



# CHEMISTRY

**BOOKS - VGS PUBLICATION-BRILLIANT**

## **CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES**

### **Very Short Answer Questions**

1. What is the difference in the approach between the Mendeleev's periodic law and the

modern periodic law?



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



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3. Write the atomic number of the element, present in the third period and seventeenth group of the periodic table.



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4. Which element do you think would have been named by

(a) Lawrence Berkeley Laboratory



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5. Which element do you think would have been named by

(b) Seaborg's group





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



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7. What are representative elements? Give their valence shell configuration.



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8. Justify the position of f-block elements in the periodic table.



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9. An element 'X' has atomic number 34. Give its position in the periodic table.



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10. What factors impart characteristic properties to the transition elements?



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**11.** Give the outer shells configuration of d-block and f-block elements.



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**12.** State and give one example for Dobereiner's law of triads and Newland's law of octaves.



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**13.** Name the anomalous pairs of elements in the Mendeleev's periodic table.



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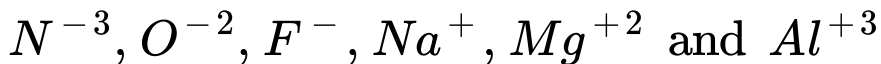
**14.** How does atomic radius vary in a period and in a group? How do you explain the variation?



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15.

Among



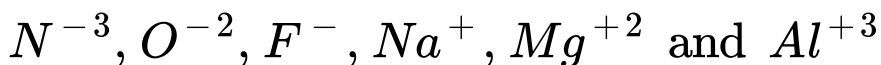
(a) What is common in them?



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16.

Among



(b) Arrange them in the increasing ionic radii.



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**17.** What is the significance of the term isolated gaseous atom while defining the ionization enthalpy.

Hint: Requirement for comparison.



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**18.** 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  $Jmol^{-1}$ .





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**19.** Ionization enthalpy<sub>1</sub> ( $IE$ )<sub>1</sub> of O is less than that of N-explain.



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**20.** Which in each pair of elements has a more negative electron gain enthalpy?

(a) O or F



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**21.** Which in each pair of elements has a more negative electron gain enthalpy?

(b) F or Cl



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



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**23.** Use the periodic table to identify elements.

(a) With 5 electrons in the outer subshell.



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**24.** Use the periodic table to identify elements.

(b) Would tend to lose two electrons.



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**25.** Use the periodic table to identify elements.

(c) Would tend to gain two electrons.



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**26.** Given the outer electronic configuration of s,p,d and f-block elements.



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**27.** Write the increasing order of the metallic character among the elements B, Al, Mg and K.



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**28.** Write the correct increasing order of non-metallic character for B,C,N,F and Si.



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**29.** Write the correct increasing order of chemical reactivity in terms of oxidizing property for N, O , F and Cl.



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**30.** What is electronegativity? How is this useful in understanding the nature of elements?



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**31.** What is screening effect? How is it related to IE ?



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**32.** How are electronegativity and metallic & non-metallic characters related?



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**33.** What is the valency possible to arsenic with respect to oxygen and hydrogen?



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**34.** What is an amphoteric oxide? Give the formula of an amphoteric oxide formed by a element of group - 13.



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**35.** Name the most electronegative element. Is it also having the highest electron gain enthalpy? Why or why not?



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**36.** What is diagonal relation? Give one pair of elements, that have this relation.



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**37.** How does the nature of oxides vary in the third period?



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**38.** Radii of iron atom and its ions follow  $Fe > Fe^{2+} > Fe^{3+}$  - explain.



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**39.**  $IE_2 > IE_1$  for a given element - why?



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**40.** What is lanthanoid contraction ? What are the consequences of lanthanoid contraction?



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**41.** What is the atomic number of the element, having maximum number of unpaired 2p electrons? To which group does it belong?



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**42.** Sodium is strongly metallic, while chlorine is strongly non-metallic -explain.



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**43.** Why are zero group elements called noble gases or inert gases?



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**44.** Select in each pair, the one having lower ionization energy and explain the reason.

(a)  $I$  and  $I^-$



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**45.** Select in each pair, the one having lower ionization energy and explain the reason.

(b) Br and K



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**46.** Select in each pair, the one having lower ionization energy and explain the reason.

*Li* and *Li*<sup>+</sup>



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**47.** Select in each pair, the one having lower ionization energy and explain the reason.

(d) Ba and Sr



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**48.** Select in each pair, the one having lower ionization energy and explain the reason.

(e ) O and S



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**49.** Select in each pair, the one having lower ionization energy and explain the reason.

(f) Be and B



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50. Select in each pair, the one having lower ionization energy and explain the reason.

N and O



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51.  $IE_1$  of O  $<$   $IE_1$  of N but  $IE_2$  of O  $>$   $IE_2$  of N – Explain.



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52.  $Na^+$  has higher value of ionization energy than Ne, though both have same electronic configuration - Explain.



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53. Which is each pair of elements has a more electronegative gain enthalpy? Explain.

(a) N or O



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**54.** Which in each pair of elements has a more negative electron gain enthalpy?

(b) F or Cl



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**55.** Electron affinity of chlorine is more than that of fluorine - explain.



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56. Which in each has higher electron affinity?

$F$  or  $Cl^-$



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57. Which in each has higher electron affinity?

(b)  $O$  or  $O^-$



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58. Which in each has higher electron affinity?

(c)  $Na^+$  or  $F$



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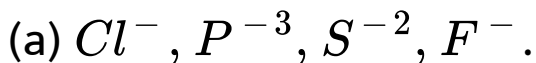
59. Which in each has higher electron affinity?

$F$  or  $F^-$



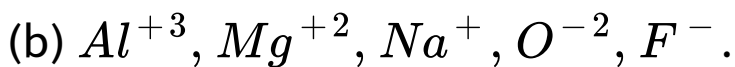
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60. Arrange the following in order of increasing ionic radius :



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61. Arrange the following in order of increasing ionic radius :



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**62.** Arrange the following in order of increasing ionic radius :



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**63.**  $Mg^{+2}$  is smaller than  $O^{-2}$  in size, though both have same electronic configuration - explain.



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**64.** Among the elements  $B$ ,  $Al$ ,  $C$  and  $Si$

(a) Which has the highest first ionization enthalpy ?



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**65.** Among the elements  $B$ ,  $Al$ ,  $C$  and  $Si$

(b) Which has the most negative electron gain enthalpy?



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**66.** Among the elements  $B$ ,  $Al$ ,  $C$  and  $Si$

(c) Which has the largest atomic radius?



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**67.** Among the elements  $B$ ,  $Al$ ,  $C$  and  $Si$

(d) Which has the most metallic character?



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**68.** Consider the elements N, P, O and S and arrange them in order of :

(a) Increasing first ionization enthalpy



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**69.** Consider the elements N, P, O and S and arrange them in order of :

(b) Increasing negative electron gain enthalpy



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**70.** Consider the elements N, P, O and S and arrange them in order of :

(d) Increasing non-metallic character.



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**71.** Arrange in the given order:

(a) Increasing EA : O, S and Se



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**72.** Arrange in the given order:

(b) Increasing  $IE_1$ :  $Na$ ,  $K$  and  $Rb$



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**73.** Arrange in the given order:

(c) Increasing radius:  $I^-$ ,  $I^+$  and  $I$



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**74.** Arrange in the given order:

(d) Increasing electronegativity: F , Cl, Br, I



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**75.** Arrange in the given order:

(e ) Increasing EA : F, Cl, Br, I



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**76.** Arrange in the given order:

(f) Increasing radius :  $Fe$ ,  $Fe^{+2}$ ,  $Fe^{+3}$ .



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**77.** Name the element with highest ionization enthalpy.



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**78.** Name the family with highest value of ionization enthalpy.



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**79.** Which element possesses highest electron affinity?



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**80.** Name unknown elements at the time of Mendeleef.



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**81.** Name any two typical elements.



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**82.** Name any two bridge elements.



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**83.** Name two pairs showing diagonal relationship.



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**84.** Name two transition elements.



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**85.** Name two rare earths.



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86. Name two transuranic elements.



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## Short Answer Questions

1. On the basis of quantum numbers, justify that the 6<sup>th</sup> period of the periodic table should have 32 elements.



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2. How did Mosley's work on atomic number show that atomic number is a fundamental property better than atomic weight?



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3. State modern periodic law. How many groups and periods are present in the long form of the periodic table?



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4. Why are f-block elements placed below the main table?



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5. Mention the number of elements present in each of the periods in the long form periodic table.



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6. Give the outer orbit general electronic configuration of

(a) Noble gases



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7. Give the outer orbit general electronic configuration of

(b) Representative elements



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8. Give the outer orbit general electronic configuration of

(c) Transition elements



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9. Give the outer orbit general electronic configuration of

(d) Inner transition elements.



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**10.** Write the characteristic properties of transition elements.



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**11.** What are rare earths and transuranic elements?



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**12.** What is isoelectronic series? Name a series that will be isoelectronic with each of the

following atom or ions .

(a)  $F^{-}$



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**13.** What is isoelectronic series? Name a series that will be isoelectronic with each of the following atom or ions .

(b)  $Ar$



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14. What is isoelectronic series? Name a series that will be isoelectronic with each of the following atom or ions .

(c)  $He$



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15. What is isoelectronic series? Name a series that will be isoelectronic with each of the following atom or ions .

(d)  $Rb^+$





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16. Explain why cation is smaller and anion is larger in radii than their parent atoms.



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17. Arrange the second period elements in the increasing order of their first ionization enthalpies. Explain why Be has higher  $IE_1$  than B.



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18.  $IE_1$  of Na is less than that of Mg-explain.



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19. What are the various factors due to which the IE of the main group elements tends to decrease down a group ?



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20. The first ionization enthalpy values (in  $\text{kJmol}^{-1}$ ) of group 13 elements are:

<i>B</i>	<i>Al</i>	<i>Ga</i>	<i>In</i>	<i>Tl</i>
801	577	579	558	589

How do you explain this deviation from the general trend?



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21. Would you expect the second electron gain enthalpy of oxygen as positive, more negative or less negative than the first? Justify.



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22. What is the basic difference between the electron gain enthalpy and electropositivity?



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23. Would you expect  $IE_1$  for two isotopes of the same element to be the same or different? Justify.



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24. Increasing order of reactivity among group

- 1 elements is  $Li < Na < K < Rb < Cs$ ,

whereas among group - 17 elements it is

$F > Cl > Br > I$ - explain.



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25. Assign the position of the element having

outer electronic configuration.

(a)  $ns^2np^4f$  or  $n = 3$



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**26.** Assign the position of the element having outer electronic configuration.

(b)  $(n - 1)d^2ns^2f$  or  $n = 4$



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

(a) Li and O



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

(b) Mg and N



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

(c) Al and I



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**30.** Predict the formulae of the stable binary compounds that would be formed by the

combination of the following pairs of elements.(d) Si and O



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

(e ) P and Cl



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

(f) Element with atomic number 30 and Cl.



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**33.** Write a note on the variation of metallic nature in a group and in a period.



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**34.** How does the covalent radius increase in group 7?



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**35.** Which element of 3<sup>rd</sup> period has the highest  $I. E_1$  ? Explain the variation of  $I. E_1$  in this period?



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**36.** What is valency of an element? How does it vary with respect to hydrogen in the third period.



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**37.** What is diagonal relationship? Give a pair of elements having diagonal relationship. Why do they show this relation?



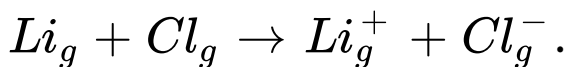
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**38.** What is lanthanoid contraction ? What are the consequences of lanthanoid contraction?



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**39.** The first of lithium is 5.41 eV and electron affinity of Cl is  $-3.61\text{eV}$ . Calculate  $\Delta H$  in  $\text{kJ mol}^{-1}$  for the reaction:



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**40.** How many Cl atoms can you ionize in the process  $Cl \rightarrow Cl^+ + e$  by the energy liberated for the process  $Cl + e \rightarrow Cl^-$  for one Avogadro number of atoms. Given IP = 13.0 eV, and EA = 3.60 eV. Avogadro number =  $6 \times 10^{23}$ .



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**41.** The electron affinity of chlorine is 3.7 eV. How much energy in kcal is released when 2g of chlorine atoms is completely converted to

$Cl^-$  ions in the gaseous state?

( $1eV = 23.06Kcal$ ).



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## Long Answer Questions

1. Discuss in detail about the classification of elements by Mendeleeff.



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2. From a study of properties of neighbouring elements, the properties of an unknown element can be predicted - justify with an example.



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3. Define the modern periodic law . Discuss the construction of the long form of the periodic table .



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4. Discuss the relation between the number of electron filled into the sub energy levels of an orbit and the maximum number of elements present in a period.



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5. Write an essay on s, p, d and f-block elements.



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6. Relate the electronic configuration of elements and their properties in the classification of elements.



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7. What is a periodic property? How the following properties vary in a group and in a period? Explain

(a) Atomic radius.



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**8.** What is a periodic property? How the following properties vary in a group and in a period? Explain

(b) Electron gain enthalpy.



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**9.** What is a periodic property? How the following properties vary in a group and in a period? Explain

(a) IP.



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**10.** What is a periodic property? How the following properties vary in a group and in a period? Explain

(b) EN.



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**11.** Write a note on

(a) Atomic radius.





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**12.** Write a note on

(b) Metallic radius.



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**13.** Write a note on

(c) Covalent radius.



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**14.** Define  $IE_1$  and  $IE_2$ . Why is  $IE_2 > IE_1$  for a given atom? Discuss the factors than effect IE of an element.



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**15.** How do the following properties change in group - 1 and in the third period? Explain with example.

(a) Atomic radius.



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**16.** How do the following properties change in group - 1 and in the third period? Explain with example.

(b) IE



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**17.** How do the following properties change in group - 1 and in the third period? Explain with example.

(c) EA





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**18.** How do the following properties change in group - 1 and in the third period? Explain with example.

(d) Nature of oxides.



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**19.** Define electron gain enthalpy. How it varies in a group and in a period ? Why is the electron gain enthalpy of O or F is less

negative than that of succeeding element in the group ?



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**20. What is electronegativity?**



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**21. How does it vary in a group and in a period ?**



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**22.** Explain the following

(a) Valency



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**23.** Explain the following

(b) Diagonal relationship



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**24.** Explain the following

(c ) Variation of nature of oxides in the Group -

1:



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