gain enthalpies become more negative across a period. In other words, the ionization enthalpy of the exterme left element in a period is the least and teh electron gain enthalpy of the element on the exterme right is the highest negative. This results into high chemical reactivity at the two extermes and the lowest in he centre. Similarly down the group, the increase in

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The loss and gain of electrons can be co-related with the reducting and oxidising behaviour, and also with metallic and non-metallic character respectively, of the elements.

Which of the following statements is correct?

A. ionisation enthalpies of elements decrease along a period and increase along a group in Modern periodic table.

B. In the 3^{rd} period of Modern periodic table, the two most reactive elements are sodium and fluorine.

C. Fluorine has the least negative electron gain enthalpy among all halogens.

D. Ionisation enthalpy of Pb is greater than that of Sn.

Answer: D

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119. Arrange the following ions in order of their increasing size: Li^+, Mg^{2+}, K^+, AI^{3+}.

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120. Fill in the blanks:

Compounds that formally contain Pb^{4+} are easily reduced to Pb^{2+}. The stability of the lower oxidation state is due to..... .

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121. Assertion: F atom has a less negative electron affinity than CI atom.

Reason: Additional electrons are repelled more effectival by $3p$ electrons in CI atom than by $2p$ electrons in F atom.

A. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true, but Reason is not correct explanation of Assertion.

C. Assertion is true but Reason is false.

D. Assertion is false but Reason is true.

Answer: C

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122. 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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123. 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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124. Assertion: The first ionization energy of Be is greater than that of B.

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

A. Both Assertion and Reason are true and reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not correct explanation of Asseration.

C. Assertion is true but Reason is false.

D. Assertion is false but Reason is true.

Answer: C

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125. 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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126. Identify the least stable ion amongst the following:

A. Li^-

B. Be^-

C. B^-

D. C^-

Answer: B

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127. Assertion (A) :Pb^{+4} compounds are stronger oxidiising agents than Sn^{4+} compounds .

Reason (R): The higher oxidation states for group 14 elements are more stable for the heavier members of the group due to inert pair effect .

A. Statement-1 is Ture, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is Ture, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is Ture, Statement-2 is False

D. Statement-1 is Flase, Statement-2 is True

Answer: C

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128. Among the following , the number of elements showing only one non-zero oxidation state is:

$O, C, F, N, P, Sn, Tl, Na, Ti$

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

A. Li^+

B. B^{2+}

C. O^{2-}

D. F^-

Answer: C

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

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

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

A. oxygen is more electronegative.

B. oxygen has high electron affinity.

C. O^- ion will tend to resist the addition of another electron.

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

Answer: C

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

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

B. $B < C < F < O$-increasing first ionisation enthalpy

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

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

Answer: B

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132. Which of the following factors may be regarded as the main cause of lanthanide contraction?

A. Greater shielding of $5d$ electrons by $4f$ electrons.

B. Poorer shielding of $5d$ electron by $4f$ electrons.

C. Effective shielding of one of $4f$ electrons by another in the sub-shell.

D. Poor shielding of one of $4f$ electron by another in the sub-shell

Answer: D

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133. The lanthanide contraction is responsible for the fact that

A. Zr and Y have about the same radius

B. Zr and Nb have similar oxidation state

C. Zr and Hf have about the same radius

D. Zr and Zn have same oxidation state.

Answer: C

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134. 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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135. Lanthanoid contraction is caused due to:

A. the appreciable shielding on outer electrons by $4f$ electrons from the nuclear charge

B. the appreciable shielding on outer electrons by $5f$ electrons from the nuclear charge

C. the same effective nuclear charge from Ce to Lu

D. the imperfect shielding on outer electrons by $4f$ electrons from the nuclear charge

Answer: D

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136. The stability of dihaiides of Si, Ge, Sn and Pb increases steadlly in the sequence.

A. $SiX_2 < < GeX_2 < < SnX_2 < < PbX_2$

B. $PbX_2 < < SnX_2 < < GeX_2 < < SiX_2$

C. $GeSX_2 < < SiX_2 < < SnX_2 < < PbX_2$

D. $SiX_2 < < GeX_2 < < PbX_2 < < SnX_2$

Answer: A

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137. The set representing the correct order of ionic radius is : a) $Na^+ > Mg^{2+} > Al^{3+} > Be^{2+} > Li^+$

b) $Na^+ > Li^+ > Mg^{2+} > Al^{3+} > Be^{2+}$ c) $Na^+ > Mg^{2+} > Al^{3+} > Li^+ > Be^{2+}$ d) $Na^+ > Mg^{2+} > Li^+ > Be^{2+} > Al^{3+}$

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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138. The correct sequence which shows decreasing order of the ionic radii of the elements is

A. $AI^{3+} > Mg^{2+} > Na^{+} > F^{-} > O^{2-}$

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

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

D. $O^{2-} > F^{-} > Na^{-} > Mg^{2+} > AI^{3-}$

Answer: D

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139. The outer electronic configuration of Gd (At.No. 64) is

A. $4f^3 5d^5 6s^2$

B. $4f^8 5d^6 6s^2$

C. $4f^4 5d^4 6s^2$

D. $4f^7 5d^1 6s^2$

Answer: D

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140. the correct order of electron gain enthalpy with negative sign of F, Cl, Br and I , having atomic number $9, 17, 35$ and 53 respectively is

A. $F > CI > Br > I$

B. $CI > F > Br > I$

C. $Br > CI > I > F$

D. $I > Br > CI > F$

Answer: B

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141. The increasing order of the ionic radii of the given isoelectronic species is :-

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

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

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

D. $K^+, S^{7-}, Ca^{2+}, CI^-$

Answer: C

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142. Which of the following represents the correct order of increasing first ionisation enthalpy for Ca, Ba, Se, and Ar?

A. $Ca < S < Ba < Se < Ar$

B. $S < Se < Ca < ba < Ar$

C. $Ba < Ca < Se < S < Ar$

D. $Ca < Ba < S < Se < Ar$

Answer: C

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143. 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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144. The ionic radii of N^{3-}, O^{2-} and F^{-} are respectively given by:

A. 1.36, 1.40 and 1.71

B. 1.36, 1.71 and 1.40

C. 1.71, 1.40 and 1.36

D. 1.71, 1.36 and 1.40

Answer: C

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Exercise 2

1. The statement that is not correct for periodic classification of element isA)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 electron 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

A. The properties of element 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 element generally increase with increase in atomic number as we go along a period.

Answer: C

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Exercise 3

1. The correct statement among the following is:

A. the first ionization energy of AI is less than first ionizarion energy of Mg.

B. the second ionization energy of Mg is greater than second ionization energy of Na

C. the first ionization energy of Na is less than first ionization energy of Mg.

D. the third ionization energy of Mg is greater than third ionization energy of AI.

Answer: B

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Advanced Level Problems

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

A. inert gas elements

B. representative elements

C. trantition elements

D. none of these

Answer: C

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2. Of the following pairs, the one containing examples of metalloid elements is:

A. B and AI

B. Ga and Ge

C. AI and Si

D. As and Sb

Answer: D

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3. Which of the following is the wrong statements?

A. All the actinide elements are radioactive.

B. Alkali and alkaline earth metals are s-block elements.

C. Pnicogens and halogens are p-block elements.

D. The first member of the lanthanide series is lanthanum.

Answer: D

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

A. $f < p < d < s$

B. $s < p < d < f$

C. $f < d < p < s$

D. $s = p = d = f$

Answer: C

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6. Which of the following is correct prder of Z_{eff}:

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

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

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

D. $Li > Be > B$

Answer: B

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7. In sodium atom on $3s$ electron the screening is due to:

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

B. $4s^1$

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

D. $3s^1$

Answer: C

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8. Which of the following elements can heve negative oxidation states.

A. AI

B. Ca

C. Fe

D. B

Answer: D

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9. What is correct order of reducing capacity.

A. $Ge^{2+} > Sn^{2+} > Pb^{2+}$

B. $Ge^{2+} < Sn^{2+} < Pb^{2+}$

C. $Ge^{2+} \approx Sn^{2+} \approx Pb^{2+}$

D. $Pb^{2+} > Ge^{2+} > Sn^{2+}$

Answer: A

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10. Intert pair effect is observed in elements of which block:

A. s

B. p

C. d

D. f

Answer: B

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

A. $Li < Be < Mg$

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

C. $O < F < Ne$

D. $Li < Na < K < Ca < Rb$

Answer: B

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12. The lanthanide contraction refers to:

A. radius of the series

B. valence electrons of the series.

C. the density of the series

D. electronegativity of the series.

Answer: A

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13. Which of the following statement is correct with respect to the property of elements with an increase in atomic number in the carbon family (group 14)?

A. Atomic size increases

B. Ionization energy increases

C. Metallic character decreases

D. Stability of $+4$ oxidation state increase

Answer: A

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14. Which group of atoms have nearly same atomic radius.

A. Na, K, Rb, Cs

B. Li, Be, B, C

C. fe, Co, Mn

D. F, CI, Br, I

Answer: C

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15. The incorrect order of radius is:

A. $Cu^- > Cu > Cu^+$

B. $Sc^{3+} > K^+ > S^{2-}$

C. $Ni < Cu < Zn$

D. All of these

Answer: B

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

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

B. it is easier to remove electron from cation.

C. ionization is an endothermic process.

D. the cation is smaller than its parent atom

Answer: D

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17. 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. 2 valence electrons in an atom

Answer: C

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18. 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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19. The atomic number of V, Cr, Mn and Fe are respectively $23, 24, 25$ and 26. Which one of these may be expected to have the highest second ionization enthalpy?

A. V

B. Cr

C. Mn

D. Fe

Answer: B

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20. For which of the following species $2^{nd}IE < 1^{st}IE$

A. Be

B. Ne

C. Na^{+}

D. None of these

Answer: D

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21. With reference to $1^{st} IP$ which are correct.

(a) $Li < C$ (b) $O < N$ (c) $Be < N < Ne$

A. a, b only

B. b, c only

C. a, c only

D. a, $b \& c$

Answer: D

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22. Values of 1^{st} four ionisation energies (kJ/mol) of an element are respectively 496, 4563, 6913, 9541 the electronic configuration of that element can be.

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

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

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

D. (3) and (2) both

Answer: C

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23. Which one of the following statement is correct?

A. The elements having large negative values of electron gain enthalpy generally act as strong oxidising agents.

B. The elements having low values of ionisation enthalpies act as strong reducing agents.

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

D. All of these.

Answer: D

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24. For magnitude of eletron gain enthalpy of chalocogens and halogens, which of the following option is correct?

A. $Br > F$

B. $S > F$

C. $O < CI$

D. $S < Se$

Answer: C

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25. The correct order of electron gain enthalpy (most endothermic first and most exothermic last) 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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26. $N_0/2$ 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. $I.E. = \frac{2E_1}{N_0}, \Delta_{eq}H = -\frac{E_2}{2N_0}$

B. $I.E. = -\frac{E_2}{2N_0}. \Delta_{eq}H = \frac{2E_1}{N_0}$

C. $I.E. = \frac{E_1}{2N_0}, \Delta_{eq}H = -\frac{E_2}{2N_0}$

D. $I.E. = \frac{N_0}{2E_0}. \Delta_{eq}H = -\frac{2N_0}{E_2}$

Answer: A

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27. The formation of oxide ion $O^{2-}(g)$ from oxygen atom requires first an exothermic and then an endothermic step as shown below

$O(g) + e^- \rightarrow O^-(g), \Delta H^- = -141 kjmol^{-1}$

$O^-(g) + e^- \rightarrow O^{2-}(g), \Delta H^- = +780 kjmol^{-1}$

Thus, process of formation of O^{2-} in gas phase is unfavourable even through O^{2-} is isoelectronic with neon. It is due to the fact that A) oxygen is more electronegative B) addition of electron in oxygen results in larget size of the ion C) electron repulsion outweights the stability gained by achieving noble gas configuration D) O^- ion has comparatively smaller size than oxygen atom

A. oxygen is more electronegative.

B. addition of electron in oxygen results in larger size of the ion.

C. electron repulsion outweights the stability gained by achieving noble gas configuration

D. O^- ion has comparatively smaller size than oxygen atom.

Answer: C

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28. The prperties which are not common to both groups 1 and 17 elements in the p-periodic table are:

A. Electropositive character increase down the groups.

B. Reactivity decrease from top to bottom in these groups.

C. Atomic radii increase as the atomic number increase.

D. Electronegativity decreases on moving down the group

Answer: B

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29. The correct set of decreasing order of electronegativity is:

A. Li, H, Na

B. Na, H, Li

C. H, Li, Na

D. Li, Na, H

Answer: C

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30. Which of the following is most electronegative in p-block elements

A. Oxygen

B. Chlorine

C. Fluorine

D. Phosphours

Answer: C

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31. Which set does not show correct matching ?

A. $Cr = [Ar]3d^5 4s^1$, element belongs to 6^{th} group.

B. $Fe^{2+} = [Ar]3d^6$, element belongs to 8^{th} group.

C. $Sc^{3+} = [Ne]3s^2 3p^6$, element belongs to zer/eighteen group.

D. All of the above

Answer: C

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32. In which element shielding effect is not possible ?

A. H

B. Be

C. B

D. N

Answer: A

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33. Elements of which block in modern periodic table cannot have-ve oxidation state?

A. s

B. d

C. p

D. None of these

Answer: A

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34. Which of following ions do not exist togther in aqueous solution:

A. Pb^{2+}, F^{-}

B. TI^{3+}, I^{-}

C. Both (A) and (B)

D. None of these

Answer: B

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35. Select correct statement (s):

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

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

C. Both are correct statements

D. None of the statement is correct.

Answer: C

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36. Which of the following is the correct order of ionisation enthalpy ?

A. $Te^{2-} < I < C < Ba^{2+}$

B. $I^{-} < Te^{2-} < Cs < Ba^{2+}$

C. $Ts^{2-} < Cs < I^{-} < Ba^{2+}$

D. $Ba^{2+} < Cs^{+} < I^{-} < Te^{2-}$

Answer: A

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37. Which is true statement(s)?

A. Large is the value of ionisation enthalpy easier is the formation of cation.

B. Larger is the value of electron gain enthalpy, easier is the formation of anion.

C. Large is the have of ionisation energy as well as electron affinity, smaller is the Muliken electronegativity of atom.

D. Large to the Z_{eff} large is the size of atom.

Answer: B

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38. Which of the following statement is wrong for the d-block elements?

A. They have general electronic configuration $(n-1)d^{1-10}ns^{0-7}$.

B. They generally exhibit variable valency.

C. Last electron enters in $(n-1)d$ sub-shell in them.

D. They are placed from $3^{rd} \rightarrow 6^{th}$ period in modern periodic table.

Answer: A::B::C

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39. Poor shielding of nuclear charge by d or f-orbital electrons is responsible for which of the following facts?

A. Atomic radius of $Nb(4d$-series) is comparable to that of $Ta(5d$-series)

B. The 1^{st} ionisation enthalpy 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 1^{st} ionisation energy for gold is greater than that of silver.

Answer: A::D

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40. Which of the following element(s) have only one non-zero oxidation state.

A. Be

B. O

C. F

D. N

Answer: A::C

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41. Which of the following is/are true order (s):

A. $B^+ < B < B^- \quad Size$

B. $I < Br < CI < F \quad \text{Electron gain enthalpy}$

C. $O < O^- < O^+ \quad Z_{eff}$

D. $Na < AI < Mg < Si \quad \text{Ionisation potential}$

Answer: A::C::D

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42. Select the endothermic step(s):

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

B. $Ne(g) + e^- \rightarrow Ne^-(g)$

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

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

Answer: A::B::C::D

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43. Which of the following has/have not unit?

A. Electronegativity

B. Electron gain enthalpy

C. Ionisation enthalpy

D. Metallic character

Answer: A::D

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44. Atomic number of Ag is 47. In the same group the atomic numbers of elements placed and below Ag in

long form of periodic table will be x and y respectively.

Given the value fo $(x+y)/12$.

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45. What is the sum of oxidation states of hydrogen in $CaH_2 \& CH_4$.

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46. Most stable oxidation state of Thallium is $+n$. What is the value of n.

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47. Total number of elements which have more ionization energy as compare to their next higher atomic number elements. Li, be, C, N, O, F, Ne

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48. For the gaseous reaction $K + F \rightarrow K^+ + F^-$, Δh was calculated to be 18.4 kcal/mol under conditions where the cations and anions were preverted from combining with each other. The ionisation enthalpy of K is 4.3 eV/atom. What is the electron gain enthalpy of F (in eV)? If your answer is x report it as $-2x$.

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49. How many elements are more electropositive than $CI.$

$B, N, O, C, S, P, At, H, Li$

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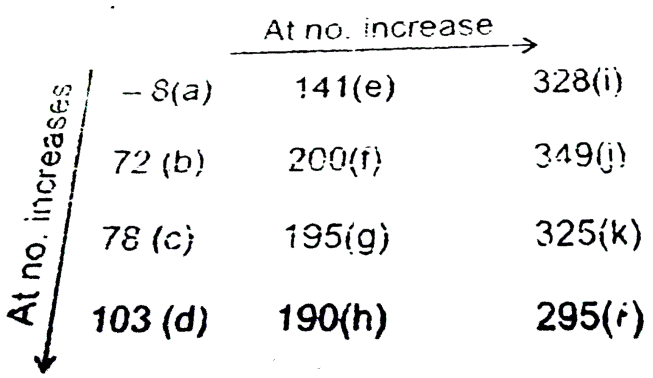
50. EA_1 value of some group of p-Block elements ae given:



$a, b, c. \ldots \ldots \ldots \ldots l$ are non radioactive p-Block elements:

Select the correct order of atomic radius:

A. $A < b < c < d$

B. $a < e < i$

C. $I > j > k > l$

D. $e > f > g$

Answer: A

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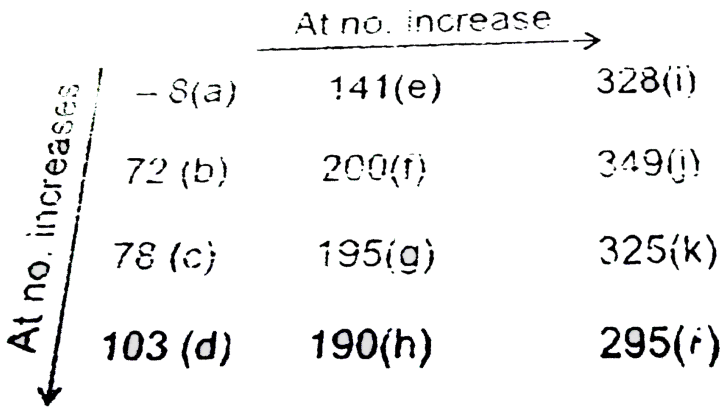
51. EA_1 value of some group of p-Block elements ae given:



$a, b, c. \ldots \ldots \ldots \ldots l$ are non radioactive p-Block elements:

Select the correct order of 2^{nd} ionisation energy:

A. $a < e < i$

B. $a < e < i$

C. $e < a < i$

D. $e > I > a$

Answer: D

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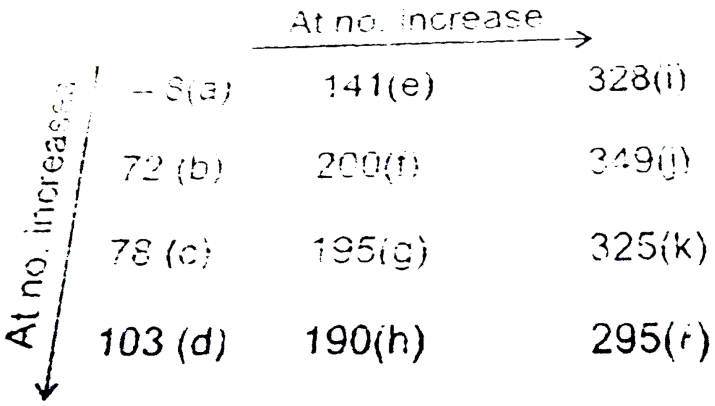
52. EA_1 value of some group of p-Block elements ae given:



$a, b, c. \ldots\ldots\ldots\ldots l$ are non radioactive p-Block

elements:

Choose correct match :

A. $a, b, c, d =$ Pnictogens

B. $e, f, g, h =$ Chalogens

C. $I, j, k, l =$ Halogens

D. All of these

Answer: D

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53. The element whose electronic configuration is $1s^2, 2s^2 2p^6, 3s^2$ is a/an

A. metal

B. inter gas

C. metalloid

D. non-metal

Answer: A

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54. Oxygen shows $+2$ oxidation state is

A. F_2O

B. H_2O

C. K_2O

D. D_2O

Answer: A

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55. Which Group IIIA elements is expected to have physical and chemical properties least similar to other members of that group?

A. Ga

B. AI

C. B

D. In

Answer: C

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56. Which of the followig ions will show highest magnetic moment (Z values for nautral atoms are as follows: $N = 7, Cr = 24, Fe = 26 \& Co = 27$)

A. Fe^{3+}

B. Cr^{3+}

C. N^{3+}

D. Co^{3+}

Answer: A

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57. The oxidation number of Cr in $K_2Cr_2O_7$ is

A. $+3$

B. $+6$

C. $+4$

D. -4

Answer: B

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58. Which of the following is the smallest in size?

A. N^{2-}

B. F^{-}

C. O^{2-}

D. Na^{+}

Answer: D

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59. Oxidation Number of Mn in $[MnO_4]^{-}$ is:

A. -7

B. $+7$

C. $+2$

D. -2

Answer: B

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60. The reduction potentials of Zn, Cu, Fe and Ag are in the increasing order:

A. Zn, Cu, Fe, Ag

B. Cu, Ag, Fe, Zn

C. Ag, Cu, Fe, Zn

D. Fe, Zn, Cu, Ag

Answer: C

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61. The formation of anion from a neutral atom X is favoured by:

A. high electron affinity

B. large size of X

C. low ionisation potential

D. high charge on anion X

Answer: A

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62. An isotone of $._{32}^{76}Ge$ is-

(a) $._{32}^{77}Ge$

(b) $._{33}^{77}As$

(c) $._{34}^{77}Se$

(d) $._{34}^{78}Se$

A. $._{34}^{77}Sc$

B. $._{33}^{77}As$

C. $._{32}^{76}Ge$

D. $._{34}^{79}Se$

Answer: B

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63. Which element of $3rd$ row has biggest atomic size?

A. chlorine

B. sodium

C. silicon

D. neon

Answer: D

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64. Which group of periodic table have large negative energy of activation ?

A. Alkali metal

B. Zero group

C. Halogen family

D. Alkaline earth metal

Answer: C

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65. The species which has its fifth ionization potential equal to 340 V is :

A. B^+

B. C^+

C. B

D. C

Answer: B

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66. The atom of an element X contains 27 electron X is expected to be

A. a non-metal belonginig to p-block

B. paramagnetic belonging to d-block

C. diamagnetic belonging to d-block

D. an s-block element.

Answer: B

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67. The group in the periodic table that contains the elements in all the different physical states at room temperature is

A. VA

B. IA

C. $VIIA$

D. IVA

Answer: C

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68. The ion having a noble gas electronic configuration is

A. Se^{2-}

B. Fe^{3+}

C. Cr^{3+}

D. Cu^{+}

Answer: A

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69. Element with $Z = 83$ belongs to which block?

A. s

B. p

C. d

D. f

Answer: B

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70. Intert pair effect plays an important role in the case of

A. P

B. Bi

C. Sb

D. As

Answer: B

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71. Which of the following has the highest electron affinity?

A. F

B. Br

C. CI

D. I

Answer: C

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72. The element having electronegativity nex of that of fluorine is

A. oxygen

B. chlorine

C. idoine

D. sodium

Answer: A

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73. The group in the long from of periodic table having three elements togther is

A. zero group

B. III^{rd} group

C. IV^{th} group

D. $VIII^{th}$ group

Answer: D

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74. Atom with the largest electron affinity is

A. Na

B. CI

C. I

D. P

Answer: B

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75. The lithium ion $\left(Li^{+}\right)$ and hydride ion $\left(H^{-}\right)$ are isoelectronic ions. Which statements about these

system is true?

A. Chemical properties of these ions are identical since they are isoelectronic.

B. Li^+ is a stronger reducing agenet than H^-

C. More energy is needed to ionize H^- than Li^+

D. Radius of H^- is large than that of Li.

Answer: D

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76. Which of the following sequence of elements is arranged in the order of increasing atomic radii?

A. Na, Mg, AI, Si

B. C, N, O, F

C. O, S, Se, Te

D. I, Br, CI, F

Answer: C

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77. The number of unpaired electrons in the scandium atom is

A. 1

B. 2

C. 0

D. 3

Answer: A

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78. The three quantum numbers n, l, m corresponding to the valence electrn in rubidium $(Z = 37)$ are :

A. 5, 0, 0

B. 5,1,0

C. 5,0,1

D. 5,1,1

Answer: A

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79. Which of the following pairs represents isoelectronic ions?

A. Mn^{3+} and Fe^{2+}

B. Mn^{2+} and Fe^{3+}

C. Cr^{3+} and Mn^{2+}

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

Answer: C

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80. Which of the following statements concerning transition elements is false?

A. They are all metals.

B. They easily form coordination compounds.

C. Their ions are mostly coloured.

D. They show multiple oxidation states always differing by two units.

Answer: D

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81. Element having $(4, 0, 0 + 1/2)$ as a set of four quantum numbers for its valence electron is-

A. Na

B. Ca

C. K

D. Br

Answer: C

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82. Europium forms stable Eu^{2+} ions because

A. Europium is a lanthanide

B. $+2$ is the common oxidation state of lanthanides.

C. Eu^{2+} has f^7 valence electronic configuration

D. All of the above reasons.

Answer: C

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83. Assuming a Lewis structure for SO_2 in which all the atoms obey the octet rule, the formal charge on S is:

A. $+1$

B. 0

C. $+2$

D. 2

Answer: B

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84. Which of these ions is expected to be colored in aqeous solution?

[I] Fe^{3+} [II] Zn^{2+} [III] AI^{3+} [IV] Sc^{3+}

A. [I] only

B. [III] only

C. [I] and [II] only

D. [I], [II] and [III]

Answer: A

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85. How many unpaired electrons ae in a Fe^{2+} ion in the ground state?

A. 0

B. 2

C. 4

D. 6

Answer: C

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86. 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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87. The noble gas was first time discovered by

A. Cavendish

B. Willian Ramsay

C. Rayleigh

D. Frankland

Answer: B

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88. The correct order of increasing first ionization energy is

A. $Ca < K < Ne < P < F$

B. $F < Ca < ne < P < K$

C. $K < Ca < P < F < Ne$

D. $Ne < F < P < Ca < K$

Answer: C

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89. The group that has the species correctly listed in the order of decreasing radius is:

A. cu^{2+}, cu^{+}, Cu

B. V, V^{2+}, V^{3+}

C. F^{-}, Br^{-}, I

D. B, Be, Li

Answer: B

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90. The number of valence electrons in an atom with the configuration $1s^2 2s^2 2p^6 3s^2 3p^2$ is:

A. 6

B. 5

C. 4

D. 2

Answer: C

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91. The compound in which Mn has oxidation state of $+3$ is

A. $KMnO_4$

B. $K_2\left[Mn(CN)_6\right]$

C. $MnSO_4$

D. $CsMn(SO_4)_2.12H_2O$

Answer: D

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92. The most abundant element found in the earth's crust is:-

A. aluminium

B. oxygen

C. silicon

D. iron

Answer: B

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93. Einstenium has 11 electrons in the $4f$ subshell. The number of unpaired electrons in the subshell is:

A. 3

B. 4

C. 7

D. 11

Answer: A

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94. Lanthanoid contraction is caused due to:

A. the appreciable shielding on outer electrons by $4f$ electron from the nuclear charge

B. the appreciable shielding on outer electrons by $5d$ electrons from the nuclear charge

C. the same effective nuclear charge from $Ce \rightarrow Lu$.

D. the imperfect shielding on outer electrons by $4f$ electrons from the nuclear charge

Answer: D

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95. The outermost electronic configuration of the most electronegative element is

A. ns^2, np^3

B. $ns^2, np^6(n-1)d^2$

C. ns^2, np^5

D. ns^2, np^6

Answer: C

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96. 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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97. The first four ionization energies of an element are $191, 578, 872,$ and $5962 \mathrm{kcal}$. The number of valence electrons in the element is.

A. 1

B. 2

C. 3

D. 5

Answer: C

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98. The number of unpaired electron in Ni^{2+} is

A. 0

B. 2

C. 3

D. 4

Answer: B

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99. Europium (Eu) and Terbium (Tb) attain stable $4f^7$ configuration by exhibiting oxidation states of

A. $+2$ and $+4$

B. $+3$ and $+4$

C. $+2$ and $+3$

D. $+1$ and $+3$

Answer: A

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100. $4s$ orbitals has less energy than $3d$ orbital

A. Greater value of n

B. Lesser value of l

C. Lesser value of $(n + l)$

D. $l = 0$

Answer: C

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101. In the compound $Na_2S_2O_3$, the oxidation state of sulphur is:

A. -2

B. $+2$

C. $+4$

D. $+6$

Answer: B

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102. Of the following the ion with the largest size is

A. O^{2-}

B. Na^{2+}

C. F^{-}

D. AI^{3+}

Answer: A

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103. The correct statement for the molecule CsI_3 is

A. it contains Cs^+, I^- and molecular I_2

B. it is a covalent compound

C. it contains Cs^+ and I_3^-

D. it contains Cs^{3+} and I^-

Answer: C

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104. The transtion metals form complexes that involve central metal atom coordinated with ligands. The

geometry of these complexes depends upon the number of ligands associated with the central metal atom. Hexacoordinate metal complexes normally perfer to have octahedral geometry.

From the following pair of oxides, indicate the number of d electrons of central metal atom. Also indicate which oxide will be coloriess and which will be colored. Explain your answer in brief.

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105. The periodic system of the elements in our three-dimensional world is based on the four electron quantym numbers

$n = 1, 2, 3, \ldots .1 = 0, 1. . n - 1, m = 0, \pm 1, \pm 2. . . \pm 1$ and $s = \pm 1/2$. In Flatlandia a twodimensional world, the periodic system in thus based on three electron quantum numbers: $n = 1, 2, 3 \ldots m_1 = 0, \pm 1, \pm 2 \ldots \pm (n - 1)$, and $s = \pm 1/2$ where m_1 plays the combined role of 1 and m_1 of the three dimensional world. The following takes relate to this two-dimensional world, where the chemical and physical experience obtained from our world is supposed to be still applicable.

Draw the first four periods of the Flatlandian periodic table of the elements. Number them according to their nuclear charge. Use the atomic numbers (Z) as symbols of the specific element. Write the electron configuration for each element.

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world is supposed to be still applicable.

Which of the following elements has the largest third ionization energy?

A. B

B. C

C. N

D. Mg

Answer: d

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107. The periodic system of the elements in our three-dimensional world is based on the four electron quantym numbers $n = 1, 2, 3, \ldots . 1 = 0, 1. . n - 1, m = 0, \pm 1, \pm 2. . . \pm 1$ and $s = \pm 1/2$. In Flatlandia a twodimensional world, the periodic system in thus based on three electron quantum numbers: $n = 1, 2, 3 . . . m_1 = 0, \pm 1, \pm 2 . . . \pm (n - 1)$, and $s = \pm 1/2$ where m_1 plays the combined role of 1 and m_1 of the three dimensional world. The following takes relate to this two-dimensional world, where the chemical and physical experience obtained from our world is supposed to be still applicable.

Which second period (row) element has the six

ionization energies (IE in electron volts, eV) listed below?

IE_1	IE_2	IE_3	IE_4	IE_5	IE_6
11	24	48	64	392	490

A. B

B. C

C. N

D. O

Answer: B

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