

- In which of the following species energy is released when electron is added ?  
(a)  $F^-$  (b) O (c)  $O^-$  (d) Na
- The correct order of the size is-  
(a)  $Ca^{2+} > K^+ > Ar > Cl > S^{2-}$  (b)  $K^+ > Ca^{2+} > Cl > Ar > S^{2-}$   
(c)  $S^{2-} > Cl > Ar > K^+ > Ca^{2+}$  (d)  $S^{2-} > Ar > Cl > Ca^{2+} > K^+$
- d-block elements in long form of periodic table are placed -  
(a) On the extreme left (b) On the extreme right  
(c) At the bottom (d) None of these
- Which one of the following is not the representative element ?  
(a) Fe (b) K (c) Ba (d) N
- Whose name is not associated with the development of the periodic table ?  
(a) Mosley (b) Mendeleeff  
(c) Newland (d) Rutherford
- Which of the following pairs has both members from the same group of periodic table ?  
(a) Mg, Ba (b) Mg, Na (c) Mg, Cu (d) Mg, Cl
- Which of the following processes requires maximum energy -  
(a)  $Mg(g) \longrightarrow Mg^+(g) + e^-$  (b)  $Mg^+(g) \longrightarrow Mg^{2+}(g) + e^-$   
(c)  $Na(g) \longrightarrow Na^+(g) + e^-$  (d)  $Na^+(g) \longrightarrow Na^{2+}(g) + e^-$
- Which is correct order of ionic radii in increasing order -  
(a)  $Cr^{6+} < Cr^{3+} < Cr^{2+}$  (b)  $Mn^{2+} < Mn^{6+} < Mn^{7+}$   
(c)  $Pb^{4+} < Pb^{2+}$  (d) Both (a) and (c)
- Which is correct order of reducing character in case of alkali metals ?  
(a)  $Li < Na < K < Rb < Cs$  (b)  $Cs < K < Rb < Na < Li$   
(c)  $Na < K < Rb < Cs < Li$  (d)  $K < Na < Rb < Cs < Li$
- Increasing order of atomic radii is :  
(a)  $Mg^{2+} < Na^+ < Ne < F^- < O^{2-}$   
(b)  $Na^+ < Mg^{2+} < Ne < F^- < O^{2-}$   
(c)  $Na^+ < Mg^{2+} < F^- < Ne < O^{2-}$   
(d)  $Na^+ < Mg^{2+} < F^- < O^{2-} < Ne$
- Ionic radii is/are :  
(a) Directly proportional to effective nuclear charge  
(b) Directly proportional to square of effective nuclear charge  
(c) Inversely proportional to effective nuclear charge  
(d) Inversely proportional to square of effective nuclear charge
- An element with atomic number 20 will be placed in which period of the periodic table ?  
(a) 1 (b) 2 (c) 3 (d) 4
- Which pair of atomic numbers represents s-block elements ?  
(a) 3, 12 (b) 6, 12 (c) 7, 15 (d) 9, 17
- Which of the following has largest ionic radius ?  
(a)  $Li^+$  (b)  $K^+$  (c)  $Na^+$  (d)  $Cs^+$
- Ionization potential is lowest for :  
(a) Alkali metals (b) Inert gases  
(c) Halogens (d) Alkaline earth metals
- Which of the following is a typical element ?  
(a) Li (b) Na (c) F (d) N

17. Which of the following set of elements is not according with octave rule ?  
(a) H, F, Cl (b) Li, Na, K (c) C, Si, Ge (d) Be, Mg, Ca
18. Atomic radius decreases along a period. But the radius of zero group elements is more than the radius of corresponding halogens because -  
(a) It is covalent radius  
(b) It is an ionic radius  
(c) It is vanderwaal's radius  
(d)  $Z_{\text{effective}}$  of inert gases is less than halogens
19. Select the correct statements –  
(1) The first I.E. of Na is less than first IE of Mg  
(2) the third I.E. of Mg is greater than the third I.E. of Al  
(3) The  $I.E_1$  of Al is less than  $I.E_1$  of Mg  
(4) The  $I.E_2$  of Mg is greater than  $I.E_2$  of Na  
(a) Only (1) (b) (1) and (3)  
(c) (1), (2) and (3) (d) (1), (2) and (4)
20. Which of the following statements are correct ?  
(1) The elements like F, Cl, O etc having high values of electron affinity act as strong oxidizing agents  
(2) The elements having low values of ionisation energies act as strong reducing agent  
(3) The formation of  $S^{2-}$  is an endothermic process  
(4) Formation of  $Cl^-$  is exothermic whereas formation of  $O^{2-}$  is endothermic  
(a) (1), (2) and (3) (b) (1) and (3)  
(c) (1), (2), (3) and (4) (d) (1), (2) and (4)
21. Which of the following is/are generally true regarding effective nuclear charge ( $Z_{\text{eff}}$ ) :  
(a) It increases on moving left to right in a period.  
(b) It remains almost constant on moving top to bottom in a group.  
(c) For isoelectronic species, as  $Z$  increases,  $Z_{\text{eff}}$  decreases.  
(d) Both (a) and (b).
22. Match the correct atomic radius with the element :
- | S.No. | Element | Code | Atomic radius (pm) |
|-------|---------|------|--------------------|
| (i)   | Be      | (p)  | 74                 |
| (ii)  | C       | (q)  | 88                 |
| (iii) | O       | (r)  | 111                |
| (iv)  | B       | (s)  | 77                 |
| (v)   | N       | (t)  | 66                 |
- (a) (i) – r, (ii) – q, (iii) – t, (iv) – s, (v) – p  
(b) (i) – t, (ii) – s, (iii) – r, (iv) – p, (v) – q  
(c) (i) – r, (ii) – s, (iii) – t, (iv) – q, (v) – p  
(d) (i) – t, (ii) – p, (iii) – r, (iv) – s, (v) – q
23. The electronegativity values of C,N,O and F on Pauling scale  
(a) Decrease from carbon to fluorine.  
(b) Increase from carbon to fluorine.  
(c) Increase upto oxygen and then decrease upto fluorine.  
(d) Decrease from carbon to nitrogen and then increase continuously.
24. The electronegativity values of the elements are useful in predicting :  
(a) Bond energy of a molecule. (b) Polarity of a molecule.  
(c) Nature of an oxide. (d) All of these
25. Which of the following is true about the element  ${}_{33}\text{As}$  according to Modern periodic table :  
(a) It is a 5<sup>th</sup> period element.  
(b) It is a p-block element.  
(c) It belongs to 16<sup>th</sup> group.  
(d) It is one among typical elements.

26. The first element of a group differs in many ways from the other heavier members of the group. This is due to :
- Small size
  - High electronegativity and high ionisation potential
  - Unavailability of d-orbitals
  - All of the above
27. Screening effect is not observed in :
- He<sup>+</sup>
  - Li<sup>2+</sup>
  - Be<sup>3+</sup>
  - In all cases
28. In which of the following compounds, manganese shows maximum radius ?
- MnO<sub>2</sub>
  - KMnO<sub>4</sub>
  - MnO
  - K<sub>3</sub>[Mn(CN)<sub>6</sub>]
29. Values of IE<sub>1</sub>, IE<sub>2</sub> and IE<sub>3</sub> of an element are 9.3, 18.2 and 553.8 eV. What information(s) do these data convey?
- The element has two electrons in the valence shell.
  - The element belongs to 14<sup>th</sup> group of Modern periodic table.
  - Both (a) and (b)
  - None of these
30. The ground state electronic configurations of some elements, A, B, C, D, and E (these symbols represent the some of the known elements given in the Modern periodic table) are as follows :
- A : 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>2</sup>
- B : 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 4s<sup>1</sup>
- C : 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>1</sup>
- D : 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>5</sup> 4s<sup>1</sup>
- E : 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>10</sup> 4s<sup>2</sup> 4p<sup>6</sup>.
- Match the electronic configurations of the elements with the properties given below and select the correct sequence by choosing the correct codes given.
- Element forms a cation which is isoelectronic with P<sup>3-</sup>.
  - Element which in its compounds can show a maximum oxidation state of +6 and also forms coloured compounds in this oxidation state.
  - Element has largest atomic radius and highest first ionisation enthalpy in the respective period.
  - Element which has intermediate value of electronegativity and its oxide forms salts with strong acids and bases.
- (a) B C E A    (b) B D E C    (c) B C D E    (d) A B C D

1. (b)  
Energy is released when electron is added to O but energy is absorbed in rest of the cases when electron is added.
2. (c)  
All the species are isoelectronic therefore greater the nuclear charge lesser will be the size.
3. (d)  
d-block elements present middle of the periodic table.
4. (a)  
Group 1,2,13,14,15,16,17 are representative elements.
5. (d)  
Rutherford
6. (a)  
Be, Mg, Ca, Sr, Ba  $\Rightarrow$  II A Group
7. (d)  
 $\text{Na}^+$  has stable electronic configuration.
8. (d)  
As nuclear charge decreases, ionic radii increases.
9. (c)  
As we move from sodium to caesium with decrease in ionization energy reducing character increases. For lithium, it is hydration energy which makes it as best reducing agent Thus order of reducing character is  $\text{Na} < \text{K} < \text{Rb} < \text{Cs} < \text{Li}$
10. (a)  
 $\text{Mg}^{+2} < \text{Na}^+ < \text{Ne} < \text{F}^- < \text{O}^{-2}$
11. (c)  

$$\left[ \text{Ionic Radius} \propto \frac{1}{\text{Effective Nuclear charge}} \right]$$
12. (d)  
 ${}_{20}\text{Ca} = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$   
 Period  $\Rightarrow$  4<sup>th</sup>
13. (a)  
 $\text{Li} \Rightarrow Z = 3$   
 $\text{Mg} \Rightarrow Z = 12$
14. (d)  

$$\text{T} \xrightarrow[\text{Size } \uparrow]{\text{Li}^+ \quad \text{Na}^+ \quad \text{K}^+ \quad \text{Cs}^+} \text{B}$$
15. (a)  

$$\text{L} \xrightarrow[\text{I.P. } \uparrow]{\text{Alkali metal}} \text{R}$$
  
 Minimum I.P. has alkali metals.
16. (b)  
3<sup>rd</sup> period elements
17. (c)  
Only H to Ca are arranged in Newland's octave and Ge is beyond of 'Ca'.

18. (c)  
Vanderwaal's radius is very large.
19. (c)  
 $IE_2$  of sodium is greater than  $IE_2$  of magnesium.
20. (c)  
All statements are correct.
21. (d)  
For isoelectronic species, as  $Z$  increases,  $Z_{\text{eff}}$  increases (and vice versa).
22. (c)  
On moving left to right in a period, atomic radii decreases due to increase in  $Z_{\text{eff}}$  and addition of electrons to the same outermost shell.
23. (b)  
As size of atom decreases across the period, the attraction between the nucleus and shared pair of electrons increases. So electronegativity increases across the period.
24. (d)  
All these properties vary with the change in electronegativity. For example the change in values of electronegativity of the elements, bring about the change in the acidic character of oxide.  
 $\underline{\text{Na}_2\text{O} < \text{B}_2\text{O}_3 < \text{N}_2\text{O}_5 < \text{SO}_3 < \text{Cl}_2\text{O}_7} \rightarrow$   
electronegativity increases & thus acidic character increases
25. (b)  
Electron configuration is  $[\text{Ar}]^{18} 3d^{10} 4s^2 4p^3$ . As last electron enters in p-subshell it is p-block element and thus its group number is equal to  $10 + 5 = 15$ . As principal quantum number of valence shell is 4, so it is 4<sup>th</sup> period element.
26. (d)  
All these characteristics contribute for the different behaviour of the first element of each group.
27. (d)  
 $\text{He}^+, 1s^1$ ;  $\text{Li}^{2+}, 1s^1$ ;  $\text{Be}^{3+}, 1s^1$ . All these ions have only one electron. So they do not have any inner orbital and thus do not experience any screening effect.
28. (c)  
Mn is in +2 oxidation state in MnO while in other compounds, it is in higher oxidation state. As number of electrons per proton decreases, the size decreases.
29. (a)  
This can be explained by taking the example of Mg which has electronic configuration  $1s^2 2s^2 2p^6 3s^2$ . After removing two electron from valence shell i.e.  $3s^2$ , the third electron is to be removed from inert gas configuration. So there is big jump in Ionisation energy from  $IE_2$  to  $IE_3$  as indicated in the problem.
30. (b)  
(i) Alkali metal, potassium forms  $\text{K}^+$  (number of electrons = 18) which is isoelectronic with  $\text{P}^{3-}$  (number of electrons = 18)  $\rightarrow$  B.  
(ii) Transition element, chromium show maximum oxidation state of +6 in  $\text{Cr}_2\text{O}_7^{2-}$  and  $\text{CrO}_4^{2-}$  and they are coloured  $\rightarrow$  D.  
(iii) Noble gas, Kr has largest atomic radius because radius is expressed as Vanderwaal radius and there are interelectronic repulsions due to completely filled outermost shell. Inert gas has highest first ionisation enthalpy in the respective period because of stable valence shell electron configuration  $\rightarrow$  E.  
(iv) Element ( $Z=13$ ), aluminium has intermediate value of electronegativity and therefore its oxide is amphoteric in nature  $\rightarrow$  C.