

Chapter 3

Classification of Elements and Periodicity in Properties

- The element $Z = 114$ has been discovered recently. It will belong to which of the following family/group and electronic configuration?
 - Carbon family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^2$
 - Oxygen family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^4$
 - Nitrogen family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^6$
 - Halogen family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^5$

(NEET 2017)
- In which of the following options the order of arrangement does not agree with the variation of property indicated against it?
 - $\text{I} < \text{Br} < \text{Cl} < \text{F}$ (increasing electron gain enthalpy)
 - $\text{Li} < \text{Na} < \text{K} < \text{Rb}$ (increasing metallic radius)
 - $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$ (increasing ionic size)
 - $\text{B} < \text{C} < \text{N} < \text{O}$ (increasing first ionisation enthalpy)

(NEET-I 2016)
- The species Ar , K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase?
 - $\text{Ca}^{2+} < \text{K}^+ < \text{Ar}$
 - $\text{K}^+ < \text{Ar} < \text{Ca}^{2+}$
 - $\text{Ar} < \text{K}^+ < \text{Ca}^{2+}$
 - $\text{Ca}^{2+} < \text{Ar} < \text{K}^+$

(2015, Cancelled)
- Which of the following orders of ionic radii is correctly represented?
 - $\text{H}^- > \text{H}^+ > \text{H}$
 - $\text{Na}^+ > \text{F}^- > \text{O}^{2-}$
 - $\text{F}^- > \text{O}^{2-} > \text{Na}^+$
 - $\text{Al}^{3+} > \text{Mg}^{2+} > \text{N}^{3-}$

(2014)
- Which one of the following arrangements represents the correct order of least negative to most negative electron gain enthalpy for C , Ca , Al , F and O ?
 - $\text{Al} < \text{Ca} < \text{O} < \text{C} < \text{F}$
 - $\text{Al} < \text{O} < \text{C} < \text{Ca} < \text{F}$
 - $\text{C} < \text{F} < \text{O} < \text{Al} < \text{Ca}$
 - $\text{Ca} < \text{Al} < \text{C} < \text{O} < \text{F}$

(Karnataka NEET 2013)
- Identify the wrong statement in the following.
 - Amongst isoelectronic species, smaller the positive charge on the cation, smaller is the ionic radius.
 - Amongst isoelectronic species, greater the negative charge on the anion, larger is the ionic radius.
 - Atomic radius of the elements increases as one moves down the first group of the periodic table.
 - Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table.

(2012)
- What is the value of electron gain enthalpy of Na if IE_1 of $\text{Na} = 5.1 \text{ eV}$?
 - -5.1 eV
 - -10.2 eV
 - $+2.55 \text{ eV}$
 - $+10.2 \text{ eV}$

(Mains 2011)
- The correct order of the decreasing ionic radii among the following isoelectronic species is
 - $\text{Ca}^{2+} > \text{K}^+ > \text{S}^{2-} > \text{Cl}^-$
 - $\text{Cl}^- > \text{S}^{2-} > \text{Ca}^{2+} > \text{K}^+$
 - $\text{S}^{2-} > \text{Cl}^- > \text{K}^+ > \text{Ca}^{2+}$
 - $\text{K}^+ > \text{Ca}^{2+} > \text{Cl}^- > \text{S}^{2-}$

(2010)
- Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O , S , F and Cl ?
 - $\text{Cl} < \text{F} < \text{O} < \text{S}$
 - $\text{O} < \text{S} < \text{F} < \text{Cl}$
 - $\text{F} < \text{S} < \text{O} < \text{Cl}$
 - $\text{S} < \text{O} < \text{Cl} < \text{F}$

(2010)
- Among the elements Ca , Mg , P and Cl , the order of increasing atomic radii is
 - $\text{Mg} < \text{Ca} < \text{Cl} < \text{P}$
 - $\text{Cl} < \text{P} < \text{Mg} < \text{Ca}$
 - $\text{P} < \text{Cl} < \text{Ca} < \text{Mg}$
 - $\text{Ca} < \text{Mg} < \text{P} < \text{Cl}$

(Mains 2010)
- Among the following which one has the highest cation to anion size ratio?
 - CsI
 - CsF
 - LiF
 - NaF

(Mains 2010)
- Amongst the elements with following electronic configurations, which one of them may have the highest ionisation energy?

- (a) Ne $[3s^2 3p^2]$ (b) Ar $[3d^{10} 4s^2 4p^3]$
 (c) Ne $[3s^2 3p^1]$ (d) Ne $[3s^2 3p^3]$
 (2009)
- 13.** Which one of the following arrangements does not give the correct picture of the trends indicated against it?
 (a) $F_2 > Cl_2 > Br_2 > I_2$: Bond dissociation energy
 (c) $F_2 > Cl_2 > Br_2 > I_2$: Electronegativity
 (e) $F_2 > Cl_2 > Br_2 > I_2$: Oxidizing power
 (d) $F_2 > Cl_2 > Br_2 > I_2$: Electron gain enthalpy
 (2008)
- 14.** Identify the correct order of the size of the following:
 (a) $Ca^{2+} < K^+ < Ar < Cl^- < S^{2-}$
 (b) $Ar < Ca^{2+} < K^+ < Cl^- < S^{2-}$
 (c) $Ca^{2+} < Ar < K^+ < Cl^- < S^{2-}$
 (d) $Ca^{2+} < K^+ < Ar < S^{2-} < Cl^-$
 (2007)
- 15.** With which of the following electronic configuration an atom has the lowest ionisation enthalpy?
 (a) $1s^2 2s^2 2p^3$ (b) $1s^2 2s^2 2p^5 3s^1$
 (c) $1s^2 2s^2 2p^6$ (d) $1s^2 2s^2 2p^5$
 (2007)
- 16.** Which one of the following ionic species has the greatest proton affinity to form stable compound?
 (a) NH_2^- (b) F^- (c) I^- (d) HS^-
 (2007)
- 17.** Which one of the following orders is not in accordance with the property stated against it?
 (a) $F_2 > Cl_2 > Br_2 > I_2$: Bond dissociation energy
 (b) $F_2 > Cl_2 > Br_2 > I_2$: Oxidising power
 (c) $HI > HBr > HCl > HF$: Acidic property in water
 (d) $F_2 > Cl_2 > Br_2 > I_2$: Electronegativity
 (2006)
- 18.** Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species?
 (a) $S < O < Cl < F$ (b) $Cl < F < S < O$
 (c) $F < Cl < O < S$ (d) $O < S < F < Cl$
 (2005)
- 19.** Ionic radii are
 (a) inversely proportional to effective nuclear charge
 (b) inversely proportional to square of effective nuclear charge
 (c) directly proportional to effective nuclear charge
 (d) directly proportional to square of effective nuclear charge.
 (2004)
- 20.** The ions O^{2-} , F^- , Na^+ , Mg^{2+} and Al^{3+} are isoelectronic. Their ionic radii show
 (a) a significant increase from O^{2-} to Al^{3+}
 (b) a significant decrease from O^{2-} to Al^{3+}
 (c) an increase from O^{2-} to F^- and then decrease from Na^+ to Al^{3+}
 (d) a decrease from O^{2-} to F^- and then increase from Na^+ to Al^{3+} .
 (2003)
- 21.** Which statement is wrong?
 (a) Bond energy of $F_2 > Cl_2$
 (b) Electronegativity of $F > Cl$
 (c) F is more oxidising than Cl
 (d) Electron affinity of $Cl > F$
 (2000)
- 22.** Which of the following elements has the maximum electron affinity?
 (a) I (b) Br (c) Cl (d) F
 (1999)
- 23.** The first ionization potentials (eV) of Be and B respectively are
 (a) 8.29, 8.29 (b) 9.32, 9.32
 (c) 8.29, 9.32 (d) 9.32, 8.29
 (1998)
- 24.** Which one of the following is correct order of the size of iodine species?
 (a) $I^+ > I^- > I$ (b) $I^- > I > I^+$
 (c) $I > I^- > I^+$ (d) $I > I^+ > I^-$
 (1997)
- 25.** Which of the following ion is the largest in size?
 (a) K^+ (b) Ca^{2+} (c) Cl^- (d) S^{2-}
 (1996)
- 26.** Which of the following has the smallest size?
 (a) Al^{3+} (b) F^- (c) Na^+ (d) Mg^{2+}
 (1996)
- 27.** The electronics 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?
 (a) 33 (b) 34 (c) 36 (d) 49
 (1995)

Classification of Elements and Periodicity in

- 28.** One would expect proton to have very large
 (a) charge
 (b) ionization potential
 (c) hydration energy
 (d) radius. (1993)
- 29.** Na^+ , Mg^{2+} , Al^{3+} and Si^{4+} are isoelectronic. the order of their ionic size is
 (a) $\text{Na}^+ > \text{Mg}^{2+} < \text{Al}^{3+} < \text{Si}^{4+}$
 (b) $\text{Na}^+ < \text{Mg}^{2+} > \text{Al}^{3+} > \text{Si}^{4+}$
 (c) $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+} > \text{Si}^{4+}$
 (d) $\text{Na}^+ < \text{Mg}^{2+} > \text{Al}^{3+} < \text{Si}^{4+}$ (1993)
- 30.** If the atomic number of an element is 33, it will be placed in the periodic table in the
 (a) first group (b) third group
 (c) fifth group (d) seventh group. (1993)
- 31.** In the periodic table from left to right in a period, the atomic volume
 (a) decreases
 (b) increases
 (c) remains same
 (d) first decrease then increases. (1993)
- 32.** Which electronic configuration of an element has abnormally high difference between second and third ionization energy?
 (a) $1s^2, 2s^2, 2p^6, 3s^1$
 (b) $1s^2, 2s^2, 2p^6, 3s^1 3p^1$
 (c) $1s^2, 2s^2, 2p^6, 3s^2 3p^2$
 (d) $1s^2, 2s^2, 2p^6, 3s^2$ (1993)
- 33.** One of the characteristic properties of non-metals is that they
 (a) are reducing agents
 (b) form basic oxides
 (c) form cations by electron gain
 (d) are electronegative. (1993)
- 34.** Pauling's electronegativity values for elements are useful in predicting
 (a) polarity of the molecules
 (b) position in the E.M.F. series
 (c) coordination numbers
 (d) dipole moments. (1989)
- 35.** The electronic configuration of four elements are given below. Which elements does not belong to the same family as others?
 (a) $[\text{Xe}]4f^{14}5d^{10}1s^2$
 (b) $[\text{Kr}]4d^{10}5s^2$
 (c) $[\text{Ne}]3s^2 3p^5$
 (d) $[\text{Ar}]3d^{10}4s^2$ (1989)
- 36.** In the periodic table, with the increase in atomic number, the metallic character of an element
 (a) decreases in a period and increases in a group
 (b) increases in a period and decreases in a group
 (c) increases both in a period and the group
 (d) decreases in a period and the group. (1989)

Answer Key

1. (a) 2. (a, d) 3. (a) 4. (None) 5. (d) 6. (a) 7. (a) 8. (c) 9. (b)
 10. (b) 11. (b) 12. (d) 13. (a, d) 14. (a) 15. (b) 16. (a) 17. (a) 18. (d) 19. (a)
 20. (b) 21. (a) 22. (c) 23. (d) 24. (b) 25. (d) 26. (a) 27. (a) 28. (c) 29. (c)
 30. (c) 31. (d) 32. (d) 33. (d) 34. (a) 35. (c) 36. (a)