

Periodic properties

Q1. According to modern periodic law the properties of elements repeat at regular intervals when the elements are arranged in order of:

- (a) decreasing atomic number (b) increasing atomic weight
(c) increasing atomic number (d) decreasing atomic weights

Q2. Give the symbol of the elements of lowest atomic number that has three 2p electrons:

- (a) Mg (b) P (c) N (d) Si

Q3. In the fourth period of the periodic table, how many elements have one or more 4d electrons?

- (a) 2 (b) 18 (c) 0 (d) 6

Q4. Assuming that elements are formed to complete the seventh period, what would be the atomic number of the alkaline earth metal of the eighth period?

- (a) 113 (b) 120 (c) 119 (d) 106

Q5. Choose the correct statement regarding transition elements:

- (a) transition elements have low melting points
(b) transition elements do not have catalytic activity
(c) transition elements exhibit variable oxidation states
(d) transition elements exhibit inert pair effect

Q6. Which one of the following is a different pair?

- (a) Li, Na (b) Be, Ba (c) N, As (d) O, At

Q7. The most electropositive element possesses the electronic configuration:

- (a) $[He]2s^1$ (b) $[Ne]3s^2$ (c) $[Xe]6s^1$ (d) $[Xe]6s^2$

Q8. Which one of the following elements shows both positive and negative oxidation states?

- (a) cesium (b) fluorine (c) iodine (d) xenon

Q9. The number of elements present in fifth period is:

- (a) 18 (b) 32 (c) 8 (d) 24

Q10. Which of the following arrangements shows the correct order of decreasing paramagnetism ?

- (a) $N > Al > O > Ca$ (b) $N > O > Al > Ca$
(c) $O > N > Al > Ca$ (d) $O > N > Ca > Al$

Q11. The elements with the lowest atomic number that has a ground state electronic configuration of $(n - 1)d^6ns^2$ is located in the:

(a) fifth period (b) sixth period (c) fourth period (d) third period

Q12. Which of the following sets of atomic numbers corresponds to elements of group 16 ?

(a) 8, 16, 32, 54 (b) 16, 34, 54, 86 (c) 8, 16, 34, 52 (d) 10, 16, 32, 50

Q13. The atomic numbers of the metallic and non-metallic elements which are liquid at room temperature respectively are: ?

(a) 55, 87 (b) 33, 87 (c) 35, 80 (d) 80, 35

Q14. In the periodic table, metallic character of the elements shows one of the following trend:

(a) decreases down the group and increases across the period

(b) increases down the group and decreases across the period

(c) increases across the period and also down the group

(d) decreases across the period and also down the group

Q15. Nucleus of an element contains 9 protons. Its valency would be:

(a) 1 (b) 2 (c) 3 (d) 5

Q16. Transition metals are not characterized by:

(a) fixed valency (b) coloured compound

(c) high melting and boiling points (d) tendency to form complexes

Q17. The ionic radii of Li^+ , Be^{2+} and B^{3+} follows the order:

(a) $Be^{2+} > B^{3+} > Li^+$ (b) $Li^+ > B^{3+} > Be^{2+}$

(c) $B^{3+} > Be^{2+} > Li^+$ (d) $Li^+ > Be^{2+} > B^{3+}$

Q18. Largest in size out of Na^+ , Ne and F^- is:

(a) Na^+ (b) Ne (c) F^- (d) All are equal

Q19. 21. Which of the following atom or ions has the smallest size?

(a) F (b) F^- (c) O (d) N

Q20. The single covalent radius of P is 0.11 nm. The single covalent radius of Cl will be:

(a) smaller than P (b) greater than P (c) same as P (d) twice of P

Q21. Which of the following is arranged in decreasing order of size?

(a) $Mg^{2+} > Al^{3+} > O^{2-}$ (b) $O^{2-} > Mg^{2+} > Al^{3+}$

(c) $Al^{3+} > Mg^{2+} > O^{2-}$ (d) $Al^{3+} > O^{2-} > Mg^{2+}$

Q22. The correct order of increasing atomic radius of the following elements is:

- (a) $S < O < Se < C$ (b) $O < C < S < Se$
(c) $O < S < Se < C$ (d) $C < O < S < Se$

Q23. The correct order of increasing radius of the elements Si, Al, Na and P is:

- (a) $Si < Al < P < Na$ (b) $P < Si < Al < Na$
(c) $Al < Si < P < Na$ (d) $Al < P < Si < Na$

Q24. The size of the species, Pb, Pb^{2+}, Pb^{4+} decreases as:

- (a) $Pb^{4+} > Pb^{2+} > Pb$ (b) $Pb > Pb^{2+} > Pb^{4+}$
(c) $Pb > Pb^{4+} > Pb^{2+}$ (d) $Pb^{4+} > Pb > Pb^{2+}$

Q25. The amount of energy released on the addition of an electron in outermost shell of an atom is called:

- (a) ionization enthalpy (b) hydration enthalpy
(c) electronegativity (d) electron gain enthalpy

Q26. Second ionization potential of Li, Be and B is in the order:

- (a) $Li > Be > B$ (b) $Li > B > Be$
(c) $Be > Li > B$ (d) $B > Be > Li$

Q27. The ionization energy of boron is less than that of beryllium because:

- (a) beryllium has a higher nuclear charge than boron
(b) beryllium has a lower nuclear charge than boron
(c) the outermost electron in boron occupies a $2p^-$ orbital
(d) the $2s$ and $2p^-$ orbitals of boron are degenerate

Q28. The first four I.E. values of an element are 284, 412, 656 and 3210 kJ.mol^{-1} .

The number of valence electrons in the element are:

- (a) 1 (b) 2 (c) 3 (d) 4

Q29. The first I.E. of Na, Mg, Al and Si are in the order:

- (a) $Na < Mg < Al < Si$ (b) $Na < Al < Mg < Si$
(c) $Na < Al < Si < Mg$ (d) $Na > Mg > Al > Si$

Q30. The ionization energy will be higher when the electron is removed from:

- (a) s - orbital (b) p - orbital (c) d - orbital (d) f - orbital

Q31. Which of the following isoelectronic ion has the lowest ionization energy?

- (a) K^+ (b) Cl^{-1} (c) Ca^{2+} (d) S^{2-}

Q32. The ionization potentials of Li and K are 5.4 and 4.3eV respectively. The ionization potential of Na will be:

- (a) 9.7eV (b) 1.1eV (c) 4.9eV (d) cannot be calculated

Q33. Which of the following electronic configuration is associated with the biggest jump between the second and third ionization energies?

- (a) $1s^2 2s^2 2p^2$ (b) $1s^2 2s^2 2p^6 3s^1$ (c) $1s^2 2s^2 2p^6 3s^2$ (d) $1s^2 2s^2 2p^1$

Q34. The second ionization energy is maximum for:

- (a) boron (b) beryllium (c) magnesium (d) aluminium

Q35. A large difference between the fourth and fifth ionization energies indicates the presence of:

- (a) 5 valence electrons in an atom (b) 6 valence electrons in an atom
(c) 4 valence electrons in an atom (d) 8 valence electrons in an atom

Q36. For which of the following reaction ΔH^0 value is equal to the first ionization energy of Ca ?

- (a) $Ca_{(g)}^+ \rightarrow Ca_{(g)}^{2+} + e$ (b) $Ca_{(g)} \rightarrow Ca_{(g)}^+ + e$
(c) $Ca_{(s)} \rightarrow Ca_{(g)}^+ + e$ (d) $Ca_{(g)} \rightarrow Ca_{(g)}^{2+} + 2e$

Q37. Ionization enthalpy of an atom is equal to:

- (a) Electron gain enthalpy of the cation (b) electronegativity of the ion
(c) ionization enthalpy of the cation (d) none of these

Q38. From the ground state electronic configuration of the elements given below, pick up the one with highest value of second ionization energy:

- (a) $1s^2 2s^2 2p^6 3s^2$ (b) $1s^2 2s^2 2p^6 3s^1$ (c) $1s^2 2s^2 2p^6$ (d) $1s^2 2s^2 2p^5$

Q39. An element has successive ionization enthalpies as 940 (first), 2080, 3090, 4140, 7030, 7870, 16000 and 19500 $kJ.mol^{-1}$. To which group of the periodic table does this element belong?

- (a) 14 (b) 15 (c) 16 (d) 17

Q40. The second ionization potential of elements is invariably higher than first ionization potential because:

- (a) the size of cation is smaller than its atom
(b) it is easier to remove electron from cation
(c) ionization is an endothermic process
(d) none of these

Q41. To which of the following atom, the attachment of electron is most difficult?

- (a) radon (b) nitrogen (c) oxygen (d) radium

Q42. Arrange N, O and S in order of decreasing electron affinity:

- (a) $S > O > N$ (b) $O > S > N$ (c) $N > O > S$ (d) $S > N > O$

Q43. The increasing order of electron affinity of the electronic configurations of element

I) $1s^2 2s^2 2p^6 3s^2 3p^5$ **II)** $1s^2 2s^2 2p^3$ **III)** $1s^2 2s^2 2p^5$ **IV)** $1s^2 2s^2 2p^6 3s^1$ is

- (a) $II < IV < III < I$ (b) $I < II < III < IV$
(c) $I < III < II < IV$ (d) $IV < III < II < I$

Q44. Second electron gain enthalpy:

- (a) is always negative (b) is always positive
(c) can be positive or negative (d) is always zero

Q45. The element having very high ionization enthalpy but zero electron gain enthalpy is:

- (a) H (b) F (c) He (d) Be

Q46. The electronegativity of the following elements increases in the order:

- (a) $C < N < Si < P$ (b) $Si < P < C < N$
(c) $N < C < P < Si$ (d) $C < Si < N < P$

Q47. The hydration energy of Mg^{2+} ions is lesser than that of:

- (a) Al^{3+} (b) Ba^{2+} (c) Na^+ (d) None of these

Q48. Among the following, which has the maximum hydration energy?

- (a) OH^- (b) NH (c) F^- (d) H^+

Q49. Which of the following is arranged in order of increasing radius?

- (a) $K_{(aq)}^+ < Na_{(aq)}^+ < Li_{(aq)}^+$ (b) $Na_{(aq)}^+ < K_{(aq)}^+ < Li_{(aq)}^+$
(c) $K_{(aq)}^+ < Li_{(aq)}^+ < Na_{(aq)}^+$ (d) $Li_{(aq)}^+ < Na_{(aq)}^+ < K_{(aq)}^+$

Q50. Amongst sodium halides (NaF, NaCl, NaBr and NaI), NaF has the highest melting point because of:

- (a) high oxidizing power (b) lowest polarity
(c) maximum lattice energy (d) minimum ionic character

Q51. Among the following oxides, which has the maximum lattice energy?

- (a) MgO (b) CaO (c) SrO (d) BaO

Q52. Sodium generally does not show oxidation state of +2, because of its:

- (a) high first ionization potential (b) high second ionization potential
(c) large ionic radius (d) high electronegativity

Q53. Which of the following is different from other three oxides?

- (a) MgO (b) SnO (c) ZnO (d) PbO

Q54. Which one of the following compounds has a positive enthalpy of solution ?

(a) LiF (b) $LiCl$ (c) $LiBr$ (d) LiI

Q55. Which one of the following compounds has a negative enthalpy of solution ?

(a) KCl (b) KBr (c) KF (d) KI

Answer Key:

(1.) c (2.) c (3.) c (4.) b (5.) c (6.) d (7.) c
(8.) c (9.) a (10.) b (11.) c (12.) c (13.) d
(14.) b (15.) a (16.) a (17.) d (18.) b (19.) a
(20.) a (21.) b (22.) b (23.) b (24.) b (25.) d
(26.) b (27.) c (28.) c (29.) b (30.) a (31.) d
(32.) c (33.) c (34.) a (35.) c (36.) b (37.) a
(38.) b (39.) c (40.) a (41.) a (42.) a (43.) a
(44.) b (45.) c (46.) b (47.) a (48.) d (49.) a
(50.) c (51.) a (52.) b (53.) a (54.) a (55.) c