

# CHEMISTRY

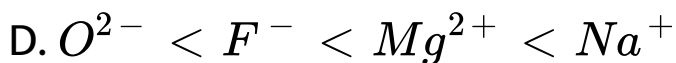
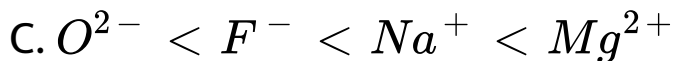
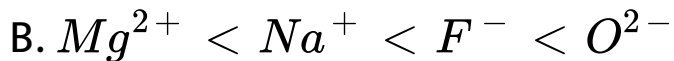
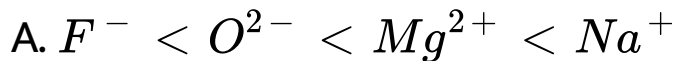
## BOOKS - NCERT CHEMISTRY (ENGLISH)

### CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES.

#### Multiple Choice Questions Mcqs

1. Consider the isoelectronic species,  $Na^+$ ,  $Mg^{2+}$ ,  $F^-$  and  $O^{2-}$ . The correct order

of increasing length of their radii is:



**Answer: B**



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2. Which of the following is not an actinoid?

A. Curium ( $Z = 96$ )

B. Californium ( $Z = 98$ )

C. Uranium ( $Z = 92$ )

D. Terbium ( $Z = 65$ )

**Answer: D**



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3. 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 represents the repulsive force felt by the valence shell from the electrons present 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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4. The first ionisation potential of  $Na$ ,  $Mg$ ,  $Al$  and  $Si$  are in the order

A.  $Na < Mg > Al < Si$

B.  $Na < Mg > Al > Si$

C.  $Na < Mg < Al < Si$

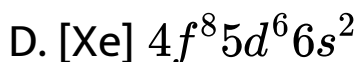
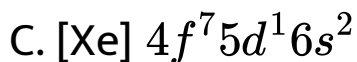
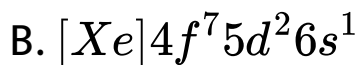
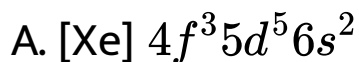
D.  $Na > Mg > Al < Si$

**Answer: A**



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



**Answer: C**



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

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

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

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

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

**Answer: C**



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

A.  $F > Cl > Br > I$



B.  $F < Cl < Br < I$

C.  $F < Cl > Br > I$

D.  $F < Cl < Br < I$

**Answer: C**



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**8.** The period number in the long form of the periodic table is equal to

A. magnetic quantum number of any element of the period

B. atomic number of any element of the period

C. maximum principal quantum number of any element of the period

D. maximum azimuthal quantum number of any element of the period

**Answer: C**



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9. The elements in which electrons are progressively filled in 4f-orbitals are called:

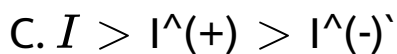
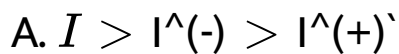
- A. actinoids
- B. transition elements
- C. lanthanoids
- D. halogens

**Answer: C**



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

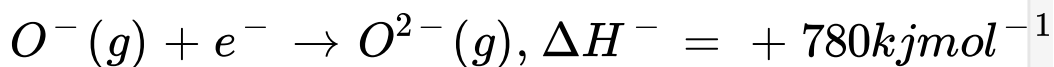


**Answer: D**



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



Thus, process of formation of  $O^{2-}$  in gas phase is unfavourable even though  $O^{2-}$  is isoelectronic with neon. It is due to the fact that

m

A. oxygen is more electronegative

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

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

D.  $O^-$  ion has comparatively smaller size of the oxygen atom

**Answer: C**



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**12.** In the modern periodic table, elements are arranged in order of increasing atomic numbers, which is related to the electronic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, s, 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 principle, the seven periods (1 to 7) have 2, 8, 8, 18, 18, 32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being

too long, the two series of f-block elements, called 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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**13.** Comprehension given below is followed by some multiple choice questions. Each question has one correct option. Choose the correct option.

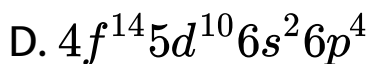
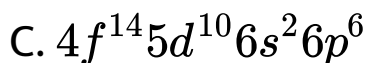
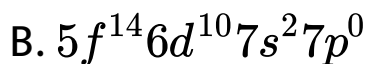
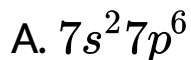
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The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanoids and actinoids are placed at the bottom of the main body of the periodic table

(ii) The last element of the p-block in 6th period

is represented by the outermost electronic configuration.



**Answer: C**



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**14.** In the modern periodic table, elements are arranged in order of increasing atomic numbers, which is related to the electronic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, s, 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 principle, the seven periods (1 to 7) have 2, 8, 8, 18, 18, 32 and 32 elements respectively. The seventh period is still

incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanoids and actinoids, are placed at the bottom of the main body of the periodic table

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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**15.** Comprehension given below is followed by some multiple choice questions. Each question has one correct option. Choose the correct option.

In the modern periodic table, elements are arranged in order of increasing atomic numbers which is related to the electronic configuration.

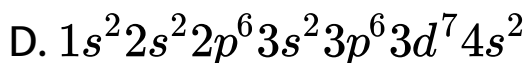
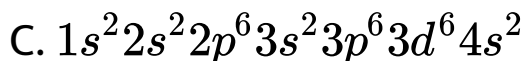
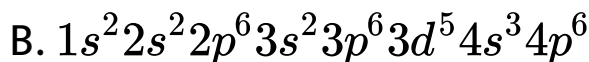
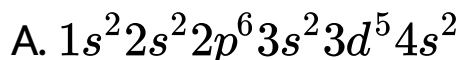
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The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanoids and

actinoids are placed at the bottom of the main body of the periodic table

(iv) The electronic configuration of the element which is just above the element with atomic number 43 in the same group is .....



**Answer: A**



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**16.** In the modern periodic table, elements are arranged in order of increasing atomic numbers, which is related to the electronic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, s, 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 principle, the seven periods (1 to 7) have 2, 8, 8, 18, 18, 32 and 32 elements

respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called 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

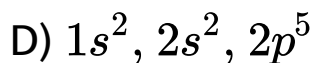
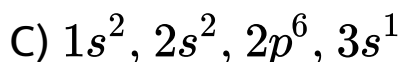
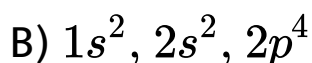
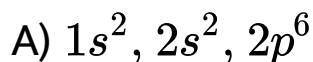
- A. noble gas
- B. halogens
- C. heavy metals
- D. light metals

**Answer: B**



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**17.** Electronic configuration of four elements A, B, C and D are given below



Which of the following is the correct order of increasing tendency to gain electron?

A.  $A < C < B < D$

B.  $A < B < C < D$

C.  $D < B < C < A$

D.  $D < A < B < C$

**Answer: A**



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

A. Be

B. p-block

C. S

D. B

**Answer: B::C**



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**19.** Those elements impart colour to hte flame on heating in it, the atoms of which require low energy for the ionisation (i.e., absorb energy in

the visible region of spectrum). The elements of which of the following groups will impart colour to the flame?



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**20.** Which of the following sequences contain atomic numbers of only representative elements ?

A. 3,33,53,87

B. 2,10,22,36

C. 7,17,25,37,48

D. 9,35,51,88

**Answer: A::D**



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**21.** Which of the following elements will gain one electron more readily comparison to other elements of their groups? a)  $S(g)$  B)  $Na(g)$  C)  $O(g)$  D)  $Cl(g)$

A.  $S(g)$

B.  $Na(g)$

C. O(g)

D. Cl (g)

**Answer: A::D**



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**22.** Which of the following statements are correct?

A. Helium has the highest first ionisation enthalpy in the periods table.



B. Chlorine has less negative electron gain enthalpy than fluorine.

C. Mercury and bromine are liquids at room temperature.

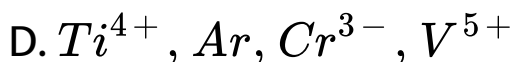
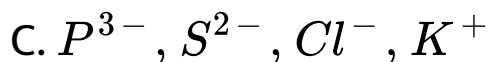
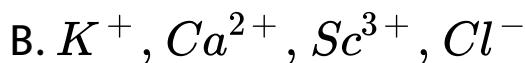
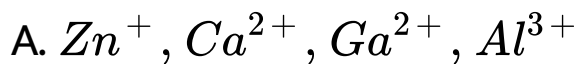
D. In any period, atomic radius of alkali metal is the highest.

**Answer: A::C::D**



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



**Answer: B::C**



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

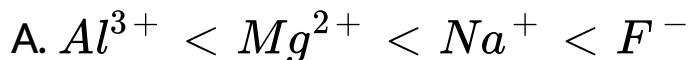
Thinking process.

i) The ionic size increases as the positive charge on the cation decreases or the negative charge on the anion increases.

ii) First ionisation enthalpy increases from left to right in the periodic table.

iii) Electron gain enthalpy increases as the electronegativity of the atom increases.

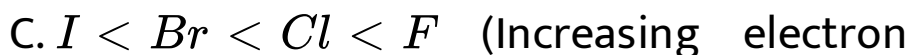
iv) The metallic character increases as the size of the metal atom increases.



(Increasing ionic size)



ionisation enthalpy)



gain enthalpy)



radius)

**Answer: B::C**



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**25. Which of the following have no unit?**

- A. Electronegativity
- B. Electron gain enthalpy
- C. Ionisation enthalpy
- D. Metallic character.

**Answer: A::D**



26. Ionic radii vary in

A. Inverse proportion to the effective nuclear charge

B. inverse proportions to the square of effective nuclear charge

C. direct proportions to the screening effect.

D. direct proportions to the square of screening effect.

**Answer: A::C**



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

- A. Good conductor of electricity
- B. Liquid, metallic
- C. Solid, metallic
- D. Solid, non-metallic

**Answer: A::C**



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## Short Answer Types Questions

1. The negative value of electron gain enthalpy is less for fluorine than for chlorine . Why?



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2. All transition elements are d-block elements, but all d-block elements are not transition elements. Which the following is true.



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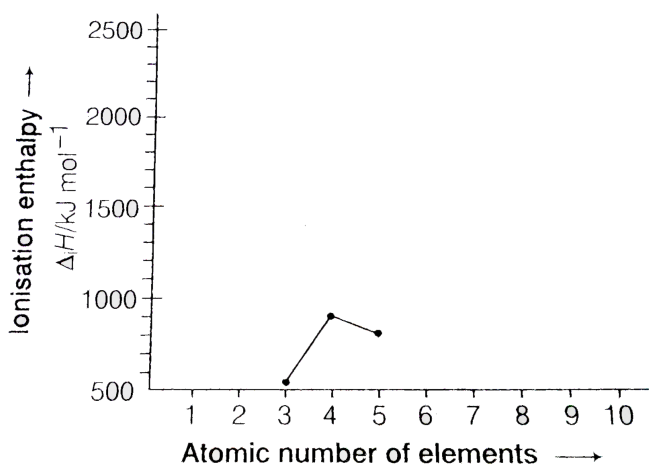
3. Identify the group and valency of the elements having atomic number 119. Also predict the outermost electronic configuration and write the general formula of its oxide.



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4. Ionisation enthalpies of elements of second period are given below Ionisation enthalpy/k cal  $mol^{-1}$ , 520,899,801,1086,1402,1314, 1681, 2080.

Match the correct enthalpy with the elements and complete the graph given in the figure. Also write symbols of elements with their atomic number.



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5. Among the elements, B, Al, C and Si,

a) which element has the highest first ionisation enthalpy?

b) which element has the most metallic character? Justify your answer in each case,



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



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7. Choose the correct order of atomic radii of fluorine and neon (in pm) out of the output given below and justify your answer.

A. 72, 160

B. 160,160

C. 72,72

D. 160,72

**Answer: A**



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**8.** Illustrate by taking examples of transition elements and non-transition elements that oxidation states of elements are largely based on electronic configuration.



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**9.** Nitrogen has positive electron gain enthalpy whereas oxygen has negative. However, oxygen has lower ionisation enthalpy than nitrogen. Explain.



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**10.** First member of each group of representative elements (i.e., s and p-block elements) shows anomalous behaviour. Illustrate with two examples.



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**11.** p-block elements form acidic, basic and amphoteric oxides. Explain each property by

giving two examples, and also write the reactions of these oxides with water.



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**12.** 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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**13.** What do you understand by exothermic reaction and endothermic reaction? Give one example of each type.



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**14.** Arrange the elements N, P, O and S in the order of

i) increasing first ionisation enthalpy.

ii) increasing non-metallic character.

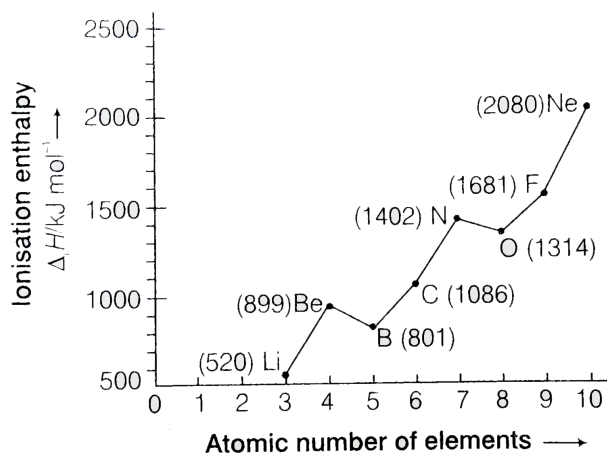
Give reason for the arrangement assigned.



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15. Explain the deviation in ionisation enthalpy of some elements from the general trend by using given figure.



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**16.** Explain the following

a) Electronegativity of elements increase on moving from left to right in the periodic table.

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



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**17.** How does the metallic and non-metallic character vary on moving from left to right in a period?



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**18.** The radius of  $Na^+$  cation is less than that of Na atom. Give reason.



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**19.** Among alkali metals which element do you expect to be least electronegative and why?



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**Matching The Columns**

1. Match the correct atomic radius with the element.

Element	Atomic radius (pm)
Be	74
C	88
O	111
B	77
N	66



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2. Match the correct ionisation enthalpies and electron gain enthalpies of the following

elements.

	Elements		$\Delta H_1$	$\Delta H_2$	$\Delta_{eg} H$
(i)	Most reactive non-metal	A.	419	3051	-48
(ii)	Most reactive metal	B.	1681	3374	-328
(iii)	Least reactive element	C.	738	1451	-40
(iv)	Metal forming binary halide	D.	2372	5251	+48



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**3.** Electronic configuration of some elements is given in Column I and their electron gain enthalpies are given in column-II. Match the electronic configuration with electron gain

enthalpy.

<b>Column-I</b> <b>Electronic configuraion)</b>	<b>Column-II</b> <b>(Electron gain</b> <b>enthalpy/kj mol)</b>
<b>C.</b> $1s^2 2s^2 2p^6$	1) -53
<b>B.</b> $1s^2 2s^2 2p^6 3s^1$	2) -328
<b>C.</b> $1s^2 2s^2 2p^5$	3) -141
<b>D.</b> $1s^2 2s^2 2p^4$	4) +48



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## Assertion And Reason

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

Reason ( R) When successive electrons are

added to the orbitals in the same principle quantum level, the shielding effect of inner core of electrons does not increase very much to compensate for the increased attraction of the electrons to the nucleus.

A. Assertion is correct statement and reason is wrong statement.

B. Assertion and reason both are correct statements and reason is correct explanation of Assertion.

C. Assertion and reason both are wrong statements.

D. Assertion and wrong statements and reason is correct statements.

**Answer: A**



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2. Assertion: Boron has a smaller first ionisation enthalpy than beryllium.

Reason: The penetration of a  $2s$  electron to the



nucleus is more than the  $2p$  electron, hence  $2p$  electron is more shielded by the inner core of electrons than the  $2s$  electrons.

A. Assertion is correct statement and reason is wrong statement.

B. Assertion and reason both are correct statements and reason is correct explanation of Assertion.

C. Assertion and reason both are wrong statements.

D. Assertion and wrong statements and reason is correct statements.

**Answer: A**



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**3. Assertion:** Electron gain enthalpy always becomes less negative as we go down a group in Modern periodic table.

**Reason:** The size of the atom increase on going down the group in Modern periodic table and

the added electron would be farther from the nucleus.

A. Assertion is correct statement and reason is wrong statement.

B. Assertion and reason both are correct statements and reason is correct explanation of Assertion.

C. Assertion and reason both are wrong statements.

D. Assertion and wrong statements and reason is correct statements.

**Answer: A**



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## Long Answer Types Question

1. Discuss the factors affecting electron gain enthalpy and the trend in its variation in the periodic table.



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2. Define ionisation enthalpy. Discuss the factors affecting ionisation enthalpy of the elements and its trends in the periodic table.



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



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4. Write down the outermost electronic configuration of alkali metals. How will you justify their placement in group 1 of the periodic table?



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



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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. Discuss and compare the trend in ionisation enthalpy of the elements of group 1 with those of group 17 elements.



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