Exercise-1

Marked Questions may have for Revision Questions.

# **OBJECTIVE QUESTIONS**

Section A-1.	Section (A) : Atomic and physical properties of alkali metals A-1. Among the alkali metals most abundant metal is :					
	(1*) Na	(2) K	(3) Li	(4) Cs		
A-2.	Which of the following c (1) [Ar]3d <sup>10</sup> 4s <sup>1</sup>	configurations represents (2) [Ne]3s <sup>2</sup> 3p <sup>1</sup>	the s-block element ? (3*) [He] 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup>	(4) None of these		
A-3.	The similarity in the pro (1) their same atomicity (3) same energy of vale	perties of alkali metals is nce shell.	due to : (2*) similar outer shell e (4) same principal quan	electron configuration. tum number of valence shell.		
A-4.	Which one of the follow (1) K	ing metal has largest siz (2*) Cs	e in the periodic table ? (3) Zn	(4) Ba		
A-5.	<ul> <li>Select the correct statement.</li> <li>(1) Density of alkali metals regularly increases in moving down the group from Li to Cs.</li> <li>(2*) Group 1 elements are the largest in their horizontal periods in the periodic table (exclude noble gases).</li> <li>(3) The melting and boiling points of group 1 elements increases on moving down from Li to Cs.</li> <li>(4) Alkali metals are more harder than alkaline earth metals.</li> </ul>					
A-6.	The hydration enthalpie (1*) decrease with increa (2) increase with increa (3) remain same with in (4) first decrease from L	es of alkali metal ions : easing ionic size down th se in ionic size down the crease ionic size down t Li to K and then increase	e group. group. he group. of Rb to Cs.			
A-7.	Which one of the follow (1) Melting point (3*) Tendency to lose e	ing properties increase	es on moving down the group from Li to Cs ? (2) Hardness of metals (4) Metallic bond strength			
A-8.	Strongest reducing age (1*) Li	nt of alkali metals is : (2) Na	(3) K	(4) Cs		
A-9.	Which of the following a (1*) Li	alkali metals gives hydrat (2) Na	ed salts ? (3) K	(4) Cs		
A-10.	Alkali metals are : (1) weak reducing agen (3) strong oxidising age	ts nts	(2*) strong reducing age (4) strong oxidising as v	ents vell as strong reducing agents		

A-11. Select the correct statement with respect to alkali metals.

- (1) Melting points decrease with increasing atomic number.
- (2) Density of potassium is less then sodium
- (3) Salts of Li to Cs impart characteristic colour to an oxidising flame. (of Bunsen burner).
- (4\*) All of these.
- A-12. Identify the correct statement.
  - (1) Sodium metal can be prepared by the electrolysis of an aqueous solution of NaCl.
  - (2) Sodium metal can be kept under ethyl alcohol.
  - (3) Sodium metal is insoluble in liquid  $NH_3$  at low temperature.
  - (4\*) Elemental sodium is easily oxidised.
- A-13. Sodium and potassium react with water much more vigorously than lithium because :
  - (1) sodium and potassium have high values of hydration energy as compared to that of lithium.
  - (2) sodium and potassium have higher melting point than that of lithium.
  - (3\*) sodium and potassium have lower melting point than that of lithium.
  - (4) sodium and potassium have lower hydration energy than that of lithium.
- A-14. Which of the following statements is true for all the alkali metals ?
  - (1) Their nitrates decomposes on heating to give the corresponding nitrites and oxygen.
  - (2) Their chlorides are deliquescent and crystallise as hydrates.
  - (3\*) They react with water to form hydroxide and hydrogen.
  - (4) They readily react with halogens to form ionic halides, M<sup>+</sup>X<sup>-</sup>.

#### Section (B) : Atomic and physical properties of alkali metals and alkaline earth metals

Which of the following electronic configurations in the outermost two shells is characteristic of the alkaline B-1. earth metals ? (2)  $(n - 1)s^2p^6d^{10}ns^2$ (1\*) (n – 1)s<sup>2</sup>p<sup>6</sup>ns<sup>2</sup>  $(3) (n - 1)s^2p^6ns^2p^1$ (4) None of these B-2. The most electropositive amongst the alkaline earth metals is : (1) Be (2) Mg (3) Ca (4\*) Ba B-3. Which of the following metal does give characteristic flame colouration? (4) All of these (1) Be (2) Mg (3\*) Ca B-4. The first ionisation energies of alkaline earth metals are higher than those of the alkali metals. This is because: (1\*) there is increase in the nuclear charge of the alkaline earth metals (2) there is decrease in the nuclear charge of the alkaline earth metals (3) there is no change in the nuclear charge (4) none of these B-5. The set representing the correct order of first ionisation potential is : (1) Ca > Mg > Be $(2^*)$  Be > Mg > Ca (3) Mg > Ca > Be (4) Be > Ca > Mg B-6. Property of alkaline earth metals that increases with their atomic number is : (1\*) thermal stability of their carbonates. (2) electron affinity. (3) hydration enthalpies of their metal ions. (4) solubility of their sulphates. B-7. The ionization enthalpy of alkaline earth metals is : (1) greater than elements of 1 and 13 groups. (2) less than alkali metals.

	(3*) greater than alkali r	netals.		(4) equal to alkali meta	lls.	
B-8.	<ul> <li>Which of the following statement is incorrect ?</li> <li>(1) The atomic radius of Na is greater than that of Mg.</li> <li>(2) Metallic bond of Mg is stronger than the metallic bond of Na.</li> <li>(3) Melting and boiling points of Mg are less than those of Ca.</li> <li>(4*) Mg and Ca both impart characteristic colour to the flame.</li> </ul>					
B-9.	Which of the following properties of the elements of group 2nd (alkaline earth metals) does not increasewith increasing atomic number ?(1) Stability of carbonate(2) Solubility of hydroxide(3) Reactivity with water(4*) First ionization energy					
B-10.	Which of the following statements is false ? (1) BeCl <sub>2</sub> exists as dimer in the vapour state and polymeric in the solid state (2) Calcium hydride is called hydrolith (3*) The oxides of Be and Ca are amphoteric (4) Bicarbonates of Na and Sr are soluble in water					
Sectio	on (C) : Chemical p	roperties of a	lkali m	etals		
C-1.	Na and Li are placed in (1) NaOH, Na <sub>2</sub> O, Li <sub>2</sub> O	dry air. We get : (2) Na₂O, Li₂O	(3) Na <sub>2</sub> (	O, Li2O, Li3N, NH3 (4*)	Na2O, Li3N, Li2O, Na2O2	
C-2.	In the presence of oxyg (1) LiO	en, on heating, lit (2) LiO <sub>2</sub>	thium fo	rms (3*) Li <sub>2</sub> O	(4) Li <sub>2</sub> O <sub>2</sub>	
C-3.	The basic strength of w (1) LiOH	hich hydroxide is (2) NaOH	maximu	ım ? (3*) CsOH	(4) KOH	
C-4.	Which of the following of (1) K <sub>2</sub> CO <sub>3</sub>	compounds has m (2) Na₂CO₃	naximun	n thermal stability ? (3) Li <sub>2</sub> CO <sub>3</sub>	(4*) Rb <sub>2</sub> CO <sub>3</sub>	
C-5.	Which of the following c (1*) Li <sub>2</sub> SO <sub>4</sub>	compounds has m (2) Na <sub>2</sub> SO <sub>4</sub>	ninimum	thermal stability ? (3) K <sub>2</sub> SO <sub>4</sub>	(4) Rb <sub>2</sub> SO <sub>4</sub>	
C-6.	Which of the following c (1) Li <sub>2</sub> CO <sub>3</sub>	can not decompos (2*) Na2CO3	se on he	eating to give CO <sub>2</sub> ? (3) KHCO <sub>3</sub>	(4) BaCO₃	
C-7.	Which does not exist in (1) NaHCO <sub>3</sub>	solid state. (2) NaHSO₃		(3*) LiHCO <sub>3</sub>	(4) CaCO <sub>3</sub>	
C-8.	The correct order of me (1*) MF > MCl > MBr > (3) MCl > MF > MBr > M	lting point of alka MΙ ΛΙ	li metal (2) MI > (4) MI >	halides is : > MBr > MCl > MF > MF > MCl > MBr		
C-9.	Select the correct order (1) LiHCO <sub>3</sub> > NaHCO <sub>3</sub> = (3) KHCO <sub>3</sub> > RbHCO <sub>3</sub> >	of thermal stabili > KHCO₃ > RbHC > NaHCO₃ > LiHC	ity of alk CO₃ CO₃	ali metal bicarbonates : (2*) RbHCO <sub>3</sub> > KHCO <sub>3</sub> (4) RbHCO <sub>3</sub> > NaHCO	3 > NaHCO3 > LiHCO3 3 > LiHCO3 > KHCO3	

C-10. Which of the following statement is incorrect ?

- (1) The superoxide ion (i.e.,  $O_2^{-}$ ) is stable only in presence of larger cations such as K, Rb, Cs.
- (2) Alkali metals are normally kept in kerosene oil.
- (3) All the alkali metal hydrides are ionic solids with high melting points.
- (4\*) The concentrated solution of alkali metals in liquid ammonia are strong paramagnetic in nature.
- C-11. Which of the following is false for alkali metal solutions in ammonia ?
  - (1) Dilute solutions of alkali metals in liquid ammonia are blue coloured.

(2) Dilute solutions of alkali metals in liquid ammonia are paramagnetic in nature and good conductor of electricity.

- (3) Concentrated solutions of alkali metals in liquid ammonia are bronze coloured.
- (4\*) Concentrated solutions of alkali metals in liquid ammonia are paramagnetic in nature.
- **C-12.** A ribben of magnesium was heated to redness in an atmosphere of nitrogen and on cooling water was added, the gas evolved was :
  - (1\*) ammonia (2) hydrogen (3) nitrogen (4) oxygen
- C-13. Which of the following elements form super oxide as major product when heated in excess of air ? (1) Mg (2) Na (3\*) Cs (4) Li
- **C-14.** Which of the following statements is not true about the solvated ions formed when sodium dissolves in liquid ammonia at low temperature ?
  - (1) Deep blue colour of the solution is due to solvated electron.
  - (2) Highly conducting nature of the solution is due to the solvated cation and solvated anion.
  - (3) The solution is reducing in nature and have paramagnetic character because of the presence of solvated unpaired electrons.

(4\*) none of these

- **C-15.** An alkali metal nitrate on heating decomposes and liberates two different gases along with an oxide. The alkali metal is :
  - (1\*) Li (2) Na (3) K (4) Cs

#### Section (D) : Chemical properties of alkaline earth metals

- **D-1.** The hydration energy of Mg<sup>2+</sup> ion is higher than that of : (1)  $AI^{3+}$  (2)  $Be^{2+}$  (3\*) Na<sup>+</sup> (4) None of these
- **D-2.** When magnesium burns in air, compounds of magnesium formed are magnesium oxide and : (1\*)  $Mg_3N_2$  (2)  $MgCO_3$  (3)  $Mg(NO_3)_2$  (4)  $Mg(NO_2)_2$
- D-3. BeF<sub>2</sub> is soluble in water because of :(1) ionic nature of BeF<sub>2</sub>
  - (2\*) greater hydration energy of Be<sup>2+</sup> ion as compared to lattice energy
  - (3) covalent nature of BeF<sub>2</sub>
  - (4) none of these
- D-4.
   Which of the following compounds is most soluble in water ?

   (1\*) MgSO4
   (2) CaSO4
   (3) SrSO4
   (4) BaSO4
- **D-5.** Among the alkaline earth metals, the element forming predominantly covalent compound is :

D-6.	(1) Ba The alkaline earth meta	(2) Sr als forming ionic oxide	(3) Ca s is:	(4*) Be		
	(1) BeO	(2) MgO	(3*) CaO	(4) All of these		
D-7.	Which one of the following properties of alkaline earth metals decreases with increase in atomic numbe down the group?					
D-8.	<ul> <li>(1) Solubility (2) Thermal stability (3) Basic character (4*) Ionisation potential</li> <li>D-8. Compounds of alkaline earth metals are less soluble in water than the corresponding alkali meta due to:</li> </ul>					
	<ul><li>(1) their high ionisation</li><li>(3) their low hydration e</li></ul>	energy energy	(2) their low electron (4*) their high lattice	negativity e energy		
D-9.	The correct order of the (1) Be > Ca > Mg > Ba (3*) Be > Mg > Ca > Sr	e solubility of sulphate >Sr <sup>-</sup> >Ba	s of alkaline earth metal (2) Mg > Be > Ba > (4) Mg > Ca > Ba >	of alkaline earth metals is : (2) Mg > Be > Ba > Ca > Sr (4) Mg > Ca > Ba > Be > Sr		
D-10.	In which of the followin (1*) BaSO4 (1*) BaSO4	g, the lattice energy is (2) BeSO4 (2) BeSO4	more than its hydration (3) MgSO <sub>4</sub> (3) MgSO <sub>4</sub>	energy? (4) None of these (4) buesa ls dksb] ugha		
D-11.	<ul> <li>Consider the following statements and pick out the wrong one.</li> <li>(a) The solubility, thermal stability and the basic character of the hydroxides of alkaline earth metals increases from Mg(OH)<sub>2</sub> to Ba(OH)<sub>2</sub>.</li> <li>(b) The dehydration of hydrated chlorides, bromides and iodides of Ca, Sr and Ba can be achieved on heating.</li> </ul>					
	acids.					
	(1) (a) and (b) only	(2) (a) and (c) only	(3) (a), (b) and (c)	(4^) none		
D-12.	The correct order of de BaCO <sub>3</sub> , MgCO <sub>3</sub> , CaCO (1*) BeCO <sub>3</sub> > MgCO <sub>3</sub> >	creasing lattice energ 93, SrCO3, BeCO3 ds tk CaCO3 > SrCO3 > Ba	y of BaCO3, MgCO3, Ca yd ÅtkZ dk vojksgh Øe gS - CO3(2) BaCO3 > SrCO3	CO <sub>3</sub> , SrCO <sub>3</sub> , BeCO <sub>3</sub> : > CaCO <sub>3</sub> > MgCO <sub>3</sub> > BeCO <sub>3</sub>		
	(3) MgCO <sub>3</sub> > BeCO <sub>3</sub> > 0	CaCO₃ > SrCO₃ > BaC	CO <sub>3</sub> (4) BeCO <sub>3</sub> > MgCO <sub>3</sub>	3 > CaCO3 > BaCO3 > SrCO3		
Section	on (E) : Compound	s of alkali metals				
E-1.	Which of the following (1) $M_2O-M(OH)_2$ (3) $MO_2-M(OH)_2 + H_2O$	alkali metal oxides is r (2) l 0 <sub>2</sub> (4*)	not correctly matched wi M2O2–MOH + H2O2 (1) and (3) both	th their hydrolysis products?		
E-2.	Which salt on heating does not give brown coloured gas ?					

**E-2.** Which salt on heating does not give brown coloured gas ? (1) LiNO<sub>3</sub> (2\*) KNO<sub>3</sub> (3) Pb(NO<sub>3</sub>)<sub>2</sub> (4) AgNO<sub>3</sub> **Sol.** (1) 2LiNO<sub>3</sub>  $\xrightarrow{\Delta}$  Li<sub>2</sub>O + 2NO<sub>2</sub> +  $\frac{1}{2}$ O<sub>2</sub> (2) KNO<sub>3</sub>  $\xrightarrow{\Delta}$  KNO<sub>2</sub> +  $\frac{1}{2}$ O<sub>2</sub> (3) Pb(NO<sub>3</sub>)<sub>2</sub>  $\xrightarrow{\Delta}$  PbO + 2NO<sub>2</sub> +  $\frac{1}{2}$ O<sub>2</sub> (4) 2AgNO<sub>3</sub>  $\xrightarrow{\Delta}$  2Ag + 2NO<sub>2</sub> + O<sub>2</sub>

E-3.	Sodium burns in dry air (1) Na <sub>2</sub> O	to give : (2*) Νa₂Ο₂	(3) NaO <sub>2</sub>	(4) Na₃N	
E-4.	The oxide that gives hy	drogen peroxide on treat	ment with a dilute cold a	cid is :	
	(1) PbO <sub>2</sub>	(2*) Na <sub>2</sub> O <sub>2</sub>	(3) MnO <sub>2</sub>	(4) SnO <sub>2</sub>	
E-5.	Washing soda has the (1) Na <sub>2</sub> CO <sub>3</sub>	formula : (2) Na₂CO₃.H₂O	(3) Na <sub>2</sub> CO <sub>3</sub> .7H <sub>2</sub> O	(4*) Na <sub>2</sub> CO <sub>3</sub> .10H <sub>2</sub> O	
EG	The by product of Soly		()	( )	
E-0.	(1) carbon dioxide	(2) ammonia	(3*) calcium chloride	(4) calcium carbonate	
E-7.	Sodium carbonate car	n be manufactured by	Solvay's process but po	otassium carbonate cannot be	
	prepared because:				
	<ul><li>(1) K<sub>2</sub>CO<sub>3</sub> is more solution</li><li>(3*) KHCO<sub>3</sub> is more solution</li></ul>	ole luble than NaHCO₃	(2) $K_2CO_3$ is less soluble (4) KHCO <sub>3</sub> is less soluble	e ole than NaHCO₃	
E-8.	Which of the following Castner-Kellner cell ?	products are obtained ir	n the electrolysis of brine	e solution (i.e. NaCl solution) in	
	(1) Na, H <sub>2</sub>	(2*) Na-amalgam, $Cl_2$	(3) Na-amalgam, NaOH	I (4) NaOH, Cl <sub>2</sub> , H <sub>2</sub>	
E-9.	Sodium amalgam on re	action with water yields			
	(1) Hg + NaOH	(2) Hg + NaOH + O <sub>2</sub>	(3*) Hg + NaOH + H <sub>2</sub>	(4) HgO + NaOH + H <sub>2</sub>	
	<ul> <li>(1) Sodium hydrogen carbonate is precipitated in the reaction of sodium chloride with ammonium hydrogen carbonate in solvay process.</li> <li>(2) Sodium metal discharged at the cathode combines with mercury to form sodium amalgam in Castner-Kellner cell in manufacture of sodium hydroxide.</li> <li>(3) Baking soda is made by saturating a solution of sodium carbonate with carbon dioxide.</li> <li>(4*) Deep blue colour solutions of alkali metals in liquid ammonia on decomposition yield alkali metals and liquid ammonia.</li> </ul>				
E-11.	What happens when s	odium metal is heated t	to a temperature 350°C	in excess of dry air containing	
	carbon dioxide gas ? (1) Na $_2\Omega_2$ is formed		(2) Na₂O is formed		
	(3*) First Na <sub>2</sub> O <sub>2</sub> is formed. (4) First Na <sub>2</sub> O <sub>2</sub> is formed.	ed which then converts in	to $Na_2CO_3$ .		
			0 Na2CO3.		
E-12.	What products are form I. Cl <sub>2</sub> (g) , II. NaOH (ac	ned during the electrolysis 1). , III. H <sub>2</sub> (g).	s of a concentrated aqueo	ous solution of sodium chloride?	
	(1) I only	(2) I and II only	(3) I and III only	(4*) All of these	
Sol.	NaCl $\longrightarrow$ Na <sup>+</sup> + Cl <sup>-</sup>	; 2 Cl <sup>-</sup> $\longrightarrow$ Cl <sub>2</sub> $\uparrow$ + 2e <sup>-</sup>			
	$HOH \longrightarrow H^{\scriptscriptstyle +} + OH^{\scriptscriptstyle -}$	; $2H^+ + 2e^- \longrightarrow H_2 \uparrow$ ;	Na⁺ + OH⁻ ───→ NaOF	I.	
E-13.	Zinc reacts with excess (1) Zn(OH) <sub>2</sub>	of caustic soda to form (2) ZnO	: (3*) Na₂ZnO₂	(4) Zn(OH)2.ZnCO3	
E-14.	Potassium carbonate is	s not prepared by :			
	(1*) Solvay process	(2) LE-Blanc process	(3) Prechts process	(4) none of these.	
E-15.	Crude common salt becomes damp on keeping in air because :				

(1) It is hygroscopic in nature.

(2\*) It contains MgCl<sub>2</sub> and CaCl<sub>2</sub> as impurities which are deliquescent in nature.

(3) (1) and (2) both.

(4) none.

### Section (F) : Compounds of alkaline earth metals

F-1.	Which of the following salts on heating gives a mixture of two gases ?					
	(1*) Ca(NO <sub>3</sub> ) <sub>2</sub>	(2) NaNO₃	(3) KNO <sub>3</sub>	(4) RbNO₃		
F-2.	Plaster of Paris harde (1) giving off CO <sub>2</sub> (3) changing into CaC	ens by : CO₃	(2*) utilising wat (4) giving out wa	er ater		
F-3.	A compound X on heating gives a colourless gas. The residue is dissolved in water to obtained Y. Excess CO <sub>2</sub> is bubbled through aqueous solution of Y, Z is formed. Z on gently heating gives back X. The compound X is:					
F-4.	Identify the correct statement. (1*) Gypsum contains a lower percentage of calcium than Plaster of Paris (2) Gypsum is obtained by heating Plaster of Paris (3) Plaster of Paris is obtained by hydration of gypsum (4) Plaster of Paris is obtained by partial oxidation of gypsum					
F-5.	Gypsum on heating a (1) calcium oxide (3) anhydrous calcium	t a temperature of 393 n sulphate	8 K yields : (2*) hemihydrate (4) none of thes	e of calcium sulphate e.		
F-6.	(i) It is used as a water softening agent (ii) It gives NaOH on reaction with Na <sub>2</sub> CO <sub>3</sub> . (iii) Its clear solution becomes milky when CO <sub>2</sub> gas is passed. (iv) It liberates ammonia gas with ammonium salts. The compound (X) is : (1) Ca(HCO <sub>3</sub> ) <sub>2</sub> (2*) Ca(OH) <sub>2</sub> (3) CaO (4) CaCO <sub>3</sub>					

# Exercise-2

Marked Questions may have for Revision Questions.

## **OBJECTIVE QUESTIONS**

#### Section (A) : Atomic and physical properties of alkali metals

1.	Which of the following electronic configuration in the outermost shell is characteristics of alkali me			
	(1) (n − 1)s²p <sup>6</sup> ns²	(2) (n − 1) s²p <sup>6</sup> d <sup>10</sup> ns <sup>1</sup>		
	(3*) (n − 1)s²p <sup>6</sup> ns¹	(4) ns <sup>2</sup> p <sup>6</sup> d <sup>1</sup>		

2.	Which of the followi	ng pair of element shows dia	gonal relationship?	[DCE 1998]	
	(1*) Li and Mg	(2) Na and Mg	(3) K and Mg	(4) Al and Mg	

3.	Which of the following statement is false for alkali metals?				
	(1) Alkali metals do not	t occur free in nature.			
	(2) Alkali metal salts im	part colour to the flame.			
	(3*) The softness of all	kali metals decreases do	wn the group with increa	asing atomic number.	
	(4) Alkali metal tarnish	in dry air.			
4.	Which of the following	statements are true abo	ut the alkali metals ?		
	(i) All alkali-metal salts	impart a characteristic o	olour to the Bunsen flam	) <b>e</b> .	
	(ii) The correct order of	increasing thermal stab	ility of the carbonates of	alkali metals is Li <sub>2</sub> CO <sub>3</sub> < Na <sub>2</sub> CO <sub>3</sub>	
	< K <sub>2</sub> CO <sub>3</sub> < Rb <sub>2</sub> CO <sub>3</sub> < C	S <sub>2</sub> CO <sub>3</sub> .	,		
	(iii) Among the alkali m	etals, caesium is the mo	ost reactive.		
	(iv) The reducing chara	acter of the alkali metal h	ydrides follow the order	: LiH > NaH > KH > RbH > CsH.	
	(1*) (i), (ii) and (iii) (2) (i), (iii) and (iv) (3) (ii), (iii) and (iv) (4) (i), (ii), (iii) and (iv)				
5.	Highly pure dilute solution of potassium in liquid ammonia at – 33°C :				
	(1) is dark red in colour	r.	(2*) is paramagnetic in	n nature.	
	(3) is bad conductor of	electricity.	(4) produces sodium a	mide and hydrogen.	
Section	on (B) : Atomic and	d physical propertie	es of alkali metals a	Ind alkaline earth metals	
6.	An element with atomic	c number 20 is :		[DCE 1995]	
	(1) an alkali metal		(2*) an alkaline earth r	netal	
	(3) a halogen		(4) a noble gas		
7	Calcium is obtained by	the			
7.	(1) roasting of limeston		(2) electrolysis of a sol	Lation of calcium chloride in H <sub>2</sub> O	
	(3) reduction of calcium	n chloride with carbon	(4*) electrolysis of a solution of calcium chloride in 1/20 (4*) electrolysis of molten anhydrous calcium chloride.		
8.	The compound of alkal	ine earth metals have th	e following magnetic nat	ure : [MPPMT 1998]	
	(1*) Diamagnetic	(2) paramagnetic	(3) Ferromagnetic	(4) Antiferromagnetic	
9.	Which of the following	is not an ore of magnesi	um ?	[DCE 2004]	
	(1) Carnallite	(2) Magnesite	(3) Dolomite	(4*) Gypsum	
10.	Among the following co	ompounds of cement wh	ich is present in the high	est amount ? [Kerla PET 2008]	
	(1) Ca <sub>2</sub> SiO <sub>4</sub>	(2*) Ca <sub>3</sub> SiO <sub>5</sub>	(3) Al <sub>2</sub> O <sub>3</sub>	(4) Ca <sub>3</sub> Al <sub>2</sub> O <sub>6</sub>	
11.	<ul> <li>S<sub>1</sub>: The first element each in 1<sup>st</sup> and 2<sup>nd</sup> groups, lithium in group 1<sup>st</sup> and beryllium in group 2<sup>nd</sup> shows similarities in properties to the second member of the next group.</li> <li>S<sub>2</sub>: Cement is a product obtained by combining a material rich in lime, CaO with other material such as</li> </ul>				
	clay which contains sili	ca, SiO <sub>2</sub> along with the c	oxides of AI, Fe and Mg.		
	$S_3$ : BeSO <sub>4</sub> and MgSO	4 are insoluble in water.			
		(a) E E E E	earth metals decreases (	with increasing cationic size.	
	(1)11 F F	(2) Г Г І І	(3)   F   F	(4) Г І Г І	

**12.** Select the false statement among the following ?

- (1) Alkaline earth metals are diamagnetic in nature.
- (2\*) Alkaline earth metals are stronger reducing agents than alkali metals.
- (3) MgCO<sub>3</sub> on heating decomposes to form MgO and CO<sub>2</sub>.
- (4) 'Dead burnt plaster' has chemical composition CaSO<sub>4</sub>.
- 13. Among the following halides, the one which has the least water of crystallisation (i.e. less than six) in hydrated molecule is :
  - (1\*) BaCl<sub>2</sub> (3) SrCl<sub>2</sub> (4) MgCl<sub>2</sub> (2) CaCl<sub>2</sub>

#### Section (C) : Chemical properties of alkali metals

14.	A substance 'X' is a compound of an element of group IA. The substance 'X' gives a violet colour flame				
	on performing flame tes	st .The compound X is :		[DCE 2000]	
	(1) LiCl	(2) NaCl	(3*) KCI	(4) None of these	
	(1) LiCl	(2) NaCl	(3*) KCI	(4) buesa ls dksbZ ugha	
15.	A metals M reacts with	N <sub>2</sub> to give a compound	'A'(M <sub>3</sub> N). 'A' on heating	at high temperature gives back	
	'M' and 'A' on reacting v B can be:	with H <sub>2</sub> O gives a gas B. 'l	B' turns CuSO4 solution b	olue on passing through it. A and [DCE 2003]	
	(1) AI and NH <sub>3</sub>	(2*) Li and NH <sub>3</sub>	(3) Na and NH <sub>3</sub>	(4) Mg and NH	
16.	Which of the following a	acts as an oxidising as w	vell as reducing agent ?	[DCE 2004]	
	(1) Na <sub>2</sub> O	(2) NaO <sub>3</sub>	(3) NaNO <sub>3</sub>	(4*) NaNO <sub>2</sub>	
17.	Consider the following abbreviations for hydrated alkali ions : [J&K CET 20 $X = [Li(H_2O)_n]^+$ ; $Y = [K(H_2O)_n]^+$ ; $Z = [Cs(H_2O)_n]^+$				
	which is the correct of				
18.	The increasing order of	f ionic character of CsF,	Lil, NaBr and KCI is :	[Orissa JEE 2006]	
	(1) NaBr < KCl < Lil < 0	CsF	(2) CaF < KCl < NaBr <	< Lil	
	(3*) Lil < NaBr < KCl <	CsF	(4) Lil < KCl < CsF < N	aBr	
19.	Among the alkali metal	s, caesium is the most re	eactive because :	[Karanatak CET 2006]	
	(1) its incomplete shell	is nearest to the nucleus	5		
	(2) it has a single election (2) it is the best side of the second secon	ron in the valence shell.			
	(3) It is the neaviest aik (4*) the outermost elec	tron is more looselv bour	nd than the outermost ele	ectron of the other alkali metals.	
	( ),	, <b>, ,</b>			
20.	RbO <sub>2</sub> is :			[Orissa JEE 2006]	
	(1) peroxide and param	nagnetic	(2) peroxide and diama	gnetic	
	(3*) superoxide and pa	ramagnetic	(4) superoxide and diar	nagnetic	
	RbO₂ g∫ %			[Orissa JEE 2006]	
21.	Potassium superoxide	finds use in breathing e	quipment and safeguards	s. The use to breathe in oxygen	
	generated internally in t	the apparatus without be	ing exposed to toxic fume	es outside. The supply of oxygen	
	is due to :				
	(I) slow decomposition	of KO <sub>2</sub>			
	(ii) reaction of superoxide with moisture in the exhaled air.				

	<ul><li>(iii) reaction of KO<sub>2</sub> with</li><li>(1) i, ii and iii are correct</li><li>(3) iii is only correct</li></ul>	CO₂ in the exhaled air t	(2*) ii and iii are correct (4) i and ii are correct	[Kerla	a PMT 2007]	
22.	The solubility of alkali m (1*) LiOH < NaOH < KO (3) LiOH > CsO	netal hydroxide follows th DH < RbOH < CsOH DH > RbOH > NaOH > K0	e order : (2) LiOH > NaOH > KO DH (4) none of thes	<b>[Oriss</b> H > RbOH > Cs se	<b>sa JEE 2007]</b> sOH	
23.	Sodium peroxide which	is a yellow solid, when e	exposed to air becomes v	white due to the [K	formation of : [erla PET 2008]	
	(1) H <sub>2</sub> O <sub>2</sub> Na <sub>2</sub> CO <sub>3</sub>	(2) Na <sub>2</sub> O	(3) Na <sub>2</sub> O and O <sub>3</sub>	(4*)	NaOH and	
Sectio	on (D) : Chemical p	roperties of alkaline	e earth metals			
24.	Which one of the follow (1) LiCl	ing salts does not impart (2) Kl	colour to the flame ? (3*) MgCl <sub>2</sub>	(4) CaCl <sub>2</sub>	[DCE 1996]	
25. 26.	The solubility in water of (1) increase in melting p (3*) higher coordination Which of the following s (1) Calcium carbonate (3) Sodium bicarbonate	of sulphates down the Be point number substabnce can be used	group is : Be > Mg > Ca (2) high ionization energ (4) all of these for drying neutral or basi (2) Sodium carbonate (4*) calcium oxide	> Sr > Ba. Thi gy c gases ? <b>[MP</b>	s is due to : [AIIMS 1999] CET 1999]	
27.	Which of the following e (1) AICI <sub>3</sub>	exists in polymeric form ? (2*) BeCl <sub>2</sub>	(3) CH4	<b>[Oris</b> (4) B <sub>2</sub> H <sub>6</sub>	sa JEE 2006]	
28.	Which pair of the follow $(1)$ BeCl <sub>2</sub> and SrCl <sub>2</sub>	ing chlorides do not impa (2*) BeCl₂ and MgCl₂	art colour to the flame ? (3) $CaCl_2$ and $BaCl_2$	[ <b>/</b> (4) BaCl <sub>2</sub> and	<b>(erla PET 2006]</b> SrCl₂	
29.	When CaC2 is heated in	n atmospheric nitrogen in	an electric furnace the o	compound form	ed is :	
	(1) Ca(CN) <sub>2</sub>	(2) Ca <sub>3</sub> N <sub>2</sub>	(3) CaNC <sub>2</sub>	(4*) CaNCN		
30.	$S_1$ : Beryllium has higher ionization enthalpy compared to other alkaline earth metals but it has reducing nature. $S_2$ : Mg <sup>2+</sup> ion is smaller than Li <sup>+</sup> ion. $S_3$ : Li <sub>2</sub> CO <sub>3</sub> decomposes on heating to give CO <sub>2</sub> gas.					
	(1) T T F	(2) F F T	(3*) T T T	(4) F F F		

Beryllium has less negative value of reduction potentials compared to other alkaline earth metals due to:
 (1) the smaller hydration energy of the Be<sup>2+</sup>.

- (2) the large value of the atomization enthalpy of the Be metal.
- (3) the large value of ionisation energy of the Be metal.
- (4\*) (2) and (3) both.
- **32.** Which of the following reactions of potassium superoxide supply oxygen gas in the breathing equipments used in space and submarines ?
  - (a) reaction of superoxide with nitrogen in the exhaled air
  - (b) reaction of superoxide with moisture in the exhaled air
  - (c) reaction of superoxide with carbon dioxide in the exhaled air
  - (1) (a), (b) and (c)  $(2^*)$  (b) and (c) only (3) (b) only (4) (a) and (b) only

### Section (E) : Compounds of alkali metals

33.	Sodium carbonate is manufactured by Solvay process, the products that are recycled are :[DCE 1998]				
	(1*) $CO_2$ and $NH_3$	(2) $CO_2$ and $NH_4CI$	(3) NaCl, CaO	(4) CaCl <sub>2</sub> ,CaO	
34.	In the reaction betwe	o form sodium chloride :	[DCE 1998]		
	(1) sodium atom is re	duced	(2*) sodium atom is oxidised		
	(3) sodium ion is reduced		(4) chlorine is oxidised		
35.	The pair of compounds which cannot exist together is :			[DCE 1999]	

- (1\*) NaHCO3 and NaOH(2) Na2CO3 and NaOH(3) Na2CO3 and NaHCO3(4) NaHCO3 and NaCI
- 36.
   Sodium carbonate is manufactured by :
   [DCE 1999]

   (1) Lowing process
   (2) Leblanc process
   (3\*) Solvay process
   (4) Haber's process
- 37.
   Which one is used as an air purifier in spacecraft ?
   [DCE 2000]

   (1) Quick lime
   (2) Slaked lime
   (3\*) Potassium superoxide
   (4) Anhydrous CaCl<sub>2</sub>
- 38.
   Carnallite in solution in water shows the properties of :
   [DCE 2003]

   (1\*) K+, Mg<sup>2+</sup>, CI<sup>-</sup>
   (2) K+, CI<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Br
   (3) K+, Mg<sup>2+</sup>, CO<sub>3</sub><sup>2-</sup>
   (4) K+, Mg<sup>2+</sup>, CI<sup>-</sup>, Br<sup>-</sup>
- 39. On strong heating sodium bicarbonate changes into : [DCE 2004]
   (1) sodium monoxide (2) sodium hydroxide (3\*) sodium carbonate (4) sodium peroxide
- 40.
   The carbonate that will not decompose on heating is :
   [Kerla PET 2007]

   (1\*) Na<sub>2</sub>CO<sub>3</sub>
   (2) CaCO<sub>3</sub>
   (3) BaCO<sub>3</sub>
   (4) SrCO<sub>3</sub>
- **41.** Select the incorrect statement with respect to sodium hydroxide.
  - (1) It is used in paper industry
  - (2) Zinc and aluminium liberates hydrogen gas on heating with NaOH.
  - (3) It is prepared by reaction of sodium carbonate with milk of lime.
  - (4\*) It is not hygroscopic in nature.

42. In Solvay process of manufacture of Na<sub>2</sub>CO<sub>3</sub>, the by products obtained from recovery tower are : (2) CaO, Na<sub>2</sub>CO<sub>3</sub>, CaCl<sub>2</sub>(3\*) CaCl<sub>2</sub>, CO<sub>2</sub>, NH<sub>3</sub> (4) Na<sub>2</sub>CO<sub>3</sub>, CaCl<sub>2</sub>, CO<sub>2</sub> (1) NH<sub>4</sub>Cl, CaO, CO<sub>2</sub> Section (F) : Compounds of alkaline earth metals 43. Plaster of Paris is : [DCE 1998] 1 (3\*) CaSO<sub>4</sub>.  $\frac{1}{2}$  H<sub>2</sub>O (4) CaSO<sub>4</sub>.1 2 H<sub>2</sub>O. (2) CaSO<sub>4</sub>.2H<sub>2</sub>O (1) CaSO<sub>4</sub>.H<sub>2</sub>O 44. Gypsum on heating at 120° C gives : [DCE 2000]  $(2^*)$  CaSO<sub>4</sub>,  $\overline{2}$  H<sub>2</sub>O (1) CaSO<sub>4</sub> (3) CaO (4) CaSO<sub>4</sub> H<sub>2</sub>O 45. Bleaching powder loses its power on keeping for a long time because : [Karnatak CET 2000] (1) it changes into calcium hypochlorate (2) it changes into calcium chloride and calcium hydroxide (3) it absorbs moisture (4\*) it changes into calcium chloride and calcium chlorate. 46. Hybridisation of BeCl<sub>2</sub> in vapour state at 100°C and in solid state respectively are : (1)  $sp^2$ ,  $sp^3$ (2)  $sp, sp^2$  $(3^*)$  sp. sp<sup>3</sup> (4) sp, sp 47. Chemical (X) is used for : (i) the production of sodium hydroxide (ii) the manufacture of bleaching powder (iii) for the extraction of magnesium from sea water. What is the chemical formula of (X)? (1\*) Ca(OH)2 (2) CaO (3) Ca(HCO<sub>3</sub>)<sub>2</sub> (4) CaCO3 48. Setting of plaster of paris involves : (1) the oxidation with atmospheric oxygen. (2) the removal of water to form anhydrous calcium sulphate. (3<sup>\*</sup>) the hydration to form the orthorhombic form of gypsum. (4) the reaction with atmospheric carbondioxide gas. 49. Which of the following is present in highest percentage in the portland cement ? (1) Dicalcium silicate (Ca<sub>2</sub>SiO<sub>4</sub>). (2\*) Tricalcium silicate (Ca<sub>3</sub>SiO<sub>5</sub>). (3) Tricalcium aluminate ( $Ca_3Al_2O_6$ ). (4) Gypsum (CaSO<sub>4</sub>.2H<sub>2</sub>O). 50. Assertion : Cesium is used in photoelectric cells. Reason : Cesium is most electropositive element. (1\*) Both assertion and reason are correct, and the reason is the correct explanation for the assertion (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion (3) The assertion is incorrect, but the reason is correct (4) Both are assertion and reason are incorrect 51. Assertion : Li<sub>2</sub>CO<sub>3</sub> is decomposed at a lower temperature. **Reason**: Smaller Li<sup>+</sup> polarises a large CO<sub>3</sub><sup>2-</sup> leading to the formation of more stable Li<sub>2</sub>O and CO<sub>2</sub> (1\*) Both assertion and reason are correct, and the reason is the correct explanation for the assertion

- (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
- (3) The assertion is incorrect, but the reason is correct
- (4) Both are assertion and reason are incorrect
- **52. Assertion**: When water is mixed with cement, setting of cement takes place to give a hard mass becuase,

**Reason :** Setting of cement involves the hydration of the molecules of the constituents and their rearrangement.

- (1\*) Both assertion and reason are correct, and the reason is the correct explanation for the assertion
- (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
- (3) The assertion is incorrect, but the reason is correct
- (4) Both are assertion and reason are incorrect

# **Exercise-3**

## PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1.	$KO_2$ (potassium super oxide) is used in oxygen (1*) Absorbs $CO_2$ and increases $O_2$ contents		<ul> <li>cylinders in space and submarines because it :</li> <li>(2) Eliminates moisture</li> </ul>			
	(3) Absorbs CO <sub>2</sub> and 1		(4) Produces oz	one	[AIEEE-2002, 3/225]	
2.	A metal M readily forms which becomes inert or (1*) Be	s water soluble sulphate n heating. The hydroxide (2) Mg	MSO₄, water inso is soluble in NaC (3) Ca	bluble hydroxide H. The M is : <b>[A</b> (4) Sr	e M(OH)₂ and oxide MC \IEEE-2002, 3/225]	
3.	In curing cement plasters, water is sprinkled fro (1*) developing interlocking needle like crystals (2) hydrated sand gravel mixed with cement (3) converting sand into silicic acid (4) keeping it cool.		m-time to time. Th of hydrate silicate	nis helps in : es	[AIEEE-2003, 3/225]	
4.	The substance not likel (1*) calcined gypsum	y to contain CaCO₃ is : (2) sea shells	(3) dolomite	(4) a m	[AIEEE-2003, 3/225] harble statue	
5.	The solubilities of carbonates decrease down the magnesium group due to a decrease in : [AIFEF-2003, 3/225]					
	(1*) hydration energies	of cations	(2) inter	ionic interactio	n	
	(3) entropy of solution formation (4) latt		(4) lattice energi	(4) lattice energies of solids.		
6.	Several blocks of magr	nesium are fixed to the b	ottom of a ship to	:	[AIEEE-2003, 3/225]	
	(1) make the ship lighte	(2*) prevent action of water and salt				
	(3) prevent puncturing	by under-sea rocks	(4) keep away th	ne sharks		
7.	One mole of magnesiu	m nitride on the reaction	with an excess of	water gives :	[AIEEE-2004, 3/225]	
	(1) one mole of ammor	nia	(2) one mole of nitric acid			
	(3*) two moles of ammonia		(4) two moles of nitric acid.			

8.	Beryllium and aluminiu	ım exhibit many propertie	es which are similar. But,	the two elements differ in				
	(1*) exhibiting maximu (3) forming covalent ha	m covalency in compoun alides	nds (2) forming pol (4) exhibiting amphoter	ymeric hydrides ric nature in their oxides.				
9.	Following statements regarding the periodic trends of chemical reactivity of the alkali metals and the halogens are given. Which of these statements gives the correct picture ? [AIEEE-2006, 3/165] (1) The reactivity decreases in the alkali metals but increases in the halogens with increase in atomic number down the group.							
	<ul><li>(2) In both the alkali m number down the grou</li><li>(3) Chemical reactivity</li></ul>	netals and the halogens t ip. increases with increase i	he chemical reactivity de	ecreases with increase in atomic ne group in both the alkali metals				
	(4*) In alkali metals the number down the grou	ne reactivity increases b ip.	ut in the halogens it dec	creases with increase in atomic				
10.	The ionic mobility of al (1) K <sup>+</sup>	kali metal ions in aqueou (2*) Rb+	is solution is maximum fo (3) Li <sup>+</sup>	or : [AIEEE-2006, 3/165] (4) Na <sup>+</sup>				
11.	Which one of the follo given oxides ?	wing orders presents the	e correct sequence of the	e increasing basic nature of the [AIEEE-2011, 4/120]				
12.	The products obtained $(1^*)$ Li <sub>2</sub> O + NO <sub>2</sub> + O <sub>2</sub>	l on heating LiNO₃ will be (2) Li₃N + O₂	9 : (3) Li <sub>2</sub> O + NO + O <sub>2</sub>	<b>[AIEEE-2011, 4/120]</b> (4) LiNO3 + O2				
13.	Which of the following	on thermal decompositio	on yields a basic as well a	as acidic oxide ? [AIEEE-2011, 4/120]				
14.	Which one of the follow enthalpy ?	ving alkaline earth metal s	sulphates has its hydratio [JEE(I	n enthalpy greater than its lattice Main) 2015, 4/120]				
	(1) CaSO <sub>4</sub>	(2*) BeSO4	(3) BaSO <sub>4</sub>	(4) SrSO <sub>4</sub>				
15.	The hottest region of E	Bunsen flame shown in th	e figure below is:	[JEE(Main) 2016, 4/120]				
	(1*) region 2	(2) region 3	(3) region 4	(4) region 1				
16.	The main oxides forme	ed on combustion of Li, N	la and K in excess of air	are, respectively: [JEE(Main)-2016, 4/120]				
	(1) $LiO_2$ , $Na_2O_2$ and $K_2$	2 <b>0</b>	(2) $Li_2O_2$ , $Na_2O_2$ and K	O <sub>2</sub>				
	(3*) $Li_2O$ , $Na_2O_2$ and K	(O <sub>2</sub>	(4) Li <sub>2</sub> O, Na <sub>2</sub> O and KO	2				
17.	Both lithium and magn	esium display several sin	nilar properties due to the	e diagonal relationship; however,				
	the one which is incorr	rect, is :	[JEE(	Main)-2017, 4/120]				
	(1) both form soluble b	oicarbonates						
	(2) both form nitrides		on hootin -					
	(3) nitrates of both Li a	and wig yield $NO_2$ and $O_2$	on neating					
	(4°) both form basic ca	ardonates						

## **ONLINE JEE-MAIN**

2.	The correct order of thermal stability of hydroxides is : [JEE(Main) 2015 Online (10-04-15), 4/120]					
	(1) Ba(OH) <sub>2</sub> < Ca(OH) <sub>2</sub>	< Sr(OH) <sub>2</sub> $<$ Mg(OH) <sub>2</sub>	(2) $Ba(OH)_2 < Sr(OH)_2$	$< Ca(OH)_2 < Mg(OH)_2$		
	(3) Mg(OH) <sub>2</sub> < Ca(OH) <sub>2</sub>	$2 < Sr(OH)_2 < Ba(OH)_2$	(4*) Mg(OH) <sub>2</sub> < Sr(OH)	2 < Ca(OH)2 < Ba(OH)2		
3.	The correct order of the	e solubility of alkaline-ear	th metal sulphates in wa [JEE(Main) 2016 Onlii	ater is : ne (09-04-16), 4/120]		
	(1) Mg < Sr < Ca < Ba		(2*) Mg > Ca > Sr > Ba	l		
	(3) Mg > Sr > Ca > Ba		(4) Mg < Ca < Sr < Ba			
4.	The commercial name	for calcium oxide is :				
	(1*) Quick lime	(2) Milk of lime	[JEE(Main) 2016 Onlin (3) Slaked lime	n <b>e (10-04-16), 4/120]</b> (4) Limestone		
5.	Both lithium and magne	esium display several sim	ilar properties due to the	e diagonal relationship; however,		
			[JEE(Main) 20	16 Online (02-04-17), 4/120]		
	<ul> <li>(1) both form soluble bicarbonates</li> <li>(2) both form nitrides</li> <li>(3) nitrates of both Li and Mg yield NO<sub>2</sub> and O<sub>2</sub> on heating</li> <li>(4*) both form basic carbonates</li> </ul>					
6.	The products obtained	when chlorine gas reacts	with cold and dilute aqu [JEE(Main) 2	ueous NaOH are : 2016 Online (02-04-17), 4/120]		
	(1) $CIO_2^-$ and $CIO_3^-$	(2*) Cl <sup>-</sup> and ClO <sup>-</sup>	(3) Cl⁻ and <sup>ClO</sup> 2 <sup>−</sup>	(4) CIO <sup>-</sup> and $CIO_3^-$		
PAR	T - II : JEE (ADVA	NCED) / IIT-JEE	PROBLEMS (PR	EVIOUS YEARS)		
1.	Property of the alkaline	earth metals that increas	ses with their atomic nur	nber is : 1997(Cancelled), 2/200]		
	<ul><li>(A) ionisation energy</li><li>(C) solubility of their sul</li></ul>	lphates	(B*) solubility of their h (D) electronegativity	ydroxides		
2.	The set representing th (A) K > Na > Li	e correct order of first ior (B*) Be >Mg>Ca	nization potential is : (C) B > C > N	<b>[JEE-2001, 1/35]</b> (D) Ge > Si > C		
3.	Statement-1 : Alkali me Statement-2 : Alkali m metals). (A) Statement-1 is True	etals dissolve in liquid an etals in liquid ammonia e, Statement-2 is True; St	nmonia to give blue solu give solvated species of tatement-2 is a correct e	tions. f the type [M(NH <sub>3</sub> ) <sub>n</sub> ]+ (M = alkali <b>[JEE-2007, 3/162]</b> explanation for Statement-1.		

Max. Time : 1 Hr.

(B)Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False.

(D) Statement-1 is False, Statement-2 is True.

## Additional Problems For Self Practice (APSP)

## **PART - I : PRACTICE TEST PAPER**

## JEE(Main) Pattern Practice paper (30 SCQ, 1 hr, 120 Marks).

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

Max. Marks : 120

#### Important Instructions

- 1. The test is of 1 hour duration.
- 2. The Test Booklet consists of **30** questions. The maximum marks are **120**.
- 3. Each question is allotted 4 (four) marks for correct response.
- 4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.

<sup>1</sup>/<sub>4</sub> (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.

1. Which of the following has maximum ionisation energy ? (1) Ba  $\rightarrow$  Ba<sup>+</sup> + e<sup>-</sup> (2) Be  $\rightarrow$  Be<sup>+</sup> + e<sup>-</sup> (3) Ca  $\rightarrow$  Ca<sup>2+</sup> + 2e<sup>-</sup> (4<sup>\*</sup>) Mg  $\rightarrow$  Mg<sup>2+</sup> + 2e<sup>-</sup>

Which of the following increases in magnitude as the atomic number of alkali metals increases?
 (1) Electronegativity
 (2) First ionisation potential

- (3\*) Ionic radius (4) Melting point
- 3. Alkali metals give colour in Bunsen flame due to : [Made by BMS\_2015]
  - (1) Low electronegativeity (2) One electron in outer most orbit
  - (3) Smaller atomic radii (4\*) Low ionisation energy
- 4. Which of the following statements about solution of alkali metals in liquid ammonia is correct ?
  - (1) The solutions have strong oxidizing properties.
  - (2) Both the dilute solution as well as concentrated solution are paramagntic in nature.
  - (3) Colour of the solution is attributed to charge transfer spectrum.
  - (4\*) None of these.
- 5. Select the incorrect statement :

(1) Solutions of alkali metals in liquid ammonia are a good reducing agents because they contain free or solvated electrons.

(2) The crystalline salts of alkaline earth metals contain more water of crystallisation than the corresponding alkali metal salts.

(4) Na<sub>3</sub>N

(3) Atoms of alkaline earth metals have smaller size and more nuclear charge than alkali metal atoms of same period.

(4\*) All alkali metal halides form hydrates.

6. Consider the following statements ;

 $\boldsymbol{S}_1$  : Among alkali metal halides lithium iodide is the most covalent in nature.

 $S_2$ : Potassium has greater photoelectric work function than sodium.

 $S_3$ : The blue solution of alkali metals in liquid ammonia is stable at room temperature, where ammonia is still a liquid, in the presence of Fe.

 $S_4$ : The melting and boiling points of alkali metal halides always follow the trend : chloride > fluoride > bromide > iodide.

and arrange in the order of true/false.

- 7. Which of the following has the highest reactivity towards water ?
  (1) Na
  (2\*) Rb
  (3) Li
  (4) K
- 8.
   Sodium burns in dry air to largely give :

   (1) Na<sub>2</sub>O
   (2\*) Na<sub>2</sub>O<sub>2</sub>
   (3) NaO<sub>2</sub>

9.	Alkali metals are not characterised by :	
	(1) good conductor of heat and electricity	(2) high oxidation potentials
	(3*) high melting points	(4) solubility in liquid ammonia

**10.** In view of their ionisation energies, the alkali metals are :

(1) weak oxidising agents	(2*) strong reducing agents
(3) strong oxidising agents	(4) weak reducing agents

- **11.** Which of the following is incorrect statement :
  - (1) Solubilities of alkaline earth metal fluorides and hydroxides generally increase down the group.
  - (2) Hydration energies of alkali metal halides decrease down the group with increase in size of cations.
  - (3\*) Mg<sup>2+</sup> ion is bigger than Li<sup>+</sup> ·
  - (4) BeCl<sub>2</sub> is easily hydrolysed in water.
- 12. A metal (M) burns with dazzling brilliance in air above 1000°C to give a white powder. The white powder reacts with water to form a white precipitate (P) and a colourless gas (G) with a characteristic smell. The metal (M) dissolves in conc. NaOH to liberate another gas(H). (H) may also be obtained on heating (G). Then:

	(1) M = Mg	(2*) M = Be	(3) $P = Ca(OH)_2$	(4) $G = O_3$
13.	Carbon can be ox	kidised to CO2 while heating	ng its powder with :	[Made by SM Sir_2015]
	(1) SO <sub>2</sub>	(2*) KNO3	(3) K <sub>2</sub> CO <sub>3</sub>	(4) FeS <sub>2</sub>

- 14. What happens when sodium metal is heated in excess of dry air containing carbon dioxide gas ?
  (1) Na<sub>2</sub>O<sub>2</sub> is formed. (2) Na<sub>2</sub>O is formed. (3\*) Na<sub>2</sub>CO<sub>3</sub> is formed. (4) Na<sub>3</sub>N is formed.
- 16. Which of the following oxides is formed when potassium metal is burnt in excess air ?

	(1) KO <sub>3</sub>	(2) K <sub>2</sub> O	(3) K <sub>2</sub> O <sub>2</sub>		(4*) KO <sub>2</sub>
17.	On commercial scale, s	odium hydroxide is prep	ared by :		
	(1) Dow's process	(2) Solvay process	(3*) Castne	r-Kellner cell	(4) Hall-Heroult process
		(2) Colvay process			
18	Which of the following a	nives sodium hydroxide :	along with hv	drogen gas o	n reaction with water 2
10.		(2*) Sodium amalaam		norovido	(4) Sodium corbonato
			(3) 30010111	peroxide	(4) Socium carbonate.
	(4) Na₂CO₃ + 2H₂O <	2NaOH + H <sub>2</sub> CO <sub>3</sub>			
40	Which of the following of	an eviet in equipous celu	ution 0		Mada hu CM Cir 20451
19.	(4) No. O	an exist in aqueous soit			
	(1) Na <sub>2</sub> O	(2) $Na_2O_2$	(3) KO <sub>2</sub>		$(4^{\circ}) \ K_2 \cup U_3$
20	Which of the following a	alta ara compand of in		tion and ania	m Mada by PMS 20151
20.				alion and anic	
			(III) MGF2		(IV) CaS
	(1) I and II	(2) II and III	(3*) III & IV	1	(4) None of these
24	Which of the following I	iboratoo H- with cold wa	tor 2		Mada by SM Sir 20151
21.					
	(1) $H_2O_2$	(2°) NaH	(3)	NaOH	(4) Mg
22	When ionic nitrides read	ct with water the produc	ts are :		
(1) acidia colution and hydrogen gos (2) acidia colution and ammonia gos					
	(3*) basic solution and	ammonia das	(2) boldie se	Jution and by	drogen gas
		ammonia gas.	(4) basic 30	nution and my	diogen gas.
23.	Low solubility of CsI in	water is due to :			
	(1) smaller hydration er	thalov of Cs+	(2) smaller	hydration ent	halov of I-
	(2) lower lattice onthale	w of its two ions	$(2)$ officients (2) $(4^*)$ (1) and	(2) both	
			(4)(1) and	(2) DOIN.	
24.	Select the correct state	ment.			
	(1) Among the alkali me	etals, only lithium reacts	with nitrogen	directly at roo	om temperature to form nitride.
	(2) Among the alkali me	etal carbonates 1 i2CO3 h	has the lowes	t thermal stat	oility
	(3) Among the alkali me	etal hydroxide. CsOH ha	s the highest	t solubility in v	water
	$(4^*)$ All of these		o the highest		
25.	NaNO <sub>3</sub> is not used as o	un powder because it is	:		
	(1*) hvaroscopic	(2) verv costly	(3)	amorphous	(4) soluble in water
	(.,).)9	(_),	(-)		()
26.	A doctor by mistake ac	Iministers a dilute Ba(N	$O_3)_2$ solution	to a patient f	or radiagraphic investigations.
	Which of the following	should be the best to pr	event the ab	sorption of sc	oluble Barium and subsequent
	Barium poisoning.	· · · · · · · · · · · · ·			Made by BMS 20151
	(1) NaCl	(2*) Na₀SO₄	(3)		(4) NH4CI
		(2)1102004	(3)	1.442003	
27.	Baking powder used to	o make cake is a mixtu	re of starch.	NaHCO <sub>3</sub> and	Ca(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub> . The function of
	$Ca(H_2PO_4)_2$ is:				
	(1) to slow down the rel	lease of CO <sub>2</sub> das			
		000000000000000000000000000000000000			

**S-BLOCK ELEMENTS** 

(2\*) it has acidic hydrogen and gives CO2 when moistened with NaHCO3

**CHEMISTRY FOR JEE** 

- (3) to act as a filler
- (4) None of these
- **28.** Which salt hydrolyses to a minimum extent ?
  - (1)  $Mg(NO_3)_2$  (2)  $Be(NO_3)_2$

(3) Ca(NO<sub>3</sub>)<sub>2</sub>

(4\*) Ba(NO<sub>3</sub>)<sub>2</sub>.

(2)  $Mg_2C_3$ ,  $Be_2C$  and  $Al_4C_3$ 

(4\*) Be<sub>2</sub>C and Al<sub>4</sub>C<sub>3</sub>

- 29. Methanides are :
  - (1) Mg\_2C\_3, Be\_2C, Al\_4C\_3 and CaC\_2
  - (3)  $Be_2C$ ,  $AI_4C_3$  and  $CaC_2$

**30.** Select correct statement :

- (1) Interstitial carbides are formed by metalloids like Si and B.
- (2\*) SiC and B<sub>4</sub>C are covalent carbides.
- (3) B<sub>4</sub>C on hydrolysis gives methane.
- (4) VC, WC are ionic carbides.

# Practice Test (JEE-Main Pattern)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

#### **OBJECTIVE RESPONSE SHEET (ORS)**

# **PART - II : PRACTICE QUESTIONS**

1.	. Which of the following is correct order ionization energies of alkali metals. [Made by DI					
	(1) Li < Na < K < Rb < 0	Cs		(2*) Li > Na > K > Rb	> Cs	
	(3) Na < Li < K < Rb < 0	Cs		(4) Cs < Na < K < Rb	< Li	
2.	Which of the following is	s correct density	order of	alkali metals.		[Made by DRM Mam]
	(1) Li < Na < K < Rb < 0	Cs		(2) Li > Na > K > Rb >	• Cs	
	(3*) Li > K > Na > Rb >	· Cs		(4) Rb < Li < Na < K	< Cs	
3.	Which of the following is	s least reducing	among a	alkali metals in aqueous	s medium.	[Made by DRM Mam]
	(1*) Sodium	(2) Potassium		(3) Cesium	(4) Rub	bidium
4.	Which of the following is	s strong reducing	g among	alkali metals in aqueo	us mediur	n.
						[Made by DRM Mam]
	(1) Sodium	(2) Potassium		(3) Cesium	(4*) Lit	hium
5.	Which of the following is	s strong reducing	g among	alkali metals in gaseo	us mediur	n.
						[Made by DRM Mam]
	(1) Sodium	(2) Potassium		(3*) Cesium	(4) Lith	ium
6.	Which of the following a	alkali metal has n	naximum	hydration in aqueous	medium.	[Made by DRM Mam]
	(1) Sodium	(2*) Lithium		(3) Cesium	(4) Pot	assium
7.	Which of the following a	alkali metal has n	ninimum	hydration in aqueous	medium. <b>[</b>	Made by DRM Mam]
	(1) Sodium	(2) Lithium		(3*) Cesium	(4) Pot	assium
8.	Which does not impart	in flame test?			[Made	by DRM Mam]
	(1) Li	(2) Na		(3) K	(4*) Be	
9.	Which has maximum re	ducing nature in	gaseou	s phase?	[Made	by DRM Mam]
	(1) Li	(2) Rb		(3*) Cs	(4) NG	
10.	Which is least reducing	in aq. medium ?			[Made	by DRM Mam]
	(1) Li	(2*) Na		(3) Cs	(4) Rb	
11.	Which is not correctly m	natched ?			(s-bloc	:k (INO)) [M]
	(1) Basic strength of oxides		Cs <sub>2</sub> O <rb<sub>2O&lt; K<sub>2</sub>O &lt; Na<sub>2</sub>O &lt; Li<sub>2</sub>O</rb<sub>			
	(2) Stability of peroxide	S	$Na_2O_2 < K_2O_2 < Rb_2O_2 < Cs_2O_2$			
	(3) Stability of bicarbonates		LiHCO	$_3 < NaHCO_3 < KHCO_3 $	< RbHCO	₃ < CsHCO₃
	(4) Melting point		NaF < I	NaCl < NaBr < Nal		
	(1*) 1 and 4	(2) 1 and 3		(3) 1 and 2	(4) 2 ai	nd 3
12.	When CO <sub>2</sub> is bubbled th	nrough NaOH, it	initially g	gives :	[SM Si	r_Jan_2013] [M]
	(1) CO		(2*) Na	2 <b>CO</b> 3		

	(3) NaHCO <sub>3</sub>	(4) Be	oth Na₂CO₃ a	and NaHCO₃ in equ	imolar ratio
13.	In context with the highl incorrect statement ? (1) In dilute solution th ammoniated) (2) It is paramagnetic, w (3*) It acts as powerful of (4) It shows blue colour	y pure dilute solution e main species are r ith approximately one xidising agent. and exhibits electrical	of sodium in metal ions (N unpaired ele conductivity.	liquid ammonia, wł Na⁺) and electrons ctron per metal atol	nich of the following is the , which are solvated (i.e. m.
14.	Which of the following st (1) Pure sodium metal c (2) CsOH has the maxim (3) Sodium carbonate at (4*) The hydrated radii c	atements is correct ? an be produced by the num basicity and least nd potassium carbona f alkaline earth metal	e electrolysis solubility am te both can b ions decreas	of an aqueous solu ong all alkali metal e manufactured by es on moving dowr	<b>(I-1) [M]</b> tion of NaCl. hydroxides. Solvay's process. the group.
15.	Berylium chloride exist a (1) $[Be(OH)_4]^{-2}$ + 2HCl (3) $Be^{+2}$ + 2Cl <sup>-</sup>	is monomer, dimer an	d polymeric s (2*) [Be(H (4) BeO +	solid form . When it <sub>2</sub> O) <sub>4</sub> ] <sup>+2</sup> + 2Cl <sup>-</sup> 2HCl <b>(Made by Dl</b>	dissolve in water it gives : (SBC(INO)) RM MAM on Jan.2014)
16.	The correct sequence of (1) BeCl <sub>2</sub> < NaCl < LiCl	increasing covalent c (2*) NaCl < LiCl < Bet	haracter is re Cl <sub>2</sub> (3) BeCl <sub>2</sub>	epresented by : < LiCl < NaCl (4) L	[AIPMT 1997] iCl < NaCl < BeCl₂
17.	Amongst the following th (1) KOH	ne weakest base is : (2) NaOH	(3*) Mg(O	H) <sub>2</sub> (4) C	[DCE 1997] Ca(OH) <sub>2</sub>
18.	For two ionic solids CaC (1) Lattice energy of Cac (2) KI is soluble in benze (3) CaO has high m.p. (4*) KI has high m.p.	and KI, identify the w D is much higher than ene	rong stateme that of KI	ent among the follow	wing ? <b>[AIPMT 1997]</b>
19.	The stability of the follow (1) LiCl > KCl > NaCL > (3) NaCl > KCl > LiCl >	ving alkali metal chlori CsCl CsCl	de follows the (2*) CsCl (4) KCl >	e order : > KCl > NaCl > LiC CsCl > NaCl > LiCl	<b>[MPPMT 1998]</b>
20.	Which of the following is (1) Al <sub>2</sub> O <sub>3</sub> .MgO, Cl <sub>2</sub> O <sub>7</sub> , S (3) SO <sub>3</sub> , Cl <sub>2</sub> O <sub>7</sub> , MgO, Al <sub>2</sub>	the correct order of g O3 2O3	radually decr (2) Cl <sub>2</sub> O <sub>7</sub> , (4*) MgO,	easing basic nature SO3, Al2O3, MgO Al2O3, SO3, Cl2O7	e of the oxides ? [DCE 1999]
21.	Brine solution on electro (1) NaOH	lysis will not give (2) Cl <sub>2</sub>	: (3) H <sub>2</sub>	(4*)	[ <b>DCE 2006</b> ] O <sub>2</sub>
22.	Dead burnt plaster is : (1) CaSO4.2H <sub>2</sub> O	(2) MgSO4.2F	H <sub>2</sub> O (3	<b>[Ke</b> ) CaSO4. 1/2 H <sub>2</sub> O	rla PMT 2006] (4*) CaSO4
23.	Pick out the statement ( A. Polarising power of L	s) which is (are) not tru '* and Mg²+ are almos	ue about the t same	diagonal relationsh	ip of Li and Mg ? [Kerla PET 2006]

B. Like Li, Mg decomposes water very fast.

	C. LiCl and MgCl <sub>2</sub> are o D. Like Li, Mg readily re (1) A and D	leliquescent. eacts with liquid bromine (2) B and C	at ordinary temperature. (3) Only B	(4*) B and D
24.	$S_1$ : LiHCO <sub>3</sub> does not e $S_2$ : Crude common sal $S_3$ : BeO is amphoteric	exist in solid state. t is hygroscopic because in nature.	e of impurities of CaSO₄ a	and MgSO <sub>4</sub> .
	(1) T T F	(2) F F T	(3*) T F T	(4) F T F
25.	Among the following hy (1) Be(OH) <sub>2</sub>	droxides highest solubili (2) Mg(OH)2	ty will be shown by (3) Ca(OH)₂	(4*) Ba(OH)2
26.	Which of the following r	netal will give apple gree	en colour on Busen flame	-
	(1*) Ba	(2) Sr	(3) Ca	(4) K
27.	The degree of hydration	n down the group	from Li+ to Cs+-	
	(1*) Decrease	(2) Increase	(3) Remain same	(4) None of these
28.	Which group of elemen	ts lose electrons more re	eadily -	
	(1*) Li, Na, K	(2) F <sub>2</sub> , Cl <sub>2</sub> , Br <sub>2</sub>	(3) N, P, As	(4) O, S, Sc