



CHEMISTRY

BOOKS - NAGEEN CHEMISTRY (ENGLISH)

CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

Example

1. Predict the blocks, periods and groups to which following elements belong:

Mg



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2. Predict the blocks, periods and groups to which following elements belong:

V



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3. Predict the blocks, periods and groups to which following elements belong:

Sb



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4. Predict the blocks, periods and groups to which following elements belong:

Rn



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5. Give the formulae of the species that will be isoelectronic with the following atoms or ions

:

Ne



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6. Give the formulae of the species that will be isoelectronic with the following atoms or ions

:

Cl^-



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7. Give the formulae of the species that will be isoelectronic with the following atoms or ions

:



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8. Give the formulae of the species that will be isoelectronic with the following atoms or ions

:





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9. Which of the following pairs would have a larger size? Explain.

K or K^+



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10. Which of the following pairs would have a larger size? Explain.

Br or Br^-



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11. Which of the following pairs would have a larger size? Explain.



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12. Which of the following pairs would have a larger size? Explain.



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13. Which of the following pairs would have a larger size? Explain.

P or As



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14. Which of the following pairs would have a larger size? Explain.

Na^+ or Mg^{2+}



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15. Arrange with explanation the following elements in the order of increasing ionisation energy.

X($Z = 4$) , Y($Z = 5$), D($Z = 6$), E($Z = 11$)



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16. Which element in each of the following pairs of elements would you expect to have lower first ionisation energy? Explain.

Cl, F



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17. Which element in each of the following pairs of elements would you expect to have lower first ionisation energy? Explain.

Cl, S



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18. Which element in each of the following pairs of elements would you expect to have

lower first ionisation energy? Explain.

K, Ar



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19. Which element in each of the following pairs of elements would you expect to have lower first ionisation energy? Explain.

Kr, Xe



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20. The first (IE_1) and the second (IE_2) ionisation energies (kJ mol^{-1}) of a few elements are given below :

Element	IE_1	IE_2
I	2372	5251
II	520	7300
III	900	1760
IV	1680	3380

Which of the above elements is likely to be a reactive metal?



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21. The first (IE_1) and the second (IE_2) ionisation energies (kJ mol^{-1}) of a few elements are given below :

Element	IE_1	IE_2
I	2372	5251
II	520	7300
III	900	1760
IV	1680	3380

Which of the above elements is likely to be a reactive non-metal?



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22. The first (IE_1) and the second (IE_2) ionisation energies (kJ mol^{-1}) of a few elements are given below :

Element	IE_1	IE_2
I	2372	5251
II	520	7300
III	900	1760
IV	1680	3380

Which of the above elements is likely to be a noble gas?



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23. First and second ionisation enthalpies(in KJ/mol) of few elements are given below:

Element	IE_1	IE_2
(i)	520	7300
(ii)	900	1760
(iii)	1680	3380
(iv)	2080	3963

Which of the above elements will form halides with formula MX_2 ?



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Review Exercises

1. On what basis did Mendeleev classify the elements ?



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2. Which of the following pairs of elements were found anomalous in Mendeleev's periodic table and why ?

Ar and K

Fe and Co

Co and Ni



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3. Which of the following pairs of elements were found anomalous in Mendeleev's periodic table and why ?

Ar and K

Fe and Co

Co and Ni



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4. Which of the following pairs of elements were found anomalous in Mendeleev's

periodic table and why ?

Ar and K

Fe and Co

Co and Ni



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5. Why was the basis of classification of elements changed from atomic mass to atomk number ?



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6. In what manner is the long form of periodic table better than Mendeleef's periodic table? Explain with examples.



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7. Write the electronic configuration of the following elements and predict the block, period and group to which each element belongs.

A ($Z = 17$)



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8. Write the electronic configuration of the following elements and predict the block, period and group to which each element belongs.

D ($Z = 26$)



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9. Write the electronic configuration of the following elements and predict the block, period and group to which each element belongs.

period and group to which each element belongs.

E ($Z = 47$)



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10. Write the electronic configuration of the following elements and predict the block, period and group to which each element belongs.

G ($Z = 55$)



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11. Write the electronic configuration of the following elements and predict the block, period and group to which each element belongs.

J ($Z = 82$)



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12. Classify the following elements into the types and the blocks to which they belong in the periodic table. Na, Kr, Cl, Hg, Ce, Ra, Zn



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13. Which of the following radii of an atom is the smallest and why?

Covalent radius, crystal radius, van der Waals' radius



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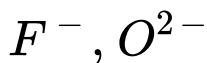
14. Which of the following pairs are isoelectronic ?

Na, Mg



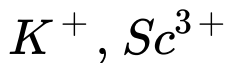
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15. Which of the following pairs are isoelectronic ?



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16. Which of the following pairs are isoelectronic ?



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17. The ionisation energy of H is 1312 kJ mol^{-1} .

How much energy is required to ionise 100 gram atoms of hydrogen?



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18. It requires $2.378 \times 10^7 \text{ J}$ energy to ionise a certain amount of helium gas. If ionisation

energy of helium is 2378.0 kJ/mol, calculate the amount of helium gas ionised.



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19. Which element in each of the following pairs would you expect to have higher first ionisation energy and why?

H, He



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20. Which element in each of the following pairs would you expect to have higher first ionisation energy and why?

F, Cl



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21. Which element in each of the following pairs would you expect to have higher first ionisation energy and why?

N, O





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22. A, B, C and D are four elements with atomic numbers $Z - 1$, Z , $Z + 1$ and $Z + 2$ respectively. B is a noble gas. Predict which element possesses highest first ionisation energy.



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23. A, B, C and D are four elements with atomic numbers $Z - 1$, Z , $Z + 1$ and $Z + 2$ respectively. B

is a noble gas. Predict

which element exists +2 oxidation state.



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24. A, B, C and D are four elements with atomic numbers $Z - 1$, Z , $Z + 1$ and $Z + 2$ respectively. B is a noble gas. Predict

whose carbonate is more stable towards heat.



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25. A, B, C and D are four elements with atomic numbers $Z - 1$, Z , $Z + 1$ and $Z + 2$ respectively. B is a noble gas. Predict whose hydroxide is less soluble in water.



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26. A, B, C and D are four elements with atomic numbers $Z - 1$, Z , $Z + 1$ and $Z + 2$ respectively. B is a noble gas. Predict which element exists +1 oxidation state.





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27. Calculate the net energy released or absorbed in converting 1 gram of oxygen atoms into O^{2-} ions.



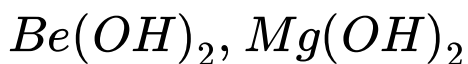
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28. Arrange LiOH, NaOH, KOH, RbOH and CsOH in the increasing order of basic strength and give an adequate explanation for the same.



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29. Which hydroxide in each of the following pairs would you expect to be more basic ?



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Very Short Answer Type Questions

1. On what basis did Mendeleev classify the elements ?



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2. How many periods and groups were present in Mendeleev's original periodic table?



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3. What are the modern names given to ekasilicon and ekaaluminium predicted by Mendeleev ?



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4. Name two anomalous pairs of elements present in Mendeleev's periodic table.



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5. Which is the most fundamental property of an atom



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6. How many groups are present in the long form of the periodic table?



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7. Which periods are short and which are long in the periodic table and how many elements do they contain?



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8. Name the orbitals which get filled in moving from left to right in fourth period



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9. what is the general electronic configuration of the elements off-block?



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10. Which groups constitute the d- block in the periodic table ?



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11. Define atomic radius of an atom.



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12. Why is van der Waals' radius of an atom greater than its covalent radius



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13. State the following:

How do the atomic radii change in a period with increasing atomic number?



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14. Give reasons why?

The size of cation is smaller than the size of parent atom.





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15. Give the formula of one species positively charged and one negatively charged that will be isoelectronic with He.



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16. Among IE_1 , IE_2 , IE_3 of an element, which is the largest ? Arrange them in the increasing order



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17. Among s, p, d and f subshells of the same shell, which has the highest ionisation energy ?



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18. How does ionisation energy vary in a group in the periodic table?



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19. Give one word or a phrase for the following statement:

The energy released when an electron is added to a neutral gaseous isolated atom to form a negatively charged ion.



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20. Name the elements which possess most negative values of electron gain enthalpy in their periods.



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21. Why does LiCl have a lower M.P. than NaCl ?



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22. Which is more basic : LiOH or NaOH ?



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23. Which is more stable : Na_2CO_3 or $CaCO_3$

?



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24. Which of the following are not representative elements ?

Li, K, Al, Cu, Ne, Fe, S, Ce, Th



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25. Which is more soluble in water : $CaSO_4$ or $SrSO_4$?



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Short Answer Type Questions

1. State Mendeleev's periodic law.



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2. State modern periodic law of classification of elements.



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3. Mention the group, period and block to which each of the following elements belongs in the long form of periodic table

X ($Z = 9$)



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4. Mention the group, period and block to which each of the following elements belongs in the long form of periodic table

Y ($Z = 28$)



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5. Mention the group, period and block to which each of the following elements belongs in the long form of periodic table

E ($Z = 40$)



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6. An element possesses electronic configuration

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^1 5s^2$. Place this element in the long form of the periodic table.



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7. Write four characteristic properties of p-block elements.



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8. What are transition elements? Mention their characteristic properties.



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9. Explain the term

periodicity in properties of elements



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10. Explain why :

Crystal radius is larger than covalent radius.



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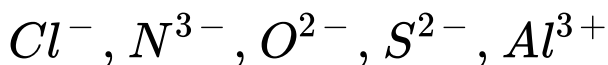
11. Give reason

Atomic size decreases across a period but increases down a group of the periodic table



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12. Arrange with explanation the following ions in the increasing order of their sizes.



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13. Arrange the following ions in the decreasing order of their sizes and explain.



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14. Define ionisation energy . What is its value for a hydrogen atom ?



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15. Why is anion larger than its parent atom ?



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16. Define valency. How does it change across a period and on going down a group?



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17. Why is the second ionisation energy of an element much greater than its first ionisation energy ?



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18. Explain what do you understand by screening effect. How does this effect influence the values of ionisation energies ?



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19. Arrange with explanation the following elements in the increasing order of their ionisation energies :

Li, Be, B, Na, Mg



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20. Why do the alkali metals possess minimum and the noble gases maximum ionisation energies in respective periods ?



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21. Why is the ionisation energy of beryllium greater than that of Li and B?



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22. Why does the ionisation energy decrease on going down a group?



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23. Among the elements of second period pick out the element with the most negative electron gain enthalpy



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24. Among the elements of second period pick out the element with the most negative electron gain enthalpy



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25. Among the elements of second period pick out the element with the largest atomic radius.



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26. Among the elements of second period pick out the element that is the most reactive non-metal.



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27. Among the elements of second period pick out the element that is the most reactive metal.



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28. Why does the fourth period have eighteen and not eight elements?



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29. The valency of a representative element is either equal to the number of valence electrons or eight minus the number. What is the basis of this rule ?



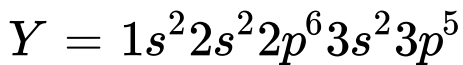
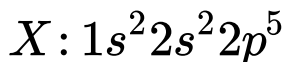
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30. Why do noble gases have positive electron gain enthalpies?



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31. Two elements X and Y possess the following electronic configuration ?



Which out of these two elements does

possess a most negative electron gain enthalpy and why?



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32. Why do the melting points decrease in going from NaF to NaI?



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33. Li_2CO_3 decomposes on heating but the carbonates of other alkali metals do not

decompose easily on heating. Why ?



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Essay Long Answer Type Questions

1. Give a brief account of the historical developments in the classification of elements.



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2. State the law on the basis of which Mendeleev classified the elements. Mention the important features of his periodic table. What are the merits and defects of Mendeleev's periodic table ?



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3. Compare the known properties of germanium with those predicted by Mendeleev for ekasilicon.





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4. What is modern periodic law? Mention the important features of the long form of the periodic table. Why is this periodic table supposed to be superior to other periodic tables ?



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5. Justify the position of hydrogen in the periodic table on the basis of its electronic

configuration.



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6. What is the basis of splitting the long form of the periodic table into s, p, d and f blocks ?

Mention the characteristic properties of the elements of each block.



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7. How can the elements be classified on the basis of their electronic configuration ?

Mention the characteristic properties of each type of elements.



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8. What do you understand by the term periodicity ? What is the main cause of periodicity ? How do the following properties

vary in periodic table ?

Atomic size



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9. What do you understand by the term periodicity ? What is the main cause of periodicity ? How do the following properties vary in periodic table ?

Valency



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10. What do you understand by the term periodicity ? What is the main cause of periodicity ? How do the following properties vary in periodic table ?

Ionisation energy



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11. What do you understand by the term periodicity ? What is the main cause of periodicity ? How do the following properties

vary in periodic table ?

Electron affinity



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12. Define various types of atomic radii. Why is covalent radius smaller than metallic and van der Waals' radii ? How do atomic radii vary in a group and in a period.



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13. What do you understand by first, second and third ionisation energies of an element ?

Discuss the factors on which ionisation energy of an element depends



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14. Define electron gain enthalpy. Explain why electron gain enthalpies of some elements are positive. How does electron gain enthalpy vary in a group and in a period ?





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15. Electron gain enthalpies of noble gases are negative.



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16. Explain why :

The electron affinities of Be and Mg are zero.



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17. Which is more basic : LiOH or NaOH ?



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18. Explain why :

The second ionisation energy of Li is very high.



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19. Write short notes on the following :

Penetration effect



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20. Write short notes on the following :

Isoelectronic ions



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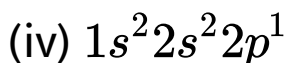
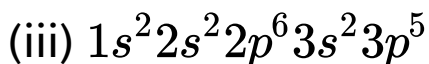
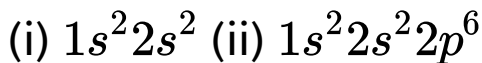
21. Write short notes on the following :

Periodic trends in melting and boiling points.



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22. The electronic configuration of some elements are given below:

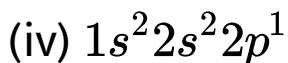
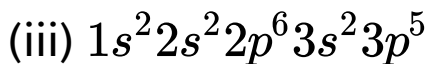
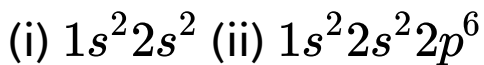


Which is a halogen ?



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23. The electronic configuration of some elements are given below:

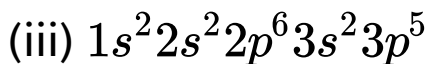
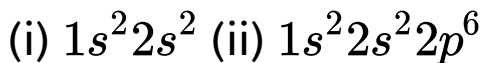


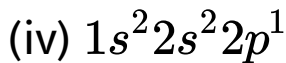
Which is a halogen ?



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24. The electronic configuration of some elements are given below:



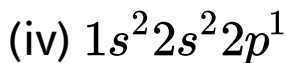
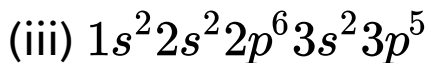
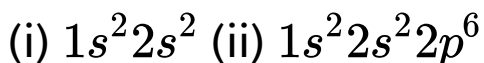


Which does belong to s-block ?



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25. The electronic configuration of some elements are given below:

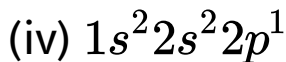
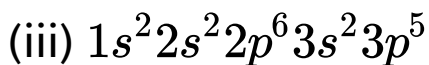
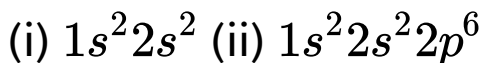


Which does have the highest IE ?



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26. The electronic configuration of some elements are given below:

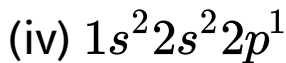
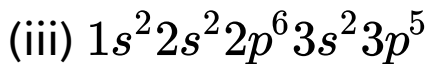
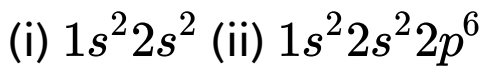


Which does have the highest IE ?



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27. The electronic configuration of some elements are given below:



Which does have valency three ?



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Objective Multiple Choice Type Questions

1. The first attempt to classify elements was made by

A. Mendeleev

B. Newlands

C. Lothar Meyer

D. Dobereiner.

Answer: A



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2. The most important active step in the development of periodic table was taken by Mendeleev

Dalton

Avogadro

Cavendish.

A. Mendeleev

B. Dalton

C. Avogadro

D. Cavendish.

Answer: A



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3. In the modern periodic table, elements are classified according to their_____. (atomic masses/atomic number)

A. increasing mass

B. increasing volume

C. increasing atomic number

D. alphabetically.

Answer: C



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4. The statement that is false for the long form of the periodic table is :

1. it reflects the sequence of filling of electrons in the order of sub energy levels s, p, d, f
2. it helps to predict the stable valency states of the elements
3. it reflects trends in physical and chemical properties of the elements
4. it helps to predict the relative ionocity of the bond between any two elements.

- A. it reflects the sequence of filling of electrons in the order of sub energy levels s, p, d, f
- B. it helps to predict the stable valency states of the elements (
- C. it reflects trends in physical and chemical properties of the elements
- D. it helps to predict the relative ionocity of the bond between any two elements.

Answer: B



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5. The tenth element in the periodic table resembles with the

A. first

B. second

C. fourt

D. ninth

Answer: B



6. In the periodic table, going down in fluorine group

- A. reactivity will increase
- B. electronegativity will increase
- C. ionic radius will increase
- D. ionisation potential will increase

Answer: C



7. Which of the following sets belong to the same period ?

Li, Na, K

Li, Mg, Ca

Cu, Ni, Zn

F, Cl, Br.

A. Li, Na, K

B. Li, Mg, Ca

C. Cu, Ni, Zn

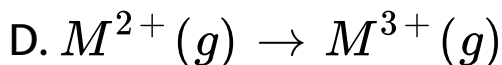
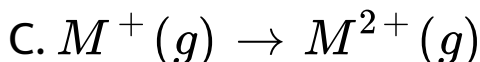
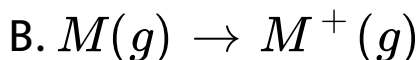
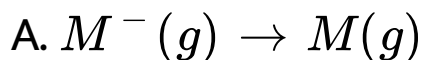
D. F, Cl, Br.

Answer: C



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



Answer: D



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9. With reference to concept of ionisation potential, which one of the following sets is correct ?

A. $U > K > Cs$

B. $B > U > K$

C. $Cs > U > B$

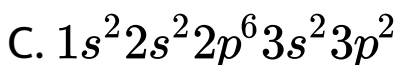
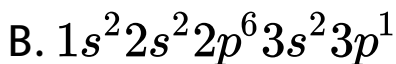
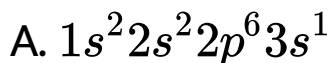
D. $Cs < U < K$

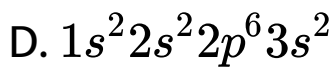
Answer: B



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10. A sudden large jump between the value of second and third ionization energies of an element would be associated with which of the following electronic configuration?





Answer: D



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11. Atomic radii of fluorine and neon in Angstrom units are respectively given by

A. 0.762, 1.60

B. 1.60, 1.60

C. 0.72, 0.72

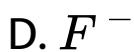
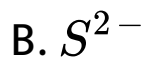
D. None of these values.

Answer: A



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12. Which of the following is the largest?



Answer: B



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13. If the valence shell electronic structure for an element is ns^2np^5 , this element will belong to the group of

- A. alkali metals
- B. inert metals
- C. noble gases
- D. halogens.

Answer: D



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14. The element californium belongs to a family of

- A. actinide series
- B. alkali metals
- C. alkaline earth metals
- D. lanthanide series

Answer: A



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15. The general electronic configuration of d-block elements is

A. $(n - 1)s^2d^{1-10}$

B. $(n - 1)d^{1-10}ns^2$

C. $(n - 1)d^{1-10}ns^2p^4$

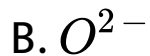
D. $(n - 1)p^4ns^2$

Answer: B



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



Answer: D



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17. Correct order of radius of elements is: C, O,
F, Cl, Br

A. F, O, C, Cl, Br

B. F, C, O, Cl, Br

C. F, Cl, Br, O, C

D. C, O, F, Cl, Br.

Answer: A



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18. Which has the highest second ionisation potential ?

A. Nitrogen

B. Carbon

C. Oxygen

D. Fluorine

Answer: C



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19. If the ionisation potential for hydrogen atom is 13.6 eV, then the ionisation potential for He^+ ion should be

A. 27.2 eV

B. 54.4 eV

C. 6.8 eV

D. 13.6 eV.

Answer: B



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20. The correct order of second ionisation potentials of carbon, nitrogen, oxygen and fluoroine is

A. $C > N > O > F$

B. $O > N > F > C$

C. $O > F > N > C$

D. $F > O > N > C$

Answer: C



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21. The element with configuration

$1s^2 2s^2 2p^6 3s^2$ would be

- A. a metal
- B. a non-metal
- C. an inert gas
- D. a metalloid

Answer: A



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22. Define the following terms:

Electron affinity .

A. energy released when an electron is added to an isolated atom in the gaseous state

B. energy absorbed when an electron is added to an isolated atom in the gaseous state

C. energy required to take out an electron from an isolated gaseous atom

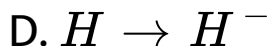
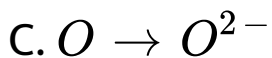
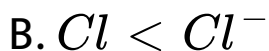
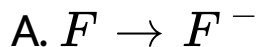
D. power of an atom to attract an electron to itself.

Answer: A



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23. The process requiring the absorption of energy is



Answer: C



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24. Which of the following sets has the strongest tendency to form anions ?

V, Cr, Mn

Ga, In, Tl

Na, Mg, Al

N, O, F.

A. V, Cr, Mn

B. Ga, In, Tl

C. Na, Mg, Al

D. N, O, F.

Answer: D



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25. Assign reasons for each of the following

(i) Transition elements exhibit variable oxidation states.

(ii) Transition metal ions are usually coloured.

A. metalloids

B. transition elements

C. non-metals

D. gases.

Answer: B



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26. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^3$. What is the atomic number of the element which is just below the above element in the periodic table ?

49

31

34

33

A. 49

B. 31

C. 34

D. 33

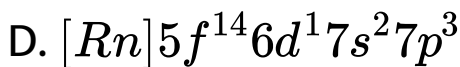
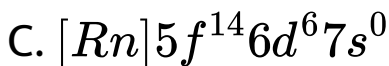
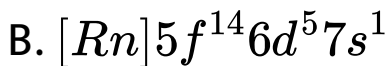
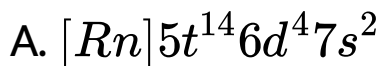
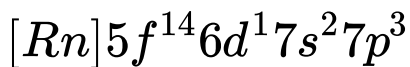
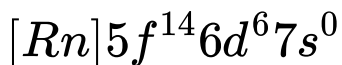
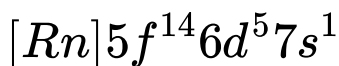
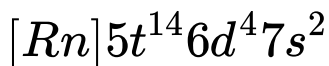
Answer: D



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27. Elements upto atomic number 105 have been discovered till now. If an element with atomic number 106 were ever discovered,

which of the following electronic configuration
will it possess?



Answer: B



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28. Which is the weakest base among $NaOH$, $Ca(OH)_2$, KOH and $Zn(OH)_2$?

A. $NaOH$

B. KOH

C. $Ca(OH)_2$

D. $Zn(OH)_2$

Answer: D



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29. Which pair of atomic numbers represents s-block elements ?

A. 7, 15

B. 6, 12

C. 9, 17

D. 3, 12.

Answer: D



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30. Which pair of elements has the same characteristic chemical properties ?

A. 13, 31

B. 11, 20

C. 12, 10

D. 21, 33.

Answer: A



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31. The values of IE_1 , IE_2 , IE_3 , IE_4 and IE_5 of an element are 7.1, 14.3, 34.5, 46.8 and 162.2 eV respectively. The element is likely to be

A. Na

B. Si

C. F

D. Ca

Answer: B



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32. 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 second ionisation potential of Mg is greater than the second ionisation potential of Na.

C. The first ionisation potential of Na is less than the first ionisation potential of Mg.

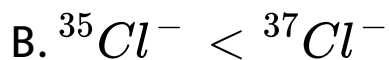
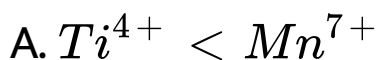
D. The third ionisation potential of Mg is greater than the third ionisation potential of Al.

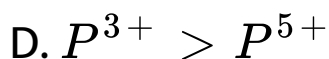
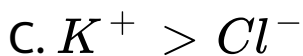
Answer: B



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33. Ionic radii of



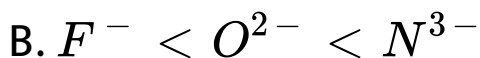


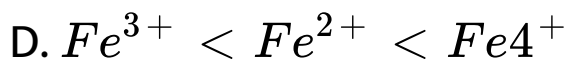
Answer: D



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34. Correct order of radii





Answer: B



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35. The correct order of first ionisation potential is



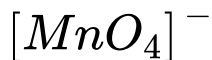
D. $Ge > Si > C$

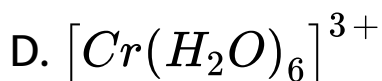
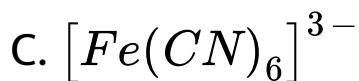
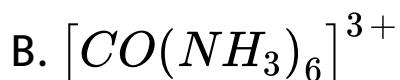
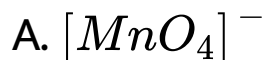
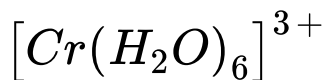
Answer: B



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36. Among the following complex ions, the species whose central metal atom does not have 'd' electron is :





Answer: A



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37. According to the periodic law of elements, the variation in properties of elements is related to their :

atomic masses

nuclear masses

atomic numbers

nuclear neutron-proton number ratios.

A. atomic masses

B. nuclear masses

C. atomic numbers

D. nuclear neutron-proton number ratios.

Answer: C



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38. The atomic numbers of vanadium (V), chromium (Cr), manganese (Mn) and iron (Fe) are respectively 23, 24, 25 and 26. Which one of these may be expected to have the highest second ionisation enthalpy?

V

Cr

Mn

Fe

A. V

B. Cr

C. Mn

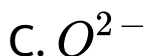
D. Fe

Answer: B



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

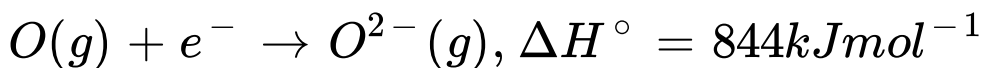


Answer: C



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



This is because

- 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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41. Fluorine is the best oxidising agent because it has

A. Electron affinity

B. Ionisation enthalpy

C. Hydration enthalpy

D. Bond dissociation energy

Answer: C



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42. The first ionisation enthalpy of the elements C,N,P,Si are in the order of

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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43. Following statements regarding the periodic trends of chemical reactivity of the alkali metals and the halogens are given. Which of these statements gives the correct picture: A) In alkali metals the reactivity

increases but in the halogens it decreases with increase in atomic number down the group

B)The reactivity decreases in the alkali metals but increases in the halogens with increases in atomic number down the group.

C)In both the alkali metals and the halogen the chemical reactivity decreases with increases in atomic number down the group

D)Chemical reactivity increases with increases in atomic number down the group in both the alkali metals and halogens.

A. The reactivity decreases in the alkali metals but increases in the halogens with increase in atomic number down the group.

B. In both the alkali metals and the halogens the chemical reactivity decreases with increase in atomic number down the group.

C. Chemical reactivity increases with increase in atomic number down the

group in both the alkali metals and halogens.

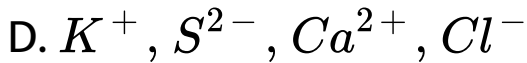
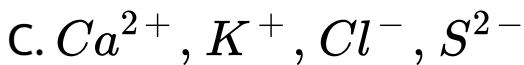
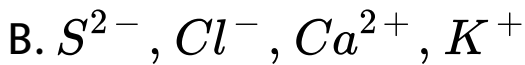
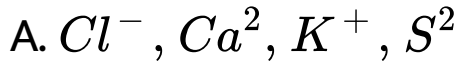
D. In alkali metals the reactivity increases but in the halogens it decreases with increase in atomic number down the group.

Answer: D



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



Answer: C



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45. Correct order of electron gain enthalpy

(Kj/mole) of F, Cl, Br, I

A. $I > Br > Cl > F$

B. $F > Cl > Br > I$

C. $Cl > F > Br > I$

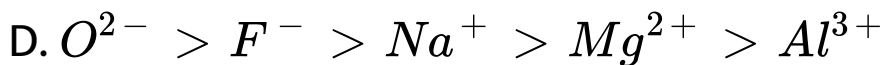
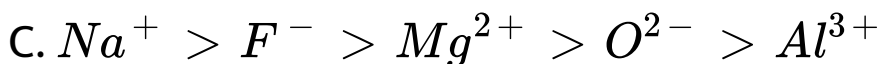
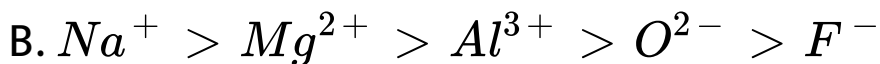
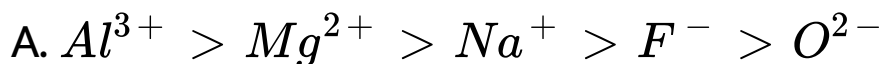
D. $Br > Cl > I > F$.

Answer: C



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

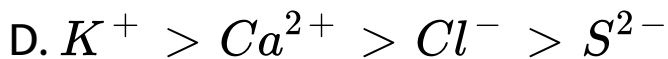
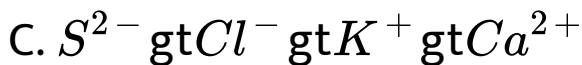
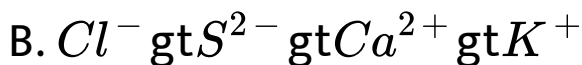
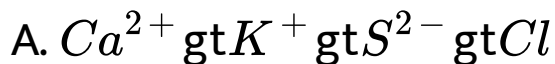


Answer: D



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47. Correct order of radii



Answer: C



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48. Which of the following represents the correct order of increasing first ionization enthalpy for Ca, Ba, S, Se and Ar?

A. $\text{Ca} < \text{S} < \text{Ba} < \text{Se} < \text{Ar}$

B. $\text{S} < \text{Se} < \text{Ca} < \text{Ba} < \text{Ar}$

C. $\text{Ba} < \text{Ca} < \text{Se} < \text{S} < \text{Ar}$

D. $\text{Ca} < \text{Ba} < \text{S} < \text{Se} < \text{Ar}$.

Answer: C



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49. The first ionisation potential of Na is $5.1eV$. The value of electron gain enthalpy of Na^+ will be

A. $-2.55eV$

B. $-5.1eV$

C. $-10.2eV$

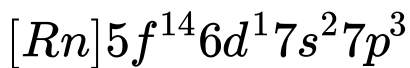
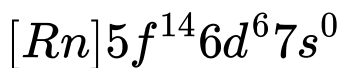
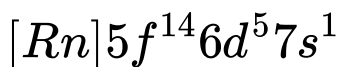
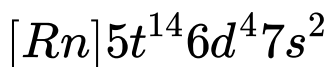
D. $+2.55eV$

Answer: B



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50. Elements upto atomic number 105 have been discovered till now. If an element with atomic number 106 were ever discovered, which of the following electronic configuration will it possess?



C. Oxygen family, $[\text{Rn}] 5f^{14}6d^{10}7s^27p^4$

D. Nitrogen family, $[\text{Rn}] 5f^{14}6d^{10}7s^27p^6$

Answer: B



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51. The correct order of atomic radii in group

13 elements is

A. $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$

B. $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$

C. $B < Ga < Al < Tl < In$

D. $B < Ga < Al < In < Tl$

Answer: D



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52. For the second period elements the correct increasing order of first ionization enthalpy is:

A. Li < B < Be < C < N < O < F
< Ne

B. Li < Be < B < C < O < N < F
< Ne

C. Li < Be < B < C < N < O < F
< Ne

D. Li < B < Be < C < O < N < F
< Ne

Answer: D



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53. The element which has highest 2nd ionisation energy is

A. Ca

B. Sc

C. K

D. Ba.

Answer: C



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54. The IUPAC symbol for the element with atomic number 119 would be:

A. uue

B. une

C. uun

D. unh.

Answer: A



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True Or False Type Questions

1. Justify the given statement with suitable examples -"the properties of the elements are a periodic function of their atomic numbers"?



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2. Why do you think the noble gases are placed in a separate group?



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3. All groups were subdivided into A and B sub groups in Mendeleev's periodic table.



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4. Mendeleev's periodic table helped in correct determination of atomic masses of elements



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5. What is modern periodic law? Mention the important features of the long form of the periodic table. Why is this periodic table supposed to be superior to other periodic tables ?



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6. What are transition elements ? How these differ from representative elements ?



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7. Find out the Value of equilibrium constant for the following reaction at 298 K, $2 \text{NH}_3(\text{g}) + \text{CO}_2 \rightleftharpoons \text{NH}_2\text{CONH}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$ Standard Gibbs energy change, ΔG° at the given temperature is $-13.6 \text{ kJ mol}^{-1}$.



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8. In the fifth period 5s, 5p and 5d shells are filled.



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9. Isotopes of an element are placed at the same place in the long form of the periodic table.



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10. The element with $Z = 11$ is present in the third period.



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11. All lanthanides are supposed to be present in group 3 of the periodic table.



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12. Atomic radius of F is greater than that of Ne.



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13. Al^{3+} is smaller than Ca^{2+} .



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14. Explain why :

The second ionisation energy of Li is very high.



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15. np electrons are more penetrating than ns electrons.



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16. The electron affinity of nitrogen is zero.



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17. The electron affinity increases in going down a group.



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18. Melting and boiling points increase regularly in going across the second period. Explain.



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19. Melting point of LiCl is less than that of NaCl.



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20. CsOH is more basic than $Ba(OH)_2$.



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Fill In The Blanks Type Questions

1. The element ekasilicon predicted by was discovered by who named it as



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2. and not the is the most fundamental property of an element.



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3. Hydrogen may be placed at the top in group as well as in group of the periodic table.



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4. Vertical columns of periodic table are known as



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5. The sixth period contains-in all elements among which are lanthanides.



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6. The elements of p-block possess electronic configuration of the type



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7. What is the basis of the long form of the periodic table?



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8. Most of the transition metal ions are
and..... in nature.



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9. Covalent radius is defined as of the distance between the centres of the of two similar atoms bonded



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10. Ca^{2+} has a smaller ionic radius than K^+ because it has



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11. The atomic radii on moving down a group.



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12. Anion is (larger / smaller) than the parent atom where as cation is (larger / smaller) than the parent atom.



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13. The screening effect of inner electrons on the nucleus causes



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14. Noble gases possess values of ionisation energies due to the presence of



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15. Give one word or a phrase for the following statement:

The energy released when an electron is added to a neutral gaseous isolated atom to form a negatively charged ion.



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16. Comment on the electron affinities of noble gases.



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17. Second electron affinity of oxygen is



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18. Why the melting and boiling points of halogens increase in going from top to bottom of the group.



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1. Why is the ionisation energy of beryllium greater than that of Li and B?



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2. Justify the given statement with suitable examples -"the properties of the elements are a periodic function of their atomic numbers"?



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3. The general electronic configuration of d-block elements is



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4. Assertion : The atomic radii of elements decrease on moving from left to

Reason : On moving from left to right in a period, the ionisation enthalpies right in a period. increase with increase in atomic number.





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5. Ionisation enthalpy of nitrogen is more than oxygen because of



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6. Assertion : The electron gain enthalpy of chlorine is less negative than that of fluorine.

Reason : The fluorine atom is much smaller in size than that of chlorine.



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Ncert Text Book Exercise With Hints And Solutions

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



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2. Which important property did Mendeleev use to classify the elements in his periodic

table and did he stick to that?



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



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4. On the basis of quantum numbers, justify that the sixth period of the periodic table

should have 32 elements.



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5. In terms of period and group where would you locate the element with $Z = 114$?



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6. Atomic number of element present in the third period and seventeenth group of periodic table



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7. Which element do you think would have been named by Lawrence Berkley Laboratory ?



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8. Which element do you think would have been named by Seaborg's group?



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



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10. What does atomic radius and ionic radius really mean to you?



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11. How do atomic radii vary in a period and in a group? How do you explain the variation?



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12. What do you understand by isoelectronic species? Name a species that will be isoelectronic with each of the following atoms or ions:



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13. What do you understand by isoelectronic species? Name a species that will be isoelectronic with each of the following atoms or ions:

Ar



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14. What do you understand by isoelectronic species? Name a species that will be isoelectronic with each of the following atoms

or ions.

(i) F^- (ii) Ar (iii) Mg^{2+} (iv) Rb^+



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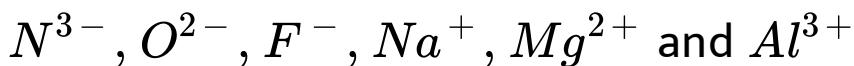
15. What do you understand by isoelectronic species? Name a species that will be isoelectronic with each of the following atoms or ions.

(i) F^- (ii) Ar (iii) Mg^{2+} (iv) Rb^+



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16. Consider the following species:



What is common in them?



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17. What is common between given cations

and anions, $O^{2-}, F^{-}, Na^{+}, Mg^{2+}, Al^{3+}$?



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



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19. What is the significance of the terms — ‘isolated gaseous atom’ and ‘ground state’ while defining the ionization enthalpy and electron gain enthalpy?

Hint : Requirements for comparison purposes.



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20. Energy of an electron in the ground state of the hydrogen atom is $-2.18 \times 10^{-18} J$.

Calculate the ionization enthalpy of atomic hydrogen in terms of $J \text{ mol}^{-1}$.

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



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21. Among the second period elements the actual ionization enthalpies are in the order

$Li < B < Be < C < O < N < F < Ne.$

Explain why

(i) Be has higher $\Delta_i H$ than B

(ii) O has lower $\Delta_i H$ than N and F?



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22. Among the second period elements the actual ionization enthalpies are in the order

$Li < B < Be < C < O < N < F < Ne.$

Explain why

(i) Be has higher $\Delta_i H$ than B

(ii) O has lower $\Delta_i H$ than N and F?



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23. How would you explain the fact that the first ionisation enthalpy of sodium is lower than that of magnesium but its second ionisation enthalpy is higher than that of magnesium?



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



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

B	Al	Ga	In	Tl
801	577	579	558	589

How would you explain this deviation from the general , trend?



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26. Which of the following pairs of elements would have a more negative electron gain enthalpy?

O or F



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27. Which of the following pairs of elements would have a more negative electron gain

enthalpy?

For Cl



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



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



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



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31. Describe the theory associated with the radius of an atom as it gains an electron



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32. Describe the theory associated with the radius of an atom as it loses an electron



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



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34. What are the major differences between metals and non-metals?



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35. Use the periodic table to answer the following questions :

Identify an element with five electrons in the outer subshell.



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36. Use the periodic table to answer the following questions :

Identify an element that would tend to lose two electrons.





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37. Use the periodic table to answer the following questions :

Identify an element that would tend to gain two electrons.



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38. Use the periodic table to answer the following questions :

Identify the groups having metal, non-metal, liquid as well as gas at the room temperature.



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39. The increasing order of reactivity among group 1 elements is $Li < Na < K < Rb < Cs$ whereas that among group 17 elements is $F > Cl > Br > I$. Explain.



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



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41. Assign the position of the element having outer electronic configuration ns^2np^4 for $n = 3$, in the periodic table.



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42. Assign the position of the element having outer electronic configuration $(n - 1)d^2ns^2$ for $n = 4$ in the periodic table.



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43. Assign the position of the element having outer electronic configuration $(n - 2)f^7(n - 1)d^1ns$ for $n = 6$, in the periodic table.



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44. The first (Δ_i, H_1) and the second (Δ, H_2) ionisation enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg}H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below :

Elements	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg}H$
I	520	7300	-60
II	419	3051	-48
III	1681	3374	-328
IV	100	1846	-295
V	2372	5251	+48
VI	738	1451	-40

Which of the above elements is likely to be :
the least reactive element?



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45. The first (Δ_i, H_1) and the second (Δ, H_2) ionisation enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg}H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below :

Elements	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg}H$
I	520	7300	-60
II	419	3051	-48
III	1681	3374	-328
IV	100	1846	-295
V	2372	5251	+48
VI	738	1451	-40

Which of the above elements is likely to be :
the least reactive element?



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46. The first (Δ_i, H_1) and the second (Δ, H_2) ionisation enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg}H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below :

Elements	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg}H$
I	520	7300	-60
II	419	3051	-48
III	168 [†]	3374	-328
IV	100	1846	-295
V	2372	5251	+48
VI	738	1451	-40

Which of the above elements is likely to be :
the least reactive element?



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47. The first (Δ_i, H_1) and the second (Δ, H_2) ionisation enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg}H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below :

Elements	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg}H$
I	520	7300	-60
II	419	3051	-48
III	1681	3374	-328
IV	100	1846	-295
V	2372	5251	+48
VI	738	1451	-40

Which of the above elements is likely to be :
the least reactive element?



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48. Calculate the work done when 1.0 mole water at 373K vaporizes against an atmospheric pressure of 1.0 atmosphere. Assume ideal gas behaviour.



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49. The first (Δ_i, H_1) and the second (Δ, H_2) ionisation enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg}H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below :

Elements	$\Delta_f H_1$	$\Delta_f H_2$	$\Delta_{eg} H$
I	520	7300	-60
II	419	3051	-48
III	1681	3374	-328
IV	100	1846	-295
V	2372	5251	+48
VI	738	1451	-40

Which of the above elements is likely to be :
a reactive metal



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50. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of

elements.

Lithium and oxygen



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51. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of elements.

Magnesium and nitrogen



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52. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of elements.

Aluminium and iodine



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53. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of

elements.

Silicon and oxygen



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54. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of elements.

Phosphorus and fluorine



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55. Predict the formulae of the stable binary compounds that would be formed by the combination of the following pairs of elements.

Element 71 and fluorine.



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56. In the modern periodic table, the period indicates the value of :

A. atomic number

B. atomic mass

C. principal quantum number

D. azimuthal quantum number.

Answer:



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57. Which 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 the value of azimuthal quantum number (l) for the last subshell that received electrons in building up the electronic configuration.

Answer:



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58. Anything that influences the valence electrons will affect the chemistry of the

element. Which one of the following factors does not affect the valence shell?

- A. Valence principal quantum number (n)
- B. Nuclear charge
- C. Nuclear mass
- D. Number of core electrons

Answer:



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59. The size of isoelectronic species – F^- , Ne 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:



60. Which one of the following statements is incorrect in relation to ionization enthalpy?

A. Ionisation enthalpy increases for each successive electron.

B. The greatest increase in ionisation enthalpy is experienced on removal of electron from core noble gas configuration

C. End of valence electrons is marked by a big jump in ionisation enthalpy.

D. Removal of electron from orbitals bearing lower n value is easier than from orbital having higher n value.

Answer:



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

A. $B > Al > Mg > K$

B. $Al > Mg > B > K$

C. $Mg > Al > K > B$

D. $K > Mg > Al > B$

Answer:



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

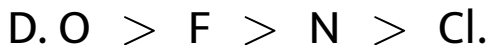
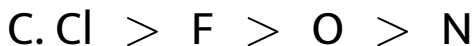
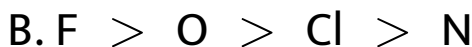
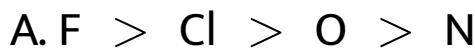
D. $F > N > C > Si > B.$

Answer:



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



Answer:



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