

CHAPTER

2

s-BLOCK ELEMENTS

MULTIPLE CHOICE QUESTIONS

- Which one of the following is not an alkali metals:
(a) Fr (b) Cs
(c) Rb (d) Ra
- Down's cell is used to prepare:
(a) Na_2CO_3 (b) NaHCO_3
(c) Na (d) NaOH
- Chile saltpeter has the chemical formula:
(a) NaNO_3 (b) KNO_3
(c) $\text{Na}_2\text{B}_4\text{O}_7$ (d) $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$
- Which ion will have the maximum value of heat of hydration:
(a) Na^+ (b) Cs^+
(c) Ba^{+2} (d) Mg^{+2}
- Beryllium metal is as hard as:
(a) Fe (b) Cu
(c) Zn (d) Diamond
- One of the following alkali metals is the most reactive which is that:
(a) Cs (b) K
(c) Na (d) Li
- Which of the following does not give flame test:
(a) Zn (b) Ba
(c) Sr (d) Ca

8. Sodium metal cannot be stored in:
- (a) Toluene (b) Alcohol
(c) Benzene (d) Kerosene oil
9. Dolomite is a carbonate of:
- (a) Ca and Ba (b) Mg and Al
(c) Ca and Mg (d) Na
10. Which one of the following configurations corresponds to an alkaline earth metals:
- (a) $[\text{Ar}] 3d^{10} 4s^2$ (b) $[\text{Ne}] 3d^2 3p^2$
(c) $[\text{Ar}] 4s^2$ (d) $[\text{Ar}] 3d^{10} 4s^1$
11. Dead burnt gypsum is:
- (a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (b) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
(c) CaSO_4 (d) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
12. When some water is added to plaster of Paris, it becomes hard and expansion in volume how much:
- (a) 1% (b) 10%
(c) 4% (d) 2%
13. Which of the following compound is formed when Na burn in excess of air:
- (a) NaO_2 (b) Na_2O_2
(c) Na_2O (d) Na_2O_3
14. Chemical formula of slaked lime is:
- (a) CaCO_3 (b) $\text{Ca}(\text{OH})_2 \cdot \text{H}_2\text{O}$
(c) $\text{Ca}(\text{OH})_2$ (d) CaSO_4
15. Which of the following is not a function of sulphur:
- (a) Enlarged root system in plants (b) Chlorophyll development in leaves
(c) Good yield of crops (d) Control of pH of soil
16. Which is produced at the cathode during the electrolysis of brine in Nelson's cell:
- (a) H_2 (b) Na
(c) Cl_2 (d) O_2

17. Which of the following elements can produce H_2 gas when treated with sodium hydroxide:
- (a) Be (b) Mg
(c) Ca (d) Sr
18. The operating temp of Down's cell is:
- (a) $800^\circ C$ (b) $600^\circ C$
(c) $1800^\circ C$ (d) $900^\circ C$
19. $CaMg_3(SiO_3)_4$ is the composition of:
- (a) Dolomite (b) Gypsum
(c) Calcite (d) Asbestos
20. Halite is chemical name of:
- (a) KCl (b) NaCl
(c) $MgCl_2$ (d) $SrCl_2$

answers

1.	(d)	2.	(c)	3.	(a)	4.	(d)	5.	(a)
6.	(a)	7.	(a)	8.	(b)	9.	(c)	10.	(c)
11.	(c)	12.	(a)	13.	(b)	14.	(c)	15.	(d)
16.	(a)	17.	(a)	18.	(b)	19.	(d)	20.	(b)

SOLVED EXERCISE

Q.1 Fill in the blanks:

- (i) Alkali metals are ———— reactive than alkaline-earth metals.
- (ii) Alkali metals decompose water vigorously producing ———— and hydrogen.
- (iii) When heated in a current of dry hydrogen, alkaline earth metals form white crystalline ———— of the type MH_2 .
- (iv) The beryllium hydroxide, like the hydroxide of aluminium is amphoteric, while the hydroxides of the other members of the group IIA are ————.
- (v) The elements of the group IA are termed as alkali metals, because their ———— are alkaline.
- (vi) Spodumene is an ore of ———— metal.
- (vii) Alkali metal nitrates on heating give the corresponding ———— and oxygen (except Li).
- (viii) $Na_2CO_3 \cdot H_2O$ is the chemical formula of a mineral of sodium which is known as ————.
- (ix) Metallic bicarbonates are decomposed on heating into their carbonates, alongwith ———— and ————.
- (x) Metal nitrates other than the alkali metals on heating decompose into the corresponding metal ———— alongwith the evolution of nitrogen peroxide and oxygen.

answers

(i)	more	(ii)	hydroxide	(iii)	hydrides
(iv)	basic	(v)	hydroxides, oxides	(vi)	lithium
(vii)	nitrite	(viii)	natron	(ix)	CO_2, H_2O
(x)	oxides				

Q.2 Indicate True or False:

- (i) Group IA elements are called alkali metals because their chlorides are alkaline in nature.
- (ii) Alkali metals are very good conductor of electricity.
- (iii) The hydroxides of alkali metals and alkaline-earth metals are soluble in water.
- (iv) Plaster of Paris is a hemihydrate.
- (v) Alkali metals have low melting and boiling points as compared to those of alkaline-earth metals.
- (vi) Lithium carbonate is decomposed to its oxide, but the carbonates of the other alkali metals are stable towards heat.
- (vii) All alkali metal sulphates are insoluble in water.
- (viii) Lithium combines with nitrogen to form lithium nitride but other alkali metals do not react with nitrogen.
- (ix) Trona is a mineral of lithium.
- (x) Alkaline-earth metals are stronger reducing agents than alkali metals.

answers

(i)	False	(ii)	True	(iii)	True	(iv)	True	(v)	True
(vi)	True	(vii)	False	(viii)	True	(ix)	False	(x)	False

Q.3 Multiple choice questions. Encircle the correct answer:

- (i) Which one of the following does not belong to alkaline-earth metals:
 - (a) Be
 - (b) Ra
 - (c) Ba
 - (d) Rn
- (ii) The oxides of beryllium are:
 - (a) Acidic
 - (b) Basic
 - (c) Amphoteric
 - (d) None of these
- (iii) Which ion will have the maximum value of heat of hydration:
 - (a) Na^+
 - (b) Cs^{2+}
 - (c) Ba^{2+}
 - (d) Mg^{2+}
- (iv) Which one of the following is not an alkali metals:
 - (a) Francium
 - (b) Caesium
 - (c) Rubidium
 - (d) Radium

- (v) Which of the following sulphates is not soluble in water:
- (a) Sodium sulphate (b) Potassium sulphate
(c) Zinc sulphate (d) Barium sulphate
- (vi) The element caesium bears resemblance with:
- (a) Ca (b) Cr
(c) Both of these metals (d) None of these metals
- (vii) Saltpetre has the chemical formula:
- (a) KNO_3 (b) KNO_2
(c) $\text{Na}_2\text{B}_4\text{O}_7$ (d) $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
- (viii) The mineral $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ has the general name:
- (a) Gypsum (b) Dolomite
(c) Calcite (d) Epsom salt
- (ix) Down's cell is used to prepare:
- (a) Sodium carbonate (b) Sodium bicarbonate
(c) Sodium metal (d) Sodium hydroxide
- (x) Which element is deposited at the cathode during the electrolysis of brine in diaphragm cell:
- (a) H_2 (b) Na
(c) Cl_2 (d) O_2

answers

(i)	(d)	(ii)	(c)	(iii)	(d)	(iv)	(d)	(v)	(d)
(vi)	(d)	(vii)	(a)	(viii)	(a)	(ix)	(c)	(x)	(a)

- Q.4** (a) Give the names, electronic configurations and occurrence of s-block elements.
- (b) Discuss the peculiar behaviour of lithium with respect to the other members of alkali metals.

Ans.

- (a) Descriptive question. For details see text book.
- (b) Descriptive question. For details see text book.

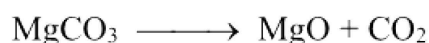
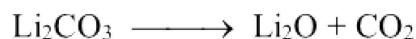
Q.5 Discuss the trends in chemical properties of compounds like oxides, hydroxides carbonates, nitrates and sulphates of IA and IIA group elements.

Ans. Detailed question. For answer see text book.

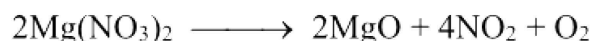
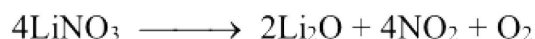
Q.6 Compare the chemical behaviour of lithium with magnesium.

Ans. As Li and Mg have diagonal relationship so they resemble in chemical properties which are given below:

- (i) On heating in air, both Li and Mg form normal oxides.
- (ii) Carbonates and phosphates of both Li and Mg are insoluble in water.
- (iii) Carbonates of both Li and Mg are unstable and decompose to form oxides.



- (iv) The nitrates of both Li and Mg decompose to form NO_2 and O_2 leaving a residue of oxides:



- (v) Both Li and Mg react with N_2 to form nitrides:



- (vi) Both Li and Mg give only monoxides Li_2O and MgO .

Q.7 (a) Mention the properties of beryllium in which it does not resemble with its own family.

(b) Why the aqueous solution of Na_2CO_3 is alkaline in nature?

Ans.

(a) Detailed question. Consult text book.

(b) When Na_2CO_3 is dissolved in water



A strong alkali NaOH and a weak acid H_2CO_3 are formed. Due to formation of NaOH , solution of Na_2CO_3 is alkaline in nature.

Q.8 (a) Describe with diagram the manufacture of sodium by Down's cell.

(b) Point out the three advantages of this process.

Ans. Detailed questions. See text book.

Q.9 (a) Compare the physical and chemical properties of alkali metals with those of alkaline-earth metals.

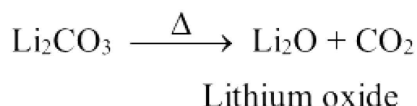
(b) What happens when:

- (i) Lithium carbonate is heated.
- (ii) Lithium hydroxide is heated to red-hot.
- (iii) Beryllium is treated with sodium hydroxide.
- (iv) Lithium hydride is treated with water.

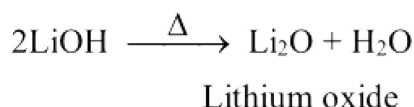
Ans.

(a) Detailed questions. See text book.

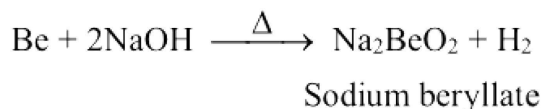
(b) (i) Lithium carbonate is heated:



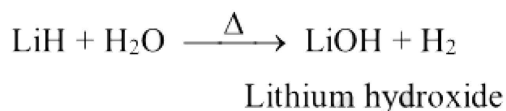
(ii) Lithium hydroxide is heated to red-hot:



(iii) Beryllium is treated with sodium hydroxide:



(iv) Lithium hydride is treated with water:



Q.10 Give formulas of the following minerals:

Ans.

- | | |
|---------------------|---|
| (a) Dolomite | $\text{MgCO}_3 \cdot \text{CaCO}_3$ |
| (b) Asbestos | $\text{CaMg}_3(\text{SiO}_3)_4$ |
| (c) Halite | NaCl |
| (d) Natron | $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ |
| (e) Beryl | $\text{Be}_3\text{Al}_2(\text{SiO}_3)_6$ |
| (f) Sylvite | KCl |
| (g) Phosphorite | $\text{Ca}_3(\text{PO}_4)_2$ |
| (h) Chile saltpeter | NaNO_3 |

Q.11 Answer the following question briefly:

- (a) Why alkali and alkaline earth metals are among the reactive elements of the periodic table?
- (b) Why lime-water turns milky with CO_2 but becomes clear with excess CO_2 ?
- (c) How gypsum is converted into plaster of Paris?
- (d) Why 2% gypsum is added in the cement?
- (e) Why lime is added to an acidic soil?
- (f) How lime and sand are used to make glass?
- (g) How lime mortar is prepared?

Ans.

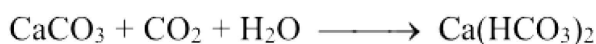
- (a) Alkali and alkaline earth metals more electropositive because they can easily lose one and two electrons from their valence shell, respectively. Their electropositive character and low ionization energy make them reactive elements of periodic table.

- (b) Lime water turns milky due to the formation of CaCO_3



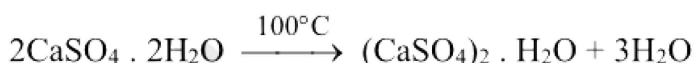
Lime water

But in the excess of CO_2 solution becomes clear due to the formation of $\text{Ca(HCO}_3)_2$ which is soluble in water



in excess

- (c) When gypsum is heated at 100°C it loses three quarters ($3/4$) of its water and resulting product is called as Plaster of Paris.



Gypsum

Plaster of Paris

- (d) During the formation of cement when it is in the form of **clinker** then 2% gypsum is added. The addition of gypsum increases the setting time of cement.
- (e) Lime is added to acidic soils because it neutralizes the soil and increase the amount of readily soluble phosphorus.
- (f) Lime has ability to react with sand at high temperature and form calcium silicate (CaSiO_3) which serves as an important basis for manufacturing of glass.
- (g) Lime mortar is prepared by mixing freshly prepared slaked lime (one volume) and (2 or 4 volumes) of water. Lime mortar binds the stones and bricks firmly.

The equations when mortar hardens are:

