

(Classification of Elements and Periodicity in Properties,
Hydrogen, The s-Block Elements)

- The element with the outer electronic configuration $3d^6 4s^2$ is a
 - (1) Metalloid
 - (2) Non-metal
 - (3) Transition metal
 - (4) Noble gas
- The period number in the long form of the periodic table is equal to
 - (1) magnetic quantum number of any element of the period
 - (2) atomic number of any element of the period
 - (3) maximum Principal quantum number of any element of the period
 - (4) maximum Azimuthal quantum number of any element of the period
- Which of the following option is incorrect with respect to ionic radii?
 - (1) $Ti^{4+} < Mn^{2+}$
 - (2) $^{35}Cl^- < ^{37}Cl^-$
 - (3) $K^+ > Cl^{-1}$
 - (4) $P^{3+} > P^{5+}$
- Elements of which of the following groups will form anions most readily
 - (1) Oxygen family
 - (2) Nitrogen family
 - (3) Halogens
 - (4) Alkali metals
- If the atomic number of an element is 33, it will be placed in the periodic table in the
 - (1) First group
 - (2) Third group
 - (3) Fifth group
 - (4) Seventh group
- In which of the following options the order of arrangement does not agree with the variation of property indicated against it?
 - (1) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (Increasing ionic size)
 - (2) $B < C < N < O$ (increasing first ionisation enthalpy)
 - (3) $I < Br < Cl < F$ (increasing electron gain enthalpy)
 - (4) $Li < Na < K < Rb$ (increasing metallic radius)
- The species Ar, K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase?
 - (1) $Ca^{2+} < Ar < K^+$
 - (2) $Ca^{2+} < K^+ < Ar$
 - (3) $K^+ < Ar < Ca^{2+}$
 - (4) $Ar < K^+ < Ca^{2+}$
- The formation of the oxide in $O^{2-}(g)$, from oxygen atom requires first an exothermic and then an endothermic step as shown below:

$$O(g) + e^- \rightarrow O^-(g); \Delta_f H^{(-)} = -141 \text{ kJ mol}^{-1}$$

$$O^-(g) + e^- \rightarrow O^{2-}(g); \Delta_f H^{(-)} = +780 \text{ kJ mol}^{-1}$$
 Thus process of formation O^{2-} in gas phase is unfavourable even though O^{2-} is isoelectronic with neon. It is due to the fact that
 - (1) Electron repulsion outweighs the stability gained by achieving noble gas configuration
 - (2) O^- ion has comparatively smaller size than oxygen atom
 - (3) Oxygen is more electronegative
 - (4) Addition of electron in oxygen results in larger size of the ion
- 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?
 - (1) $Ca < Al < C < O < F$
 - (2) $Al < Ca < O < C < F$
 - (3) $Al < O < C < Ca < F$
 - (4) $C < F < O < Al < Ca$
- Identify the wrong statement in the following:
 - (1) Amongst isoelectronic species, smaller the positive charge on the cation, smaller is the ionic radius
 - (2) Amongst isoelectronic species, greater the negative charge on the anion, larger is the ionic radius
 - (3) Atomic radius of the elements increases as one moves down the first group of the periodic table
 - (4) Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table.
- When two ice cubes are pressed over each other, they unite to form one cube. Which of the following forces is responsible to hold them together?
 - (1) Hydrogen bond formation
 - (2) Van der Waals forces
 - (3) Covalent attraction
 - (4) Ionic interaction
- Water contracts on heating
 - (1) to 100°C
 - (2) from 0°C to 4°C
 - (3) to 273 K
 - (4) from 10°C to 20°C
- Decomposition of H_2O_2 is retarded by
 - (1) H_3PO_4
 - (2) Alcohol
 - (3) Acetanilide
 - (4) All
- The hydride ion, H^- , is a stronger base than the hydroxide ion, OH^- , which one of the following reactions will occur if sodium hydride (NaH) is dissolved in water?
 - (1) $H^-(aq) + H_2O(l) \rightarrow H_3O^-(aq)$
 - (2) $H^-(aq) + H_2O(l) \rightarrow OH^-(aq) + H_2(g)$
 - (3) $H^-(aq) + H_2O(l) \rightarrow OH^-(aq) + 2H^+(aq) + 2e$
 - (4) $H^-(aq) + H_2O(l) \rightarrow$ reaction

15. The ionization of hydrogen atom would give rise to
 (1) Hydride ion (2) Hydronium ion
 (3) Proton (4) Hydroxyl ion
16. Some statements about heavy water are given below:
 (1) Heavy water is used as a moderator in nuclear reactors
 (2) Heavy water is more associated than ordinary water
 (3) Heavy water is more effective solvent than ordinary water
 Which of the above statements are correct?
 (1) (1) and (3)
 (2) (1) and (2)
 (3) (1), (2) and (3)
 (4) (2) and (3)
17. Which of the following groups of ions makes the water hard?
 (1) Sodium and bicarbonate
 (2) Magnesium and calcium
 (3) Potassium and sulphate
 (4) Ammonium and chloride
18. The dielectric constant of H_2O is 80. The electrostatic force of attraction between Na^+ and Cl^- will be
 (1) reduced to $\frac{1}{40}$ in water than in air
 (2) reduced to $\frac{1}{80}$ in water than in air
 (3) will be increased to 80 in water than in air
 (4) will remain unchanged
19. At its melting point ice is lighter than water because
 (1) H_2O molecules are more closely packed in solid state
 (2) Ice crystals have hollow hexagonal arrangement of H_2O molecules
 (3) On melting of ice the H_2O molecule shrinks in size
 (4) Ice forms mostly heavy water on first melting
20. Calgon used as a water softener is
 (1) $Na_2[Na_4(PO_3)_6]$
 (2) $Na_4[Na_2(PO_3)_6]$
 (3) $Na_4[Na_4(PO_4)_5]$
 (4) $Na_4[Na_2(PO_4)_6]$
21. Which of the following metal is found in green colouring pigment chlorophyll of plants?
 (1) Fe (2) Mg
 (3) Na (4) Al
22. The solubility of metal halides depends on their nature, lattice enthalpy and hydration enthalpy of the individual ions. Amongst fluorides of alkali metals, the lowest solubility of LiF in water is due to
 (1) Ionic nature of lithium fluoride
 (2) High lattice enthalpy
 (3) High hydration enthalpy for lithium ion
 (4) Low ionisation enthalpy of lithium atom
23. In the synthesis of sodium carbonate, the recovery of ammonia is done by treating NH_4Cl with $Ca(OH)_2$. The by-product obtained in this process is
 (1) $CaCl_2$ (2) NaCl
 (3) NaOH (4) $NaHCO_3$
24. In the replacement reaction

$$\begin{array}{c} \diagdown \\ \diagup \end{array} Cl+MF \longrightarrow \begin{array}{c} \diagdown \\ \diagup \end{array} CF + MI$$

 The reaction will be most favourable if M happens to be
 (1) Na (2) K
 (3) Rb (4) Li
25. The sequence of ionic mobility in aqueous solution is
 (1) $K^+ > Na^+ > Rb^+ > Cs^+$
 (2) $Cs^+ > Rb^+ > K^+ > Na^+$
 (3) $Rb^+ > K^+ > Cs^+ > Na^+$
 (4) $Na^+ > K^+ > Rb^+ > Cs^+$
26. In Castner – Kellner cell for production of sodium hydroxide:
 (1) Brine is electrolyzed with Pt electrodes
 (2) Brine is electrolyzed using graphite electrodes
 (3) Molten sodium chloride is electrolysed
 (4) Sodium amalgam is formed at mercury cathode
27. Which of the following statements is **incorrect**?
 (1) Pure sodium metal dissolves in liquid ammonia to give blue solution
 (2) NaOH reacts with glass to give sodium silicate
 (3) Aluminium reacts with excess NaOH to give $Al(OH)_3$
 (4) $NaHCO_3$ on heating gives Na_2CO_3
28. Which of the following oxides is **not** expected to react with sodium hydroxide?
 (1) CaO (2) SiO_2
 (3) BeO (4) B_2O_3
29. In which of the following processes, fused sodium hydroxide is electrolysed at a $330^\circ C$ temperature for extraction of sodium?
 (1) Castner's process (2) Down's process
 (3) Cyanide process (4) Both (2) and (3)
30. Aqueous solution of sodium carbonate absorbs NO and NO_2 to give
 (1) $CO_2 + NaNO_3$ (2) $CO_2 + NaNO_2$
 (3) $NaNO_2 + CO$ (4) $NaNO_3 + CO$