7 CHAPTER

HYDROGEN & S-BLOCK ELEMENTS

EXERCISE-1

[SINGLE CORRECT CHOICE TYPE]

HYDROGEN AND ITS COMPOUNDS

Hydrogen

Q.1 Which is true about different forms of hydrogen :

(A) ortho hydrogen has same spins of two nuclei clockwise or anticlockwise

(B) para hydrogen has different spins of two nuclei

(C) at absolute zero, there is 100% para form and at high temperature, there is 75% ortho form

(D) all are correct

Q.2 Out of the following metals which will give H_2 on reaction with NaOH :

I : Zn, II : Mg, III : Al, IV : Be

(A) I, II, III, IV (B) I, III, IV (C) II, IV (D) I, III

Q.3 The gas used in the hydrogenation of oils in presence of nickel as a catalyst is :

(A) methane (B) ethane (C) ozone (D) hydrogen

Q.4 Atoms in hydrogen have abundance of :

(A) $_1H^1$ atoms (B) $_1D^2$ atoms

(C) $_1T^3$ atoms (D) All three are in equal proportions

Q.5 Weakest reducing agent :

(A) Atomic hydrogen (B) Nascent hydrogen

(C) Molecular hydrogen (D) Occluded hydrogen

Q.6 In large amount dihydrogen is prepared by

(A) Zinc + HCl (B) Zinc + NaOH

(C) petroleum (C) coal

Q.7 Which of the following statement is not true for $_1H^1$, $_1H^2$, $_1H^3$ respectively –

(A) They are isotopes of each other

(B) They have similar electronic configuration

(C) They exist in the nature in the ratio 1 : 2 : 3

(D) Their atomic masses are in the ratio 1 : 2 : 3

Q.8 Hydrogen has three isotops, the number of possible molecule will be –

(A) 3 (B) 6 (C) 9 (D) 12

Q.9 Dihydrogen has :

(A) Two isotopes and no isomers (B) Three isotopes and two nuclear isomers

(C) Three isotopes and two optical isomers (D) Two isotopes and two geometrical isomers

Q.10 Hydrogen is :

(A) Electropositive

(B) Electronegative

(C) Both electropositive as well as electronegative

(D) Neither electropositive nor electronegative

Q.11 In which property listed below hydrogen does not resemble alkali metals ?

(A) Tendency to form cation (B) Nature of oxide

(C) Combination with halogens (D) Reducing character

Q.12 In which of the following reactions does dihydrogen act as oxidising agent ?

(A) $Ca + H_2 \longrightarrow$ (B) $H_2 + O_2 \longrightarrow$ (C) $H_2 + F_2 \longrightarrow$ (D) $CuO + H_2 \longrightarrow$

Q.13 Which of the following is an nuclear isomer of hydrogen ?

(A) Ortho-H (B) Para-H (C) both (A) and (B) (D) None of these

Q.14 The correct order of reactivity among

I (atomic hydrogen); II (Dihydrogen) and III (Nascent hydrogen) is

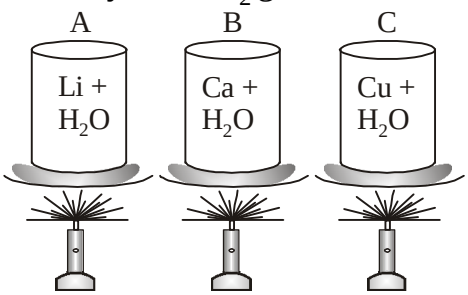
(A) I > II > III (B) I > III > II (C) II > III > I (D) III > II > I.

Q.15 Which combination cannot be used for the preparation of hydrogen gas in the laboratory ?

I. zinc/conc. H_2SO_4 ; II zinc/dil. HNO_3 III. zinc/dil. H_2SO_4

(A) I and II (B) I, II, III (C) III only (D) I and III

Q.16 By which reaction. best yield of H_2 gas forms :



(A) By C only (B) By A, B only (C) By A, B, C only (D) None of these

Q.17 H_2 gas can not be prepared by :

(A) Be + NaOH (B) Na + NaOH (C) Mg + NaOH (D) By (B & C) method

Q.18 H_2 gas is liberated at cathode and anode both by electrolysis of the following aq. solution except in :

(A) NaH (B) HCOONa (C) NaCl (D) LiH

Q.19 Under what conditions of termperature and pressure, the formation of molecular hydrogen from atomic hydrogen will be favoured most :

(A) High temperature and high pressure (B) Low temperature and low pressure

(C) High temperature and low pressure (D) Low temperature and high pressure

Q.20 Which set of properties has same value for D_2 & H_2

(I) Bond length (II) Bond energy (III) Boiling point

(A) Only I (B) Only I & II (C) Only II & III (D) Only II

Water

Q.21 When bismuth chloride is poured into a large volume of water the white precipitate produced is

(A) $Bi(OH)_3$ (B) Bi_2O_3 (C) BiOCl (D) Bi_2OCl_3

Q.22 Select correct order of boiling point

(A) $H_2O > D_2O$ (B) $H_2 > T_2 > D_2$

(C) $H_2O_2 > H_2O$ (D) $(CH_3)_2O > H_2O$

Q.23 Which of the following carbide gives methane gas on reaction with water?

(A) Be_2C (B) CaC_2 (C) Li_2C_2 (D) Mg_2C_3

Q.24 Gas that can not be collected over water is

(A) N_2 (B) O_2 (C) SO_2 (D) PH_3

Q.25 $A + H_2O \longrightarrow B + HCl$

$B + H_2O \longrightarrow C + HCl$

Compound (A), (B) and (C) will be respectively.

(A) PCl_5, $POCl_3$, H_3PO_3 (B) PCl_5, $POCl_3$, H_3PO_4

(C) $SOCl_2$, $POCl_3$, H_3PO_3 (D) PCl_3, $POCl_3$, H_3PO_4

Q.26 When borax is dissolved in water

(A) Only $B(OH)_3$ is formed (B) Only $B(OH)_4^-$ is formed

(C) Both $B(OH)_3$ and B_2O_3 are formed (D) Both $B(OH)_3$ and $[B(OH)_4]^-$ are formed

Q.27 Select correct statement about hydrolysis of BCl_3 and NCl_3

(A) NCl_3 is hydrolysed and gives HOCl but BCl_3 is not hydrolysed.

(B) Both NCl_3 and BCl_3 on hydrolysis gives HCl

(C) NCl_3 on hydrolysis gives HOCl but BCl_3 gives HCl.

(D) Both NCl_3 and BCl_3 on hydrolysis gives HOCl.

Q.28 Which of the following acid is not formed during the step wise hydrolysis of P_4O_{10}?

(A) Tetrameta phosphoric acid (B) Hypophosphoric acid

(C) Pyrophosphoric acid (D) Tetra polyphosphoric acid

Q.29 Anhydrous $AlCl_3$ is covalent however when it is dissolved in water hydrated ionic species are formed. This transformation is owing to :

(A) The trivalent state ofAl. (B) The large hydration energy of Al^{3+}

(C) The low hydration energy of Al^{3+} (D) The Polar nature of water

Q.30 In which of the following cases hydrolysis takes place through S_N2 and S_N1 mechanism respectively.

(A) P_4O_{10}, $SiCl_4$ (B) NCl_3, NF_3 (C) $SiCl_4$, SiF_4 (D) SF_4, TeF_6

Q.31 Which of the following metal carbides is a methanide carbide?

(A) CaC_2 (B) Mg_2C_3 (C) Al_4C_3 (D) BaC_2

Q.32 Which of the following carbides yields carbon containing compound having sp hybridisation on hydrolysis.

(A) Be_2C (B) Al_4C_3 (C) Mg_2C_3 (D) None of these

Q.33 What is the hydrolysis product of hypo phosphoric acid.

(A) H_2PO_3 ,$H_4P_2O_7$ (B) H_3PO_4 (C) H_3PO_3 (D) H_3PO_3 , H_3PO_4

Q.34 In the hydrolysis of ICl, the products are -

(A) HI + HCl (B) HI + HOCl (C) HCl + HOI (D) HOCl + HOI

Q.35 Which of the following compounds are the common product/s obtained in the hydrolysis of XeF_6 and XeF_4.

(A) XeO_2F_2 (B) HF (C) XeO_3 (D) Both (B) & (C)

Q.36 Select the compound in which HCl is **NOT** the product of Hydrolysis

(A) NCl_3 (B) PCl_3 (C) $AsCl_3$ (D) $BiCl_3$

Q.37 Nitrogen dioxide is dissolved in water to produce

(A) HNO_3 and HNO_2 (B) only HNO_3

(C) only HNO_2 (D) HNO_2 and N_2

Q.38 One mole of calcium phosphide on reaction with excess of water gives

(A) one mole of phosphine (B) two moles of phosphoric acid

(C) two moles of phosphine (D) one mole of phosphorus penta-oxide

Q.39 When NF_3 undergoes in hydrolysis at room temperature then product will be-

(A) HNO_2 (B) N_2O_3 (C) NO + NO_2 (D) None of these

Q.40 Which of the following molecule does not produce HCl as one of the hydrolysed product?

(A) NCl_3 (B) PCl_3 (C) $AsCl_3$ (D) $SbCl_3$

Q.41 Which of the following combination does not liberate NH_3 gas.

(A) Heating of NH_4ClO_4 (B) Heating of NH_4Cl

(C) $(NH_4)_2CO_3$ +NaOH (D) $Li_3N + H_2O$

Q.42 In which of following case the hybridisation of transition state in the hydrolysis reaction is sp^3d.

(A) SF_4 (B) SiF_4 (C) BF_3 (D) $BeCl_2$

Q.43 Which of the following is final hydrolysed product of P_4O_6.

(A) H_3PO_4 (B) H_3PO_3 (C) $H_4P_2O_7$ (D) None of these

Q.44 Hydrolysis of which of the following compound liberates acidic gas:

(A) Li_2NH (B) Al_2S_3 (C) Al_4C_3 (D) CaNCN

Q.45 Which halogen oxidizes water at room temperature but does not undergo disproportionation into it?
(A) F_2 (B) Cl_2 (C) Br_2 (D) I_2

Q.46 Which of the following compound liberates acidic gas during its hydrolysis.
(A) Ca_3P_2 (B) AlN (C) Al_2S_3 (D) CaH_2

Q.47 One of the hydrolysed product of the following compound does not react with silica of glass vessel
(A) BF_3 (B) ClF_5 (C) XeF_2 (D) SF_4

Q.48 Which of the following Xenon compound does not produce explosive XeO_3 on its complete hydrolysis:
(A) XeO_2F_2 (B) XeF_2 (C) XeF_4 (D) XeF_6

Q.49 In following reaction 'X' is

$$X \xrightarrow{\Delta} Y \xrightarrow{H_2O} X$$

(A) H_3PO_3 (B) H_3PO_4 (C) $HClO_2$ (D) $HClO_3$

Q.50 Which of the following hydrolysis product is not common in hydrolysis of XeF_2 and XeF_4 respectively?
(A) XeO_3 (B) HF (C) Xe (D) O_2

Q.51 CrO_3 dissolves in aqueous NaOH to give
(A) $Cr_2O_7^{2-}$ (B) CrO_4^{2-} (C) $Cr(OH)_3$ (D) $Cr(OH)_2$

Q.52 Density of H_2O is maximum at :
(A) 0°C (B) 100°C (C) –273°C (D) 4°C

Q.53 Which is true statement about H_2O :
(A) hardness can be removed by passing through ion exchenge resin
(B) its presence can be detected by anhydrous $CuSO_4$
(C) it is amphoprotic
(D) all are correct

Q.54 Which is true statement about D_2O and H_2O :
(A) D_2O has lower dielectric constant than H_2O
(B) NaCl is more soluble in D_2O than in H_2O
(C) both are correct
(D) none is correct

Q.55 The reactions of heavy water are slow. The reason is

(A) Heavy water is associated (B) Heavy water is dissociated

(C) Heavy water is of higher mass (D) Heavy water is of lower mass

Q.56 $4D_2O + 3Fe \xrightarrow{\text{Red hot}} FeO +$ gas. The gas produced in the above reaction is :

(A) O_2 (B) H_2 (C) D_2 (D) None

Q.57 Hard water when passed through ion exchange resin containing RCOOH group, becomes free from

(A) Cl^- (B) SO_4^{-2} (C) H_3O^+ (D) Ca^{+2}

Q.58 When zeolite is treated with hard water the sodium ion are exchange with –

(A) H^+ (B) Ca^{+2} (C) OH (D) SO_4^{2-}

Q.59 Permutit is a technical name given to :

(A) Aluminates of Ca and Na (B) Hydrated silicates of Al and Na

(C) Silicates of Ca and Na (D) Silicates of Ca and Mg

Q.60 Permanent hardness in water due to presence of :

(A) Ca^+, Mg^+ (B) $CaCl_2$, $MgCl_2$ (C) $CaCO_3$, $MgCO_3$ (D) All

Q.61 Temporary unstable hardness of water due to presence of :

(A) $CaCl_2$, $MgSO_4$ (B) Ca^{+2}, Mg^{+2}

(C) $K^{\oplus}$, $CaCO_3$ (D) $Ca(HCO_3)_2$, $Mg(HCO_3)_2$

Hydrogen Peroxide (H_2O_2)

Q.62 Acidified chromic acid + $H_2O_2 \xrightarrow{\text{Org. solvent}}$ X + Y, X and Y are

(blue colour)

(A) CrO_5 and H_2O (B) Cr_2O_3 and H_2O (C) CrO_2 and H_2O (D) CrO and H_2O

Q.63 $MnO_4^- \xrightarrow{(x)} Mn^{2+} \xrightarrow{(y)} Mn^{4+}$

$MnO_4^- \xrightarrow{(z)} MnO_2$

For above reaction x, y, z are respectively

(A) H_2O_2 / H^+, H_2O_2 / OH^-, H_2O_2 / OH^- (B) H_2O_2 / OH^-, H_2O_2 / OH^-, H_2O_2 / H^+

(C) H_2O_2 / OH^-, H_2O_2 / H^+, H_2O_2 / OH^- (D) H_2O_2 / H^+, H_2O_2 / H^+, H_2O_2 / OH^-

Q.64 H_2O_2 can be obtained when following reacts with H_2SO_4 except with :
(A) PbO_2 (B) BaO_2 (C) Na_2O_2 (D) KO_2

Q.65 A mixture of hydrazine and H_2O_2 is :
(A) antiseptic (B) rocket fuel
(C) fire extinguisher (D) insecticide

Q.66 In the reaction $2H_2O_2 \rightarrow 2H_2O + O_2$ oxidation state of oxygen changes as :
(A) Only – 1 to –2 (B) Only – 1 to zero (C) Both of the above (D) –1 to –3

Q.67 Hydrogen peroxides cannot be concentrated easily because
(A) It is highly volatile in nature (B) It is not dissolve in H_2O
(C) It decompose at its boiling point (D) It has a very high b.p.

Q.68 An aqueous solution of H_2O_2
(A) Alkaline (B) Neutral (C) Strongly acidic (D) weekly acidic

Q.69 Bleaching action of H_2O_2 is due to its :
(A) Oxidising nature (B) Reducing nature (C) Acidic nature (D) Thermal instability

Q.70 Correct order of BP is :-
(A) $H_2 > H_2O_2 > D_2O > H_2O > D_2$ (B) $H_2O_2 > H_2 > D_2O > H_2O > D_2$
(C) $H_2O_2 > D_2O > H_2O > D_2 > H_2$ (D) $H_2O_2 > D_2O > H_2O > H_2 > D_2$

s-BLOCK

Alkali

Q.71 Na and Li are placed in dry air, we get
(A) NaOH, Na_2O, Li_2O (B) Na_2O, Li_2O
(C) Na_2O, Li_2O, Li_3N, NH_3 (D) Na_2O, Li_3N, Li_2O

Q.72 Which of the following alkali metal chloride exist in hydrated form.
(A) LiCl (B) CsCl (C) NaCl (D)KCl

Q.73 Which one of the following electrolyte is used in Down's process used for extracting sodium metal?
(A) NaCl (B) NaCl + $CaCl_2$ + KF
(C) NaOH + KCl + KF (D) NaCl + NaOH

Q.74 Which one of the following reaction is not associated with the Solvay's process for manufacturing of sodium carbonate?

(A) $NH_3 + H_2O + CO_2 \longrightarrow NH_4HCO_3$

(B) $2NaOH + CO_2 \longrightarrow Na_2CO_3 + H_2O$

(C) $2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$

(D) $NaCl + NH_4HCO_3 \longrightarrow NaHCO_3 + NH_4Cl$

Q.75 Which of the following statement about LiCl and NaCl is wrong?

(A) LiCl has lower melting point than NaCl.

(B) LiCl is more soluble in organic solvents than NaCl

(C) LiCl form hydrate $LiCl.2H_2O$ but NaCl does not

(D) Fused LiCl would be more conducting than fused NaCl.

Q.76 The least soluble compounds among fluorides and iodides of alkali metals are respectively.

(A) LiF and CsI (B) CsF and LiI (C) LiF and LiI (D) CsF and CsI

Q.77 On dissolving moderate amount of sodium metal in liquid ammonia, which of following does not occur:

(A) Blue coloured Solution is obtained

(B) Na^+ ions are formed in solution

(C) Liquid ammonia becomes good conductor of electricity

(D) The liquid ammonia remains diamagnetic

Q.78 In synthesis of sodium carbonate by Solvay's process, the recovery of ammonia is done by treating NH_4Cl with $Ca(OH)_2$. The by-product obtained in this process is

(A) $CaCl_2$ (B) NaCl (C) NaOH (D) $NaHCO_3$

Q.79 Which among the following is maximum thermal stable compound ?

(A) LiH (B) NaH (C) KH (D) CsH

Q.80 Which one of the following statement is true for all the alkali metals?

(A) Their nitrates decompose on heating to give NO_2 and O_2 gas

(B) Their carbonates decompose on heating to give CO_2 and normal oxide

(C) Oxide (M_2O) & peroxide (M_2O_2) of alkali metals are diamagnetic

(D) All alkali metals bicarbonates exist in solid state

Q.81 For reaction : $NH_3(liq) + Na \xrightarrow{warm} P + Q\uparrow$

Incorrect statement is :

(A) Hydrolysis of 'P' produces NH_3 gas.

(B) Gas 'Q' reacts with heated alkali metals.

(C) Anionic part of 'P' is weaker base than NH_3.

(D) Gas Q is also produced, when Li metal is heated with NH_3 gas.

Q.82 Incorrect statement for s-block metal solution in liquid NH_3.

(A) Highly pure dilute solution of Na and Cs has same colour.

(B) Solution of Be and Mg in liquid NH_3 is paramagnetic.

(C) On adding impurity of transition metal cation H_2 gas is released.

(D) Solution of alkali metal in liquid NH_3 is powerful and selective reducing agents.

Q.83 Which group elements exhibit regular increment of melting point as atomic number decreases

(A) alkali metals (B) alkaline earth metals

(C) boron family (D) carbon family

Q.84 In which of the following combination product is paramagnetic species.

(A) $Na(s) + NH_3(l)$ (B) Hot $Na(s) + NH_3(g)$

(C) Zn + excess NaOH (aq.) (D) $AlCl_3$ (aq.) + excess NaOH

Q.85 Correct order of monoxide formation tendency among alkali metal is

(A) Li > Na > K > Rb > Cs (B) Li < Na <K < Rb < Cs

(C) Li > Na > K < Rb < Cs (D) None

Q.86 Which of the following statement about the carbonates of alkali metals is true :

(A) Except Li_2CO_3 all alkali metal carbonate are insoluble in water.

(B) Thermal stability decreases as we move down in a group.

(C) The solubility in water increases down the group.

(D) Na_2CO_3 cant be prepared by solvey process.

Q.87 Which salt is NOT deliquescent

(A) NaCl (B) $CaCl_2$ (C) $MgCl_2$ (D) None of these

Q.88 Which of following statement is not true about solution of alkali metal in liquid NH_3 ?

(A) Blue colour is due to ammoniated electrons.

(B) Blue colour changes to bronze on dilution due to formation of metal ion clusters.

(C) Paramagnetic nature of solution decreases due to electron-electron pairing with increase in concentration of alkali metal.

(D) On warming blue colour becomes colourless due to formation of metal amide and H_2 gas.

Q.89 During hydration of alkali metal cations the signs of ΔG , ΔH and ΔS respectively are:

(A) –ve, –ve, –ve (B) –ve, –ve, +ve (C) +ve, +ve, +ve (D) –ve, +ve, –ve

Q.90 Sodium Metal + NH_3(liq) $\xrightarrow{\text{warm}}$ P + Q (g)

Incorrect statement for P & Q is

(A) Q is hydrogen gas

(B) P is Na_2NH

(C) Hydrolysis of P produces NH_3 gas

(D) Anionic part of P acts as lewis base

Q.91 $X + H_2O \longrightarrow NaOH$;

$X + O_2 \xrightarrow{400°C} Y \xrightarrow[25°C]{H_2O} NaOH + O_2$

Which of the following statement is false regarding Y.

(A) Y turns green chromium salt solution to yellow

(B) Y can be used to purify the air in submarines.

(C) Y can be used as an reducing agent

(D) Y is also named as oxone

Q.92 Which of the following is not common property of all alkali metals

(A) Exhibit characteristic flame colour (B) Basic nature of oxide

(C) Reaction with liquid NH_3 (D) Formation of hydrated chloride

Q.93 Which of the following bicarbonates does not exist in solid state?

(A) $NaHCO_3$ (B) $KHCO_3$ (C) $RbHCO_3$ (D) $Ca(HCO_3)_2$

Q.94 The principle products obtained on heating iodine with concentrated caustic soda solution:

(A) $NaIO_3$ + NaI (B) NaIO + $NaIO_3$ (C) NaIO + NaI (D) $NaIO_4$ + NaI

Q.95 The correct statement is

(A) $Na_2CO_3.10H_2O$ is known as soda ash (B) $Na_2CO_3.H_2O$ is known as soda ash

(C) Na_2CO_3 is known as soda ash (D) $NaHCO_3$ is known as soda ash

Q.96 The alkali metals which form normal oxide, peroxide as well as super oxides are

(A) Na, Li (B) K, Li (C) Li, Cs (D) K, Rb

Q.97 The pair of compounds, which cannot exist together in a solution is

(A) $NaHCO_3$ and NaOH (B) Na_2CO_3 and NaOH

(C) $NaHCO_3$ and Na_2CO_3 (D) $NaHCO_3$ and H_2O

Q.98 Solution of sodium metal in liquid ammonia is a strong reducing agent due to presence of

(A) solvated sodium ions (B) solvated hydrogen ions

(C) sodium atoms or sodium hydroxide (D) solvated electrons

Q.99 The order of solubility of lithium halides in non-polar solvents follows the order

(A) LiI > LiBr > LiCl > LiF (B) LiF > LiI > LiBr > LiCl

(C) LiCl > LiF > LiI > LiBr (D) LiBr > LiCl > LiF > LiI

Q.100 Fire extinguishers contain

(A) conc. H_2SO_4 solution (B) H_2SO_4 and $NaHCO_3$ solutions

(C) $NaHCO_3$ solution (D) $CaCO_3$ solution

Q.101 $Na + Al_2O_3 \xrightarrow{\text{High temperature}+O_2} X \xrightarrow{CO_2 \text{ in water}} Y$; compound Y is :

(A) $NaAlO_2$ (B) $NaHCO_3$ (C) Na_2CO_3 (D) Na_2O_2

Q.102 When K_2O is added to water, the solution becomes basic in nature because it contains a significant concentration of

(A) K^+ (B) O^{2-} (C) OH^- (D) O_2^{2-}

Q.103 The non-metal which does not react with water but reacts with alkali

(A) Boron (B) Bromine (C) P_4 (D) Fluorine

Q.104 An aqueous solution of an halogen salt of potassium reacts with same halogen X_2 to give a brown coloured solution, in which halogen exists as X_3^- ion, then halogen X is

(A) chlorine (B) bromine (C) iodine (D) fluorine

Q.105 The aqueous solutions of lithium salts are poor conductor of electricity rather than other alkali metals because of

(A) high ionisation energy.

(B) high electronegativity.

(C) lower ability of Li^+ ions to polarize water molecules.

(D) higher degree of hydration of Li^+ ions.

Q.106 Sodium metal is highly reactive and cannot be stored under

(A) toluene (B) kerosene oil (C) alcohol (D) benzene

Q.107 The compound formed on heating sodium metal in a current of dry ammonia gas, is

(A) sodium imide (B) sodium nitrite (C) sodium amide (D) sodium azide

Q.108 Crown ethers and cryptands form

(A) complexes with alkali metals

(B) salts of alkali metals

(C) hydroxides of alkali metals used for inorganic quantitative analysis

(D) organic salts of alkali metals

Q.109 Which of the following is not a property of lithium?

(A) Hydrated lithium ion is the largest among alkali metals

(B) The melting and boiling points of lithium are comparatively higher than other alkali metals

(C) Lithium is softer than that of other alkali metals

(D) The ionisation potential and electronegativity of lithium are higher than those of other alkali metals

Q.110 The commercial method of preparation of potassium by reduction of molten KCl with metallic sodium at 850°C is based on the fact that

(A) potassium is solid and sodium distills off at 850°C

(B) potassium being more volatile and distills off thus shifting the reaction forward

(C) sodium is more reactive than potassium at 850 °C

(D) sodium has less affinity to chloride ions in the presence of potassium ion

Q.111 Which of the following groups of elements have chemical properties that are most similar

(A) Na, K, Ca (B) Mg, Sr, Ba (C) Be, Al, Ca (D) Be, Ra, Cs

Q.112 Which of the alkali metal is having least melting point?

(A) Na (B) K (C) Rb (D)Cs

Q.113 Sodium bicarbonate is less soluble in water than potassium bicarbonate, it is due to

(A) low molecular weight of $NaHCO_3$ as compared to $KHCO_3$

(B) Due to hydrogen bonding, sodium bicarbonate contains a dimeric anionic structure while in potassium bicarbonate, anions form an infinite chain

(C) Due to hydrogen bonding, potassium bicarbonate contains a dimeric anionic structure while in sodium bicarbonate, anions form an infinite chain.

(D) $KHCO_3$ is thermally less stable than $NaHCO_3$.

Q.114 The **correct** representation of 'X' and 'Y' will be.

$M + (x + y)NH_3 \rightarrow X + Y$

(M = Na, K)

(A) $X = [M(NH_2)_x]^+$, $Y = [e(NH_2)_y]^-$

(B) $X = [M_2(NH_3)_x]^+$, $Y = [e(NH_3)_y]^-$

(C) $X = [M_x(NH_3)]^+$, $T = [e_y(NH_3)]^-$

(D) $X = [M(NH_3)_x]^+$, $Y = [e(NH_3)_y]^-$

Q.115 Correct order of density is –

(A) Li > Na (B) K > Na (C) Mg > Ca (D) Cs < Rb

Q.116 Weak reductant among alkali metal is –

(A) Li (B) Na (C) K (D) Cs

Q.117 The metal used in photoelectric cell is –

(A) Na (B) K (C) Mg (D) Ca

Q.118 Lithium chloride is highly soluble in –

(A) C_6H_6 (B) H_2O (C) D_2O (D) All

Q.119 Alkali metals salts are –

(A) Diamagnetic and coloured (B) Diamagnetic and colourless

(C) Paramagnetic and coloured (D) Paramagnetic and colourless

Q.120 Which of the following halides has the highest melting point –

(A) NaCl (B) KCl (C) NaBr (D) NaF

Q.121 On heating sodium metal in the current of dry ammonia leads to the formation of which gas–

(A) $NaNH_2$ (B) NaN_3 (C) NH_3 (D) H_2

Q.122 Sodium reacts with water more vigorously than lithium because it –

(A) Has higher atomic weight (B) Is more electronegative

(C) Is more electropositve (D) Is a metal

Q.123 Dissolving metallic zinc in NaOH produces

(A) $Zn(OH)_2$ (B) Na_2ZnO_2 (C) ZnO (D) $Zn(OH)_2 + Na_2ZnO_2$

Q.124 $NaHCO_3$ can be used to –

(A) Decrease acidity of stomach (B) Prepare CO_2 used as fire extinguisher

(C) Produce sponge in bread (D) All of these

Q.125 In K, Rb and Cs, the decreasing order of reducing power in gaseous state is:-

(A) K > Cs > Rb (B) Cs > Rb > K (C) K < Cs < Rb (D) Rb > Cs > K

Q.126 On addition of metal ions, colour of liquid NH_3 solutions converts into bronze, the reason is :-

(A) Ammoniated electrones (B) Metal amide formation

(C) Liberation of NH_3 gas (D) Cluster formation of metal ions

Q.127 Nitrate of an element of alkali metal group, decomposes on heating, gives brown colour gas. Nitrate and brown colour gas are respectively:-

(A) $NaNO_3$ and NO (B) $LiNO_3$ and NO_2 (C) KNO_3 and NH_3 (D) $NaNO_3$ and NO_2

Q.128 If NaOH is added to an aqueous solution of Zn^{+2} ions, a white precipitate appears and on adding excess NaOH, the precipitate dissolves. In this solution zinc exists in the

(A) Cationic part (B) Anionic part

(C) Both in cationic and anionic part (D) There is no zinc left in the solution

Q.129 Potassium is kept :-

(A) Under cold water (B) In Ammonia (C) In Alcohol (D) In Kerosene

Alkaline Earth Metals

Q.130 A metal X on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour Y is:

(A) $Mg(NO_3)_2$ (B) Mg_3N_2 (C) NH_3 (D) MgO

Q.131 Anhydrous $MgCl_2$ can be prepared by :

(A) heating $MgCl_2.6H_2O$(s)

(B) heating $MgCl_2.6H_2O$(s) in dry HCl atmosphere at 175°C.

(C) heating $KCl.MgCl_2.6H_2O$

(D) All of these.

Q.132 A metal is brunt in air and the ash on moistening smells of ammonia. The metal is

(A) Na (B) Fe (C) Mg (D)Al

Q.133 All decomposition product(s) of which salt can react with NaOH solution

(A) $BeCO_3$ (B) $MgCO_3$ (C) $CaCO_3$ (D) $BaCO_3$

Q.134 Which of the following on heating produces CO_2 as the only gaseous product?

(A) BeC_2O_4 (B) $(CH_3COO)_2Ca$ (C) HCOONa (D) $Ag_2C_2O_4$

Q.135 Which of the following metal on burning in moist air does not give smell of ammonia

(A) Mg (B) Ca (C) K (D) Li

Q.136 The 'milk of magnesia' used as an antacid is chemically

(A) $Mg(OH)_2$ (B) MgO (C) $MgCl_2$ (D) MgO + $MgCl_2$

Q.137 EDTA is used in the estimation of

(A) Mg^{2+} ions (B) Ca^{2+} ions

(C) both Ca^{2+} and Mg^{2+} ions (D) Mg^{2+} ions but not Ca^{2+} ions

Q.138 The complex formation tendency of alkaline earth metals decreases down the group because

(A) atomic size increases

(B) availability of empty d and f-orbitals increases

(C) positive charge to volume ratio of cation increases

(D) all the above

Q.139 The alkaline earth metals, which do not impart any colour to Bunsen flame are

(A) Be and Mg (B) Mg and Ca (C) Be and Ca (D) Be and Ba

Q.140 $Y \xleftarrow{\Delta,205°C} CaSO_4 \cdot 2H_2O \xrightarrow{\Delta,120°C} X$, X and Y are respectively.

(A) plaster of paris, dead burnt plaster (B) dead burnt plaster, plaster of paris

(C) CaO and plaster of paris (D) plaster of paris, mixture of gases

Q.141 A metal M forms water soluble sulphate, and water insoluble hydroxide $M(OH)_2$, Its oxide MO is amphoteric, hard and has high melting point. The alkaline earth metal M must be

(A) Mg (B) Be (C) Ca (D) Sr

Q.142 (Milky cloud) $C \xleftarrow{CO_2} A + Na_2CO_3 \longrightarrow B + C$

The chemical formulae of A and B are

(A) NaOH and $Ca(OH)_2$ (B) $Ca(OH)_2$ and NaOH

(C) NaOH and CaO (D) $Ca(OH)_2$ and $CaCO_3$

Q.143 Which of the following metal is used in flash bulbs?

(A) Be (B) Mg (C) Ca (D) Ba

Q.144 Which of the property increases to bottom in a group?

(A) Solubility and thermal stability of alkaline earth metal sulphates.

(B) Solubility and covalent character of alkali metal fluoride

(C) Thermal stability and ionic character of alkali metal carbonates

(D) Solubility and ionic character of alkaline earth metal carbonates.

Q.145 If X and Y are the second ionisation potentials of alkali and alkaline earth metals of same period, then

(A) X > Y (B) X < Y (C) X = Y (D) X << Y

Q.146 Suspension of slaked lime in water is known as

(A) lime water (B) quick lime

(C) milk of lime (D) aqueous solution of slaked lime

Q.147 White heavy precipitates are formed when $BaCl_2$ is added to a clear solution of compound A. Precipitates are insoluble in dilute HCl. Then, the compound A is

(A) a bicarbonate (B) a carbonate (C) a sulphate (D) a chloride

Q.148 $X + C + Cl_2 \xrightarrow[\text{of about 1000K}]{\text{High temperature}} Y + CO$; $Y + 2H_2O \rightarrow Z + 2HCl$

Compound 'Y' is found in polymeric chain structure, then 'Y' must be

(A) BeO (B) $BeCl_2$ (C) BeH_2 (D) $AlCl_3$

Q.149 $BeCl_2 + LiAlH_4 \longrightarrow X + LiCl + AlCl_3$

(A) X is LiH (B) X is BeH_2 (C) X is $BeCl_2 \cdot 2H_2O$ (D) None

Q.150 A pair of substances which give all same products on reaction with water is :

(A) Mg and MgO (B) Sr and SrO (C) Ca and CaH_2 (D) Be and BeO

Q.151 The incorrect statement(s) is/are

(A) Mg^{2+} does not form complexes.

(B) Be^{2+} can form complexes due to a very small atomic size.

(C) the first ionisation potential of Be is higher than that of Mg.

(D) Mg forms an alkaline hydroxide while Be forms amphoteric oxides.

Q.152 $MgBr_2$ and MgI_2 are soluble in acetone because of

(A) Their ionic nature (B) Their coordinate nature

(C) Their metallic nature (D) Their covalent nature

Q.153 Which of the following is not the characteristic of Barium? .

(A) It emits electrons on exposure to light

(B) It is a silvery white metal

(C) It forms $Ba(NO)_2$ which is used in preparation of green fire

(D) Its ionization potential is lower than radium.

Q.154 Which is correct statement:

(1) $CaSO_4$ is known dead burnt plaster

(2) Gypsum contains more percentage of calcium than plaster of paris

(3) Plaster of paris is obtained by heating Gypsum

(4) Gypsum is obtained by hydration of plaster of paris

Correct code is :

(A) 1,2,3,4 (B) 1,3,4 (C) Only 2 (D) 2, 4

Q.155 The metal X is prepared by electrolysis of fused chloride. It reacts with hydrogen to form a colourless solid from which hydrogen is released on treatment with water. The metal is

(A) Al (B) Ca (C) Cu (D) Zn

Q.156 Which is Incorrect statement:

(A) Both LiCl and $MgCl_2$ are deliquiscent in nature.

(B) Both Li_3N and Mg_3N_2 on hydrolysis give ammonia gas.

(C) Both $LiHCO_3$ and $Mg(HCO_3)_2$ do not exist in solid state

(D) Both Li_2CO_3 and $MgCO_3$ are thermally stable

Q.157 The element which has least tendency to form nitride is

(A) Li (B) Mg (C) Al (D) K

Q.158 Slaked lime and quick lime are respectively

(A) $Ca(OH)_2(s)$, $CaO(s)$

(B) $Ca(OH)_2(s)$, aqueous suspension of $Ca(OH)_2$

(C) Aqueous suspension of $Ca(OH)_2$, aqueous solution of $Ca(OH)_2$

(D) $CaO(s)$, aqueous suspension of $Ca(OH)_2$

Q.159 Which of the following categories of salts of alkali and alkaline earth metals show same solubility trend in water.

(i) Carbonates (ii) Nitrates (iii) Hydroxides (iv) Chlorides

(A) (i) and (ii) (B) (ii) and (iv) (C) (ii) and (iii) (D) Only (ii)

Q.160 Which of them is pair of most insoluble white compound and most insoluble coloured compound among $BaSO_4$, $SrSO_4$, $BaCrO_4$, $SrCrO_4$

(A) $BaSO_4$,$BaCrO_4$ (B) $BaSO_4$,$SrCrO_4$ (C) $SrSO_4$, $BaCrO_4$ (D) $SrSO_4$, $SrCrO_4$

Q.161 Incorrect statement(s) for reaction :

$$Ca(OH)_2 + Cl_2(g) \xrightarrow{40°C} \text{Products.}$$

is / are:

(A) Chlorine undergoes disproportionation. (B) Bleaching powder is obtained as product.

(C) $Ca(OH)_2$ is called milk of lime. (D) Oxidation state of oxygen changes.

Q.162 Highly pure dilute ammonia solution of which of the following metal(s) is paramagnetic and blue colour.

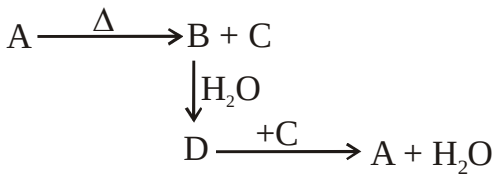
(A) Be (B) Ca (C) Mg (D) All

Q.163 Which of the following alkaline earth metal chloride does not contain water of crystallization in solid state :

(A) $BeCl_2$ (B) $CaCl_2$ (C) $SrCl_2$ (D) $BaCl_2$

Q.164 Magnesium metal burns in air to give :

(A) MgO (B) Mg_3N_2 (C)$MgCO_3$ (D) MgO and Mg_3N_2both

Q.165 

Identify A for above reaction.

(A) CaO (B) $Ca(OH)_2$ (C) $CaCO_3$ (D) $Ca(HCO_3)_2$

Q.166 Choose incorrect statement

(A) $BeCO_3$ is kept in atmosphere of CO_2 since it is least thermally stable.

(B) Be dissolves in alkali forming $[Be(OH)_4]^{2-}$.

(C) BeF_2 forms complex ion with NaF in which Be goes with cation.

(D) BeF_2 forms complex ion with NaF in which Be goes with anion.

Q.167 By adding gypsum to cement:

(A) Setting time of cement becomes less (B) Setting time of cement increases

(C) Colour of cement becomes light (D) Shining surface is obtained

Q.168 Which statement is **correct** regarding the diagonal relationship between Be and Al?

(I) Both carbides on hydrolysis produces CH_4 gas

(II) Both Be and Al oxides are amphoteric in nature.

(III) In vapour state chlorides of both exist as chloro-bridge dimer having (3c – 4e) bonds

(IV) Both Be and Al nitrides on hydrolysis give NH_3 gas.

(A) I, II are correct (B) I, II and IV are correct

(C) I, II, III, IV are correct (D) Only III is correct

Q.169 Which is having highest m.p. –

(A) Be (B) Mg (C) Ca (D) Sr

Q.170 Which of the following element have maximum tendency to form complex compound –

(A) Be (B) Ba (C) Ca (D) Mg

Q.171 Which one of the following is most soluble in ether

(A) $BeCl_2$ (B) $CaCl_2$ (C) $SrCl_2$ (D) None of these

Q.172 The normal dehydrating agent, which used in a laboratories:-

(A) $MgCO_3$ (B) CaF_2 (C) MgF_2 (D) $CaCl_2$

Q.173 Which statement will be true for solution, when Ba is dissolved in ammonia:-

(A) Solution becomes blue
(B) Solution becomes good conductor
(C) Solution remains colourless
(D) Both (A) and (B) are correct

Q.174 When chlorine is passed slow over dry slaked lime $Ca(OH)_2$ at room temperature, the product not obtained is

(A) $CaCl_2$ (B) $CaOCl_2$ (C) $Ca(ClO_2)_2$ (D) $Ca(OCl)_2$

Q.175 Identify the correct statement -

(A) Gypsum contains a lower percentage of Ca than plaster of paris
(B) Gypsum is obtained by heating plaster of paris
(C) Plaster of paris can be obtained by hydration of gypsum
(D) Plaster of paris is obtained by partial oxidation of gypsum

Q.176 Alkali metals forms following compound

(A) All form amide, MNH_2
(B) All form ionic salt like hydride MH
(C) All form superoxide like KO_2
(D) All form nitrides

Q.177 $Na_2[Be(OH)_4]$ is formed when :

(A) BeO reacts with NaOH solution
(B) Be reacts with NaOH solution
(C) both correct
(D) none is correct

Q.178 Which of the following hydride is covalent and polymeric :-

(A) CaH_2 (B) BeH_2 (C) NaH (D) BaH_2

EXERCISE-2

[MULTIPLE CORRECT CHOICE TYPE]

Q.1 **Correct** order(s) is/are

(A) Melting point: $H_2O < D_2O$ (B) Vapour pressure at 25°C: $H_2O > D_2O$

(C) Dielectric constant: $H_2O < D_2O$ (D) Thermal stability: $H_2O < D_2O$

Q.2 Which of the following species is/are **not** liberating oxygen gas on reaction with water at 25°C.

(A) Na_2O_2 (B) Cl_2 (C) P_4 (D) KO_2

Q.3 Select the **correct** order of property mentioned is brackets :

(A) $Li_2CO_3 < Na_2CO_3 < K_2CO_3$ (Solubility)

(B) $BeSO_4 < MgSO_4 < CaSO_4$ (Thermal stability)

(C) Li < Na < K < Rb < Cs (Reducing property in aquous medium)

(D) LiOH < NaOH < KOH < RbOH < CsOH (Basic strength)

Q.4 **Correct** statement(s) about sodium carbonate is / are :

(A) Crystalline $Na_2CO_3 \cdot 10H_2O$ is called washing soda

(B) Crystalline $Na_2CO_3 \cdot H_2O$ is called soda ash

(C) NaOH can be prepared by its reaction with milk of lime

(D) It is used in water softening and laundering

Q.5 Which products are obtained on electrolysis of Brine ?

(A) H_2 (B) Cl_2 (C) NaOH (D) O_2

Q.6 **Correct** statement(s) for solution of potassium in liquid ammonia is/are :

(A) dilute solution shows blue colour in presence of impurity

(B) exhibits paramagnetic character at all concentration

(C) produces metal amide on warming

(D) Blue colour fades on adding transion metal cation

Q.7 Which of the following are common products of Hydrolysis of Na_2O_2 and KO_2 at 0°C ?

(A) OH^- (aq) (B) H_2O_2 (C) O_2 (D) All

Q.8 Select **correct** set of species which can't react with water but react with NaOH

(A) NO_2 (B) P_4 (C) Al (D) I_2

Q.9 Which of the following compounds is/are consumed in solvay process of preperation of $NaHCO_3$?
(A) NH_3 (B) H_2O (C) CO_2 (D) NaCl

Q.10 The compounds formed upon cumbustion of Na-metal in excess dry air is/are
(A) Na_2O_2 (B) Na_2O (C) NaO_2 (D) NaOH

Q.11 The golden yellow colour associated with NaCl to Bunsen flame can be explained on the basis of
(A) low ionisation potential of sodium ion (B) emission spectrum
(C) photosensitivity of sodium. (D) sublimation of metallic sodium of yellow vapours

Q.12 The **correct** statement is/are :
(A) $BeCl_2$ is a covalent compound
(B) Be_2Cl_4 is an electron deficient molecule
(C) Co-ordination no. of Be in $BeCl_2$(s) is equal to four
(D) the hybrid state of Be in $BeCl_2$(s) is sp^2

Q.13 KO_2 finds use in oxygen cylinders used for space and submarines. The fact(s) related to such use of KO_2 is/are -
(A) it produces O_2 (B) it produces O_3
(C) it absorbs CO_2 (D) it absorbs both CO and CO_2

Q.14 Hydrogen gas is not evolved by :
(A) Mg + NH_3(liq.) (B) $B_2H_6 + H_2O$ (C) $NaNH_2 + H_2O$ (D) $Be + H_2O$

Q.15 Which of the following will not give any colour to flame?
(A) Be (B) Mg (C) Na (D) Li

Q.16 Which of the following compounds are paramagnetic in nature?
(A) KO_2 (B) K_2O_2 (C) Na_2O_2 (D) RbO_2

Q.17 H_2O_2 can act as reductant with :
(A) Acidified $KMnO_4$ (B) Ag_2O (C) H_2S gas (D) O_3

Q.18 The hydration energy of Mg^{2+} is
(A) more than that of Ca^{2+} ion (B) more than that of Na^+ ion
(C) more than that of Al^{3+} ion (D) more than that of Be^{2+} ion

Q.19 Highly pure dilute solution of sodium in liquid ammonia
(A) shows blue colouration due to solvated electrons.
(B) shows electrical conductivity due to both solvated electrons as well as Solvated sodium ions.
(C) shows red colouration due to solvated electrons but a bad conductor of electricity.
(D) produces hydrogen gas.

Q.20 Which of the following combination(s) of reactants produce hydrogen gas.
(A) $B_2H_6 + H_2O$ (B) $CO(g) + H_2O(g)$ (C) Fe + NaOH (D) Sn + NaOH

Q.21 The compound(s) which have –O–O– bond(s) is/are
(A) BaO_2 (B) Na_2O_2 (C) CrO_5 (D) Fe_2O_3

Q.22 Which of the following statement(s) for H_2O_2, is/are **correct** ?
(A) In pure state H_2O_2 is very pale blue or almost colourless liquid
(B) It is concentrated by distillation under reduced pressure
(C) In solid state dihedral angle of H_2O_2 molecule is different from its gaseous state
(D) Its boiling point is determined by extrapolation

Q.23 Which of the following substance(s) is/are used in laboratory for drying purposes?
(A) Anhydrous P_2O_5 (B) $CaCl_2 \cdot 6H_2O$
(C) Anhydrous $CaCl_2$ (D) Silica gel

Q.24 Incorrect statement(s) about use of polyphosphates as water softening agents is/are
(A) They form soluble complexes with anionic species
(B) They precipitate anionic species
(C) They form soluble complexes with cationic species
(D) They precipitate cationic species

Q.25 When Zeolite is treated with hard water, the sodium ions are exchanged with which of the following ion(s)?
(A) $Li^+(aq.)$ (B) $Mg^{2+}(aq.)$ (C) $Ca^{2+}(aq.)$ (D) $K^+(aq.)$

Q.26 Select correct order(s)
(A) Temperature of maximum density : $H_2O < D_2O$
(B) Boiling Point : $1° > 2° > 3°$ for isomeric amines.
(C) Ionization constant $[H^+][OH^-]$: $H_2O > D_2O$
(D) Vapour pressure at R.T. : $NH_3 < HF < H_2O < H_2O_2$

Q.27 Which of the following hydrids are ionic

(A) CaH_2 (B) BaH_2 (C) SrH_2 (D) BeH_2

Q.28 Which of the following statement is/are true for H_2

(A) It is lighter than air and soluble in water

(B) H-H bond dissociation enthalpy is the highest for a single bond between two atoms of any element

(C) It is used in fuel cells

(D) It can reduce heavy metal oxides into their respective metals

Q.29 Which of the following pair of compound gives different volatile product when heated seperately:

(A) Na_2CO_3 and $CaCO_3$ (B) $NaHCO_3$, $CsHCO_3$

(C) Na_2O_2 , BaO_2 (D) $Na_2SO_4 \cdot 10H_2O$ and $CuSO_4 \cdot 5H_2O$

Q.30 Which of the following statements are false?

(A) $BeCl_2$ can exist as linear molecule in the vapour state but it is polymeric in the solid state

(B) Calcium hydride is called hydrolith.

(C) Carbides of both Be and Ca react with water to form acetylene.

(D) Oxides of both Be and Ca are amphoteric.

Q.31 H_2O_2 can be prepared by

(A) Auto-oxidation of 2-ethylanthraquinol (B) $BaO_2 + H_3PO_4$

(C) Hydrolysis of peroxodisulphates (D) Hydrolysis of superoxides

Q.32 Which of the following are ionic carbides?

(A) CaC_2 (B) Al_4C_3 (C) Fe_3C (D) Be_2C

Q.33 The **correct** statement is -

(A) Be^{2+} cation has largest hydration enthalpy among the alkaline earth metals.

(B) The second ionisation enthalpies of the alkaline earth metals are smaller than those of the corresponding alkali metals.

(C) Li is most reducing agent among all the metals.

(D) Be does not impart any colour to the flame.

Q.34 In which of the following combination of reactants H_2O_2 acts as oxidizing agent

(A) $HOCl + H_2O_2$ (B) $I_2 + H_2O_2 + OH^-(aq)$

(C) $Fe^{2+}(aq) + H_2O_2$ (D) $Mn^{2+}(aq) + H_2O_2 + NH_4OH$

Q.35 Which of the following combination of reactants produce Hydrogen gas.

(A) $CaH_2 + H_2O \xrightarrow{RT}$ (B) $Na + NH_3(liquid) \xrightarrow{Warm}$

(C) $Be + H_2O \xrightarrow{RT}$ (D) $Zn + NaOH \xrightarrow{RT}$

Q.36 Which of the following reagents are used to remove hardness present in water either temporary or permanent.

(A) $Ca(OH)_2$ (B) Sodium zeolite (C) Na_2CO_3 (D) $MgCO_3$

Q.37 Sodium metal reacts with

(A) Phenol (B) Water

(C) $HC \equiv CH$ (D) Wax

Q.38 Na_2CO_3 is prepared by Solvay process but K_2CO_3 can not be prepared by the same process because

(A) K_2CO_3 is highly water soluble (B) $KHCO_3$ is highly water soluble.

(C) $KHCO_3$ is sparingly water soluble. (D) $KHCO_3$ never exists in solid state.

Q.39 Select correct order of given property

(A) $BeCl_2 < MgCl_2 < CaCl_2$ (Covalent character)

(B) $CaSO_4 < SrSO_4 < BaSO_4$ (Order of solubility)

(C) $BeO < MgO < CaO$ (Basic nature)

(D) $BeCO_3 < MgCO_3 < SrCO_3 < BaCO_3$(Order of thermal stability)

Q.40 Which metal(s) gives blue colour when react with liquid ammonia

(A) Na (B) Be (C) Mg (D) Li

Q.41 Which of the following metal(s) does/do not impart characteristic colour to flame:

(A) Li (B) Sr (C) Be (D) Mg

Q.42 Na_2SO_4 is water soluble but $BaSO_4$ is insoluble because

(A) the hydration energy of Na_2SO_4 is higher than that of its lattice energy.

(B) the hydration energy of Na_2SO_4 is less than that of its lattice energy.

(C) the hydration energy of $BaSO_4$ is less than that of its lattice energy.

(D) the hydration energy of $BaSO_4$ is higher than that of its lattice energy.

Q.43 Select the correct statements regarding $Na_6P_6O_{18}$ compound:

(A) It is water softening agent.

(B) The name is sodium hexa metaphosphite.

(C) It contain total number of 24 sigma bond.

(D) In this compound P–O–P linkage is in Bent form.

[REASONING TYPE]

Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose anyone of the following four responses:

(A) if both (A) and (R) are true and (R) is the correct explanation of (A)

(B) if both (A) and (R) are true but (R) is not correct explanation of (A)

(C) if (A) is true but (R) is false

(D) if (A) is false and (R) is true

Q.44 **Assertion :** Beryllium does not impart any characteristic colour to the bunsen flame.
Reason : Due to its very high ionization energy, beryllium requires a large amount of energy for excitation of the electrons

Q.45 **Assertion :** Anhyd. calcium chloride cannot be used to dry alcohol or NH_3
Reason : Anhyd. $CaCl_2$ is not a good desiccant.

Q.46 **Assertion :** Diagonal relationship is shown between Be and Al.
Reason : Polorising power (ϕ) of Be^{2+} is almost the same as that of Al^{3+}.

Q.47 **Assertion :** Beryllium halides dissolve in organic solvents.
Reason : Beryllium halides are ionic in character.

Q.48 **Assertion :** $BeCl_2$ fumes in moist air.
Reason : $BeCl_2$ reacts with moisture to form HCl gas.

Q.49 **Assertion :** Calcium carbide on hydrolysis gives methane.
Reason : Calcium carbide contains C_2^{2-} anion.

Q.50 **Assertion :** When CO_2 is passed through lime water, it first turns milky and then the solution becomes clear when the passage of CO_2 is continued.
Reason : The milkiness is due to the formation of insoluble $CaCO_3$ which then changes to soluble $Ca(HCO_3)_2$ when excess of CO_2 is present.

Q.51 **Assertion :** $MgCO_3$ is soluble in water when a current of CO_2 is passed.
Reason : The solubility of $MgCO_3$ is due to the formation of $Mg(HCO_3)_2$.

Q.52 **Assertion :** The carbonate of lithium decomposes easily on heating to form lithium oxide and CO_2.
Reason : Lithium being very small in size polarises large carbonate ion leading to the formation of more stable Li_2O and CO_2.

Q.53 **Assertion :** Beryllium carbonate is kept in the atmosphere of carbon dioxide
Reason : Beryllium carbonate is unstable and decomposes to give beryllium oxide and carbon dioxide.

[PARAGRAPH TYPE]

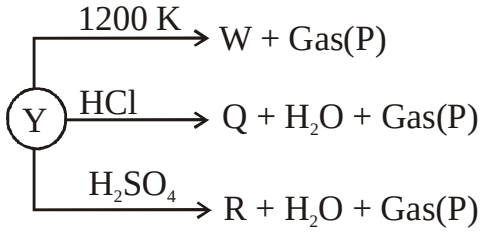
Paragraph for question nos. 54 to 57

$$Ca + O_2 \rightarrow W \xrightarrow[(limited)]{H_2O} X \xrightarrow[-H_2O]{CO_2} Y \xrightarrow[excess]{CO_2} Z$$

Q.54 The compound X is
(A) CaO (B) Slaked lime (C) milk of lime (D) lime water

Q.55 The incorrect statement is :
(A) Y is almost insoluble in water (B) Z is soluble in water
(C) Formation of X known as slaking of lime (D) Y is $Ca(HCO_3)_2$

Q.56



	W	P	Q	R
(A)	CaO	SO_3	$CaCl_2$	$Ca(HSO_4)_2$
(B)	CaO	SO_2	$CaCl_2$	$CaSO_4$
(C)	CaO	CO_2	$CaCl_2$	$CaSO_4$
(D)	$Ca(OH)_2$	CO_2	$CaCl_2$	$Ca(HSO_4)_2$

Q.57 The compound 'Y' is
(A) $Ca(HCO_3)_2$ (B) $CaCO_3$
(C) $CaSO_4$ (D) $Ca(HSO_4)_2$

Paragraph for question nos. 58 to 60

The s-Block of the periodic table constitutes Group-1 (alkali metals) and Group-2 (alkaline earth metals). They are so called because their oxides and hydroxides are alkaline in nature.

The alkali metals are silvery white, soft and low melting. They are highly reactive. The compounds of alkali metals are predominantly ionic. Their oxides and hydroxides are soluble in water forming strong alkalies.

The chemistry of alkaline earth metals is very much like that of the alkali metals. However, some differences arise because of reduced atomic and ionic sizes and increased cationic charges in case of alkaline earth metals. Their oxides and hydroxides are less basic than the alkali metal oxides and hydroxides.

Q.58 Select the **incorrect** order of basic strength of oxides

(A) $Li_2O > Na_2O > K_2O$ (B) $Na_2O > MgO > Al_2O_3$

(C) $K_2O > MgO > BeO$ (D) $BaO > SrO > CaO$

Q.59 Select the **correct** order:

(A) $Na_3N > Mg_3N_2 > AlN$ (Lattice energy)

(B) $Na^+(g) < Mg^{2+}(g) < Al^{3+}(g)$ (Ionic radius)

(C) $Li^+(aq) > Na^+(aq) > K^+(aq)$ (Hydrated radius)

(D) $F^-(aq) > Cl^-(aq) > Br^-(aq) > I^-(aq)$ (Ionic mobility)

Q.60 Identify the species which has maximum second ionisation energy

(A) Beryllium (B) Boron (C) Magnesium (D) Aluminium

Paragraph for question nos. 61 to 63

Lithium & Beryllium both are abnormally small in their respective groups. They show different properties with their respective group elements. Atomic size of lithium is almost equal to Mg & polarising power of Be^{2+} cation is almost equal to Al^{3+} cation so they show similar properties which is called diagonal relationship

Q.61 Be and Al are dissimilar in

(A) nature of their oxide (B) reaction with acids

(C) bonding in their chlorides (D) Maximum co-ordination number of metal cation

Q.62 Which is correct transformation ?

(A) $LiHCO_3(aq) \xrightarrow{\Delta} LiHCO_3(s)$ (B) $2LiNO_3 \xrightarrow{\Delta} Li_2O(s) + N_2(g) + \frac{5}{2}O_2(g)$

(C) $Li_2CO_3(s) \xrightarrow{\Delta} Li_2O(s) + CO_2(g)$ (D) None of these

Q.63 Which is **incorrect** order of given property :

(A) $Li^+ > Mg^{2+}$ Ionic radius (B) Li > Mg Atomic radius

(C) Be < Al Atomic radius (D) $Be^{2+} < Al^{3+}$ Ionic radius

Paragraph for question nos. 64 to 66

All elements of 1st and 2nd group of periodic table are called s-block metals. These metals are generally characterized by low melting point, high electropositive, highly reactive.

Q.64 $M + NH_3(liq) \rightarrow$ Deep blue colour solution.

Which of the following metal does not follow above reaction:

(A) Na (B) Be (C) Ca (D) Cs

Q.65 $X + NaOH \text{ solution} \xrightarrow{\text{warm}} Y\uparrow$

If gas 'Y' has basic properties, then which of the following substance does not follow above reaction.

(A) P_4 (B) NH_4Cl (C) PH_4I (D) Zn

Q.66 Hydrolysis of which of the following carbide liberate propyne.

(A) Al_4C_3 (B) Mg_2C_3 (C) CaC_2 (D) Be_2C

[MATCHING TYPE]

Q.67

List- I	**List - II**
On exposure to Air	***Metal***
(P) Li(s)	(1) Nitride + Oxide
(Q) Na(s)	(2) Nitride + Oxide + Peroxide
(R) K(s)	(3) Oxide + Peroxide
(S) Mg(powder)	(4) Peroxide + Superoxide

Codes:

	P	**Q**	**R**	**S**
(A)	3	2	1	4
(B)	4	3	2	1
(C)	2	3	4	1
(D)	1	2	3	4

Q.68

List-I	**List-II (Metals)**
(P) Metal + $N_2 \xrightarrow{\Delta}$ Metal Nitride	(1) Na
(Q) Metal + O_2(Excess) $\xrightarrow{\Delta}$ Metal peroxide	(2) Li
(R) Metal + $H_2 \xrightarrow{\Delta}$ Metal hydride	(3) Mg
(S) Metal + C $\xrightarrow{\Delta}$ Methanide Carbide	(4) Be

Codes:

	P	**Q**	**R**	**S**
(A)	1	2	4	3
(B)	2	1	3	4
(C)	2	3	1	4
(D)	3	1	4	2

Q.69

List-I (s-block metal)	**List-II (Stable compound)**
(P) Na	(1) Nitride
(Q) Li	(2) Carbide
(R) K	(3) Peroxide
(8) Mg	(4) superoxide

Codes:

	P	**Q**	**R**	**S**
(A)	1	2	3	4
(B)	3	2	4	1
(C)	3	4	1	2
(D)	4	1	2	3

Q.70

List-I **Reaction(s)**	**List-II** **(Characteristics of product(s))**
(P) $Mg_3N_2 + H_2O \xrightarrow{R.T.}$ ..... + ...	(1) Evolution of basic gas
(Q) Al^{3+}(aq} + excess NaOH soln. $\xrightarrow{R.T.}$	(2) Colourless solution
(R) $Ca_3P_2 + H_2O \xrightarrow{R.T.}$ .... + ...	(3) Form ppt with $(NH_4)_2C_2O_4$
(S) $NaNH_2 + H_2O \xrightarrow{R.T.}$ .... + ...	(4) White precipitate

Codes:

	P	**Q**	**R**	**S**
(A)	1	4	3	2
(B)	3	4	1	2
(C)	1	2	4	3
(D)	4	2	3	1

[INTEGER TYPE]

Q.71 Consider the following chemical reaction

$Na + O_2$(excess) $\xrightarrow{\Delta}$ (P)

$K + O_2$(excess} $\xrightarrow{\Delta}$ (Q)

Determine the value of expression (x + 2y) (where x and y are the bond order of oxygen -oxygen linkage in compound (P) and (Q) respectively).

Q.72 Read the following statements regarding $Na_6P_6O_{18}$ compound.

(I) It is used as a water softner.

(II) It is called as calgone.

(III) It's structure has 5, $\frac{\sigma}{\pi}$ bond ratio.

(IV) All Phosphorous has sp^3 hybridisation.

(V) It's IUPAC name is sodium hexa-meta phosphate

How many total number of above statements are **correct**?

Q.73 Calculate the total no. of Peroxy linkage in the following compounds $H_2S_2O_8$, CrO_5, H_2TiO_4

Q.74 Find total number of metal which gives hydrogen gas reacting with HCl.

Zn , Na, K, Cu, Ag, Au

Q.75 How many of the following will form a coloured precipitate with Na_2CO_3 (except white)?

$CaCl_2$, $BaCl_2$, $MgCl_2$, $AgNO_3$, $CuSO_4$, $ZnCl_2$,$HgCl_2$, $Pb(CH_3COO)_2$, $Hg_2(NO_3)_2$.

Q.76 With how many of the following KI will react to liberate iodine?
$CaSO_4$, $K_2Cr_2O_7$, $AgNO_3$, HNO_3, $Pb(CH_3COO)_2$, H_2O_2, $KMnO_4$ and $CuSO_4$.

Q.77 Portland cement contains how many of the following compounds?
MgO, $MgCO_3$, $MgCl_2$, CaO, SiO_2, Fe_2O_3, $CaSO_4$, $FeSO_4$, SO_3, Al_2O_3 and $CaCl_2$.

Q.78 Which of following substance is having higher lattice energy than NaBr.
$CaCl_2$, NaI , CsBr, LiF, MgO, Al_2O_3, TiO_2

Q.79 How many X–O–X linkages are present in the structure of calgon $(NaPO_3)_6$

Q.80 Total number of reagents which are used to remove hardness either temporary or permanent.

$Ca(OH)_2$	Sodium zeolite	Na_2CO_3	$Ba(OH)_2$
$BaCO_3$	$MgCO_3$	$Sr(OH)_2$	

[ANSWER KEY]

EXERCISE-1

Q.1 D	Q.2 B	Q.3 D	Q.4 A	Q.5 C
Q.6 C	Q.7 C	Q.8 B	Q.9 B	Q.10 C
Q.11 B	Q.12 A	Q.13 C	Q.14 B	Q.15 A
Q.16 B	Q.17 D	Q.18 C	Q.19 D	Q.20 A
Q.21 C	Q.22 C	Q.23 A	Q.24 C	Q.25 B
Q.26 D	Q.27 C	Q.28 B	Q.29 B	Q.30 B
Q.31 C	Q.32 C	Q.33 D	Q.34 C	Q.35 D
Q.36 A	Q.37 A	Q.38 C	Q.39 D	Q.40 A
Q.41 A	Q.42 B	Q.43 B	Q.44 B	Q.45 A
Q.46 C	Q.47 A	Q.48 B	Q.49 B	Q.50 A
Q.51 B	Q.52 D	Q.53 D	Q.54 A	Q.55 C
Q.56 C	Q.57 D	Q.58 B	Q.59 B	Q.60 B
Q.61 D	Q.62 A	Q.63 A	Q.64 A	Q.65 B
Q.66 C	Q.67 C	Q.68 D	Q.69 A	Q.70 C
Q.71 D	Q.72 A	Q.73 B	Q.74 B	Q.75 D
Q.76 A	Q.77 D	Q.78 A	Q.79 A	Q.80 C
Q.81 C	Q.82 B	Q.83 A	Q.84 A	Q.85 A
Q.86 C	Q.87 A	Q.88 B	Q.89 A	Q.90 B
Q.91 D	Q.92 D	Q.93 D	Q.94 A	Q.95 C
Q.96 D	Q.97 A	Q.98 D	Q.99 A	Q.100 B
Q.101 C	Q.102 C	Q.103 C	Q.104 C	Q.105 D
Q.106 C	Q.107 C	Q.108 A	Q.109 C	Q.110 B
Q.111 B	Q.112 D	Q.113 C	Q.114 D	Q.115 C
Q.116 B	Q.117 B	Q.118 A	Q.119 B	Q.120 D
Q.121 D	Q.122 C	Q.123 B	Q.124 D	Q.125 B
Q.126 D	Q.127 B	Q.128 B	Q.129 D	Q.130 B
Q.131 B	Q.132 C	Q.133 A	Q.134 D	Q.135 C
Q.136 A	Q.137 C	Q.138 A	Q.139 A	Q.140 A
Q.141 B	Q.142 B	Q.143 B	Q.144 C	Q.145 A
Q.146 C	Q.147 C	Q.148 B	Q.149 B	Q.150 C
Q.151 A	Q.152 D	Q.153 A	Q.154 B	Q.155 B
Q.156 D	Q.157 D	Q.158 A	Q.159 C	Q.160 A
Q.161 D	Q.162 B	Q.163 A	Q.164 D	Q.165 C
Q.166 C	Q.167 B	Q.168 B	Q.169 A	Q.170 A
Q.171 A	Q.172 D	Q.173 D	Q.174 C	Q.175 A
Q.176 B	Q.177 C	Q.178 B		

EXERCISE-2

Q.1	ABD	Q.2	BC	Q.3	ABD	Q.4	ACD	Q.5	ABC
Q.6	CD	Q.7	AB	Q.8	BCD	Q.9	BCD	Q.10	AB
Q.11	AB	Q.12	ABC	Q.13	AC	Q.14	ACD	Q.15	AB
Q.16	AD	Q.17	ABD	Q.18	AB	Q.19	AB	Q.20	ABD
Q.21	ABC	Q.22	ABCD	Q.23	ACD	Q.24	ABD	Q.25	BC
Q.26	ABC	Q.27	ABC	Q.28	BCD	Q.29	AD	Q.30	CD
Q.31	ACD	Q.32	ABD	Q.33	ABCD	Q.34	CD	Q.35	ABD
Q.36	ABC	Q.37	ABC	Q.38	B	Q.39	CD	Q.40	AD
Q.41	CD	Q.42	AC	Q.43	ACD	Q.44	**A**	Q.45	**C**
Q.46	A	Q.47	C	Q.48	A	Q.49	D	Q.50	A
Q.51	A	Q.52	A	Q.53	A	Q.54	B	Q.55	D
Q.56	C	Q.57	B	Q.58	A	Q.59	C	Q.60	B
Q.61	D	Q.62	C	Q.63	B	Q.64	B	Q.65	D
Q.66	B	Q.67	C	Q.68	B	Q.69	B	Q.70	D
Q.71	4	Q.72	4	Q.73	4	Q.74	3	Q.75	4
Q.76	5	Q.77	6	Q.78	5	Q.79	6	Q.80	3