

Question2

Identify the correct statement from the following.

- A. Among alkali metal ions, Li^+ has highest hydration enthalpy.
- B. Boiling point of alkali metals increases from Li to Cs .
- C. Density of K is less than that of Na and Rb .
- D. Li has strong tendency to form superoxide.

The correct answer is

AP EAPCET 2025 - 26th May Evening Shift

Options:

A.

A and B

B.

B and C

C.

A and C

D.

A and D

Answer: C

Solution:

Statement given in *A* and *C* are correct, while *B* and *D* are incorrect, Their correct forms are

(B) Boiling point of alkali, metal decreases from Li to Cs .

(D) Li has tendency to form monoxide.



Question3

Consider the following

Statement - I : Both BeSO_4 and MgSO_4 are readily soluble in water.

Statement - II : Among the nitrates of alkaline earth metals, only $\text{Be}(\text{NO}_3)_2$ on strong heating gives its oxide, NO_2 and O_2 .

The correct answer is

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Options:

A.

Both Statement-I and Statement-II are correct.

B.

Statement-I is correct, but Statement-II is not correct.

C.

Statement-I is not correct, but Statement-II is correct.

D.

Both statement-I and Statement-II are not correct.

Answer: B

Solution:

Analysis of Statement - I: Both BeSO_4 and MgSO_4 are readily soluble in water.

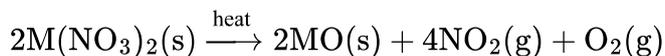
- The solubility of sulfates of alkaline earth metals generally decreases down the group.
- BeSO_4 (Beryllium sulfate) is readily soluble in water. This is due to the very small size of the Be^{2+} ion, which leads to very high hydration energy. This high hydration energy more than compensates for the relatively high lattice energy, making it highly soluble.
- MgSO_4 (Magnesium sulfate, commonly known as Epsom salt) is also readily soluble in water. Similar to beryllium, the Mg^{2+} ion is relatively small, leading to significant hydration energy.
- In contrast, CaSO_4 (Calcium sulfate) is sparingly soluble, and SrSO_4 (Strontium sulfate) and BaSO_4 (Barium sulfate) are practically insoluble.



Therefore, Statement - I is **correct**.

Analysis of Statement - II: Among the nitrates of alkaline earth metals, only $\text{Be}(\text{NO}_3)_2$ on strong heating gives its oxide, NO_2 and O_2 .

- Alkaline earth metal nitrates decompose on strong heating to give the metal oxide, nitrogen dioxide (NO_2), and oxygen (O_2). The general reaction is:



- This decomposition pattern is observed for *all* alkaline earth metal nitrates.
 - $\text{Be}(\text{NO}_3)_2 \xrightarrow{\text{heat}} \text{BeO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$
 - $\text{Mg}(\text{NO}_3)_2 \xrightarrow{\text{heat}} \text{MgO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$
 - $\text{Ca}(\text{NO}_3)_2 \xrightarrow{\text{heat}} \text{CaO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$
 - And similarly for $\text{Sr}(\text{NO}_3)_2$ and $\text{Ba}(\text{NO}_3)_2$.
- The thermal stability of these nitrates generally increases down the group ($\text{Be}(\text{NO}_3)_2$ is the least stable, and $\text{Ba}(\text{NO}_3)_2$ is the most stable), meaning they decompose at different temperatures, but the decomposition *products* are the same for all of them.
- The statement claims that "only $\text{Be}(\text{NO}_3)_2$ " decomposes in this manner, which is incorrect as all alkaline earth metal nitrates follow this decomposition pathway.

Therefore, Statement - II is **not correct**.

Conclusion:

Statement - I is correct.

Statement - II is not correct.

This matches option B.

The final answer is B

Question4

Which chloride does not exist as hydrate?

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Options:

A.

MgCl_2



B.



C.



D.



Answer: D

Solution:

KCl does not exist as hydrate. The reason is K^+ ion have a weak ability to attract and bind water molecules due to their large size and low charge density.

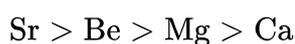
Question5

The correct order of density of Be, Mg, Ca, Sr is

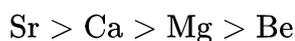
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Options:

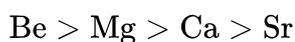
A.



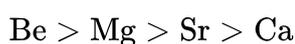
B.



C.



D.

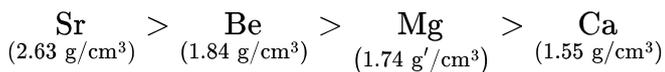


Answer: A

Solution:



The correct order of density is,



Question6

Which of the following statements are correct regarding lithium and magnesium?

- I. They react slowly with water.
- II. Their bicarbonates are solids.
- III. Their chlorides are not soluble in ethanol.
- IV. Their nitrates decompose easily on heating.

The correct option is

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Options:

- A.
II and III only
- B.
I and III only
- C.
I and IV only
- D.
III and IV only

Answer: C



Solution:

Statement given in I and IV are correct regarding lithium and magnesium, while statement II and III are incorrect. Their correct forms are (II) The bicarbonate of lithium and magnesium are liquid.

(III) LiCl or MgCl₂ are soluble in organic solvent like ethanol.

Question 7

Which of the following orders are correct against the stated property?

I. NaO₂ < KO₂ < RbO₂ < CsO₂ - stability

II. Mg(OH)₂ < Ca(OH)₂ < Sr(OH)₂ - basic strength

III. MgCO₃ < CaCO₃ < SrCO₃ - thermal stability

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Options:

A.

I and III only

B.

II and III only

C.

I and II only

D.

I, II and III

Answer: D

Solution:

All the three stated property are correctly ordered.

$\text{NaO}_2 < \text{KO}_2 < \text{RbO}_2 < \text{CsO}_2$ - stability

$\text{Mg}(\text{OH})_2 < \text{Ca}(\text{OH})_2 < \text{Sr}(\text{OH})_2$ - basic strength

$\text{MgCO}_3 < \text{CaCO}_3 < \text{SrCO}_3$ - thermal stability

Question8

Which of the following statement is incorrect with reference to alkaline earth metals?

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Options:

A.

Solubility of carbonates in water decreases down the group.

B.

All the sulphates are thermally stable.

C.

All the nitrates decompose on heating.

D.

All halides are ionic in nature.

Answer: D

Solution:

Option A:

“Solubility of carbonates in water decreases down the group.”

For **alkaline earth metals (Group 2):**

- The solubility of **carbonates (MCO_3)** actually **decreases down the group** because lattice energy decreases more slowly than the hydration energy.



✔ This statement is correct.

Option B:

“All the sulphates are thermally stable.”

For sulphates (MSO_4) of alkaline earth metals:

- All of them are thermally stable, i.e., they do not decompose easily on heating.

✔ This statement is correct.

Option C:

“All the nitrates decompose on heating.”

For nitrates ($\text{M}(\text{NO}_3)_2$) of group 2:

- All nitrates decompose on heating to give oxides, nitrogen dioxide, and oxygen.

✔ This statement is correct.

Option D:

“All halides are ionic in nature.”

For halides (MX_2):

- Most are ionic, but BeCl_2 (beryllium chloride) has covalent character due to the small size and high polarizing power of Be^{2+} .

✘ This statement is incorrect.

✔ Final Answer: Option D – All halides are ionic in nature (Incorrect statement).

Question9

Which of the following, on thermal decomposition, form both acidic and basic oxides along with O_2 ?

(i) NaNO_3

(ii) $\text{Ca}(\text{NO}_3)_2$

(iii) $\text{Be}(\text{NO}_3)_2$

(iv) LiNO_3



The correct option is

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Options:

A. ii, iii only

B. iii, iv only

C. ii, iv only

D. i , ii, iii

Answer: C

Solution:

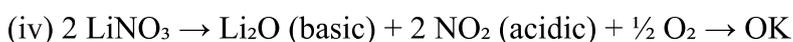
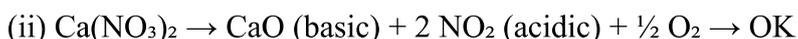
The key is that only those nitrates which on heating give

- an acidic oxide (NO_2)
- a basic oxide (the metal oxide)
- and O_2

will count.



– gives a nitrite, not a metal oxide \rightarrow rejected



Hence only (ii) and (iv) produce both an acidic oxide and a basic oxide along with O_2 .

Answer: C (ii, iv)

Question10

Which one of the following alkali metals is the weakest reducing agent as per their E° values?



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Options:

A. K

B. Cs

C. Li

D. Na

Answer: D

Solution:

Na is weakest reducing agent as per E° values. Reduction potential of sodium is -2.71 V . The reduction potential of an oxidised species is its tendency to gain electrons and get reduced.

Larger the negative value of reduction potential, stronger is the reducing agent.

$E_{M^+/M}^\circ$ (in V) \Rightarrow

Li	Rb	Cs	K	Na
-3.04	-2.93	-2.927	-2.925	-2.71

Question11

Which one of the following alkaline earth metals does not form hydride when it is heated with hydrogen directly?

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Options:

A. Be

B. Mg

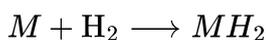
C. Ca

D. Sr

Answer: A

Solution:

All group 2 elements, except beryllium (Be), react with hydrogen to form hydrides when heated. The general reaction is as follows:



Here, M represents the alkaline earth metal. Beryllium is the exception and does not form a hydride under these conditions.

Question12

Which one of the following statements is not correct about the compounds of alkaline earth metals?

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Options:

- A. Basic nature increases from $Mg(OH)_2$ to $Ba(OH)_2$.
- B. Thermal stability decreases from $BeCO_3$ to $BaCO_3$
- C. Solubility of sulphates in water decreases from $BeSO_4$ to $BaSO_4$.
- D. Nitrates of these on heating give oxides.

Answer: B

Solution:

Basic Nature of Hydroxides

In group 2, as we move from magnesium to barium, the metal cation becomes larger and its charge density decreases.

This causes the hydroxides to be more ionic and more soluble in water.

More soluble hydroxides produce a greater amount of hydroxide ions in solution, meaning they are more basic.

Thus, $Ba(OH)_2$ is more basic than $Mg(OH)_2$.

Option A is correct.

Thermal Stability of Carbonates



The general trend for the thermal decomposition of alkaline earth metal carbonates is that the decomposition temperature increases as we go down the group.

For example, MgCO_3 decomposes at a lower temperature than CaCO_3 , and continuing this trend, BaCO_3 (if it could be isolated cleanly) would be thermally more stable than BeCO_3 .

Therefore, to say "thermal stability decreases from BeCO_3 to BaCO_3 " is incorrect; it actually increases.

Option B is the wrong statement.

Solubility of Sulphates

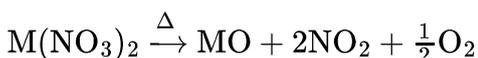
The solubility of alkaline earth metal sulphates decreases down the group.

For instance, while MgSO_4 and even BeSO_4 (with its slight peculiarities due to beryllium's atypical behavior) are relatively soluble, BaSO_4 is famous for its insolubility (used in radiography).

Thus, the trend stated in Option C is correct.

Decomposition of Nitrates

On heating, the nitrates of alkaline earth metals decompose according to a reaction like:



where M represents the metal (e.g., Mg, Ca, Ba).

This is a well-known property of these nitrates.

Option D is correct.

Conclusion:

The statement that is NOT correct about the compounds of alkaline earth metals is Option B.

Thus, the answer is Option B.

Question13

The correct order of density of Be, Mg, Ca, Sr is

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Options:

A. $\text{Sr} > \text{Be} > \text{Mg} > \text{Ca}$

B. $\text{Be} > \text{Mg} > \text{Ca} > \text{Sr}$

C. $\text{Mg} > \text{Ca} > \text{Sr} > \text{Be}$

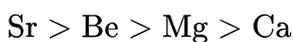
D. $\text{Ca} > \text{Sr} > \text{Be} > \text{Mg}$



Answer: A

Solution:

The correct order of density for the elements Beryllium (Be), Magnesium (Mg), Calcium (Ca), and Strontium (Sr) is:



As we move down a group in the periodic table, the size of the alkali metals increases, leading to an increase in their volume. Volume is inversely proportional to density, which means more volume generally leads to lower density.

However, in the case of Strontium (Sr) and Beryllium (Be), the increase in volume is not as significant compared to the increase in mass. This results in an unusual pattern where the density initially decreases as we go down the group but then increases.

Question14

Ba, Ca and Sr form halide hydrates. Their formulae are $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$, $\text{CaCl}_2 \cdot y\text{H}_2\text{O}$ and $\text{SrCl}_2 \cdot z\text{H}_2\text{O}$. The value of x, y, z respectively are

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Options:

A. 2, 6, 6

B. 8, 6, 2

C. 8, 6, 6

D. 6, 4, 2

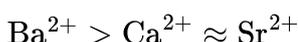
Answer: A

Solution:

Polarising power $\propto \frac{1}{\text{Size of cation}}$

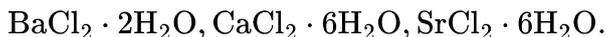
Polarising power \propto Water of crystallisation tendency.

From the given elements, size of cation order is



Thus, tendency to form water of crystallisation is minimum for Ba^{2+} and same for Ca and Sr^{2+} .

Hence, it will be



$$x = 2, y = 6, z = 6$$

Question15

The correct order of decomposition temperature of $\text{MgCO}_3(X)$, $\text{BaCO}_3(Y)$, $\text{CaCO}_3(Z)$ is

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Options:

A. $Y > Z > X$

B. $X > Y > Z$

C. $Y > X > Z$

D. $X > Z > Y$

Answer: A

Solution:

The correct order of decomposition temperature for the carbonates $\text{MgCO}_3(X)$, $\text{BaCO}_3(Y)$, and $\text{CaCO}_3(Z)$ is :



This implies the order is $Y > Z > X$.

This order of decomposition can also be described as the thermal stability order. As you move down the group in the periodic table, the thermal stability of alkaline earth metal carbonates increases. This increasing stability is explained by the rise in ionic character as you go down the group.

Question16

Identify the correct statements from the following.

(A) BeSO_4 is soluble in water.



(B) BeO is an amphoteric oxide.

(C) CO can be obtained by heating CaCO_3 at 1070 – 1270 K.

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Options:

A. A, B, C

B. A and B

C. A and C

D. B and C

Answer: B

Solution:

(A) BeSO_4 is soluble in water due to higher hydration energy of Be^{2+} . It overcomes the lattice energy factors making BeSO_4 soluble in water. The statement is correct.

(B) BeO is amphoteric oxide as it can react with both acid and base, thus acting as basic and acidic respectively. The given statement is thus correct.

(C) CO can be obtained by heating CaCO_3 at 1070 – 1270 K is a incorrect statement.



∴ The correct statements are only A and B.

Question17

The pair of elements that form both oxides and nitrides, when burnt in air are

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Options:

A. Na, Mg

B. Na, Be

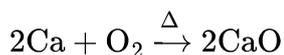
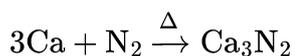
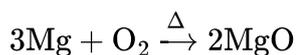
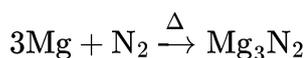
C. Mg, Ca

D. Be, Mn

Answer: C

Solution:

Group II elements are known to form both oxides and nitrides upon combustion in air. Therefore, the pair of elements from Group II that form both compounds are Magnesium (Mg) and Calcium (Ca).



Magnesium and Calcium react with nitrogen and oxygen to form magnesium nitride (Mg_3N_2), magnesium oxide (MgO), calcium nitride (Ca_3N_2), and calcium oxide (CaO), respectively.

Question18

Assertion (A) MgSO_4 is readily soluble in water.

Reason (R) The greater hydration enthalpy of Mg^{2+} ions overcome is lattice enthalpy.

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Options:

A. A and R both are correct and R is the correct explanation of A .

B. A and R both are correct but R is not the correct explanation of A .

C. A is correct but R is not correct.

D. A is incorrect but R is correct.



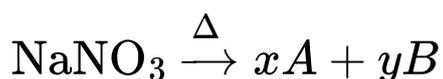
Answer: A

Solution:

Out of sulphates of group II, only BeSO_4 and MgSO_4 are soluble in water. This is because of the higher hydration enthalpies of both the ions which allow them to overcome the lattice enthalpy and making them soluble in water. Hence, both Assertion and Reason are correct and Reason is the correct explanation of the Assertion.

Question19

Identify A and B from the following reaction,



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Options:

A. $\text{NaNO}_2, \text{O}_2$

B. $\text{Na}_2\text{O}, \text{NO}_2$

C. $\text{Na}_2\text{O}, \text{NO}$

D. Na, NO_2

Answer: A

Solution:

Sodium nitrate decomposes on heating to form sodium nitrite and oxygen gas. The complete balanced equation is as follows



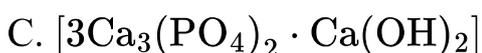
Thus, A and B in the given reaction are NaNO_2 and O_2 respectively.

Question20

The main constituent of enamel on the surface of teeth is

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Options:



Answer: C

Solution:

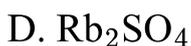
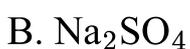
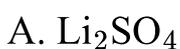
Enamel is the hardest substance in human body and it covers outer surface of teeth, which is $[3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{Ca}(\text{OH})_2]$.

Question21

Which of the following does not form doublesalts?

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Options:



Answer: A



Solution:

Li_2SO_4 is the only alkali metal salt that does not form double salt due to small size.

Question22

In the preparation of baking soda, H_2O and CO_2 in ratio is used to react with Na_2CO_3 .

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Options:

A. 3 : 1

B. 1 : 2

C. 2 : 1

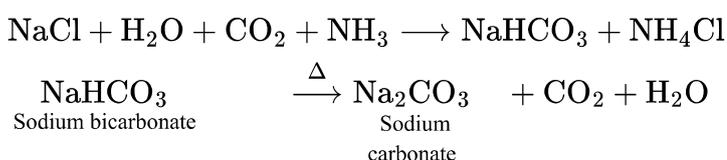
D. 1 : 1

Answer: D

Solution:

Sodium carbonate is stable and does not dissociate upon normal heating.

Two mole of sodium bicarbonate produce one mole of CO_2 , one mole of H_2O and one mole of sodium carbonate.



Hence, the ratio of CO_2 and H_2O is 1 : 1.



Question23

Which metal oxide among the following gives H_2O_2 on treatment with dilute acid?

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Options:

A. BaO_2

B. RbO_2

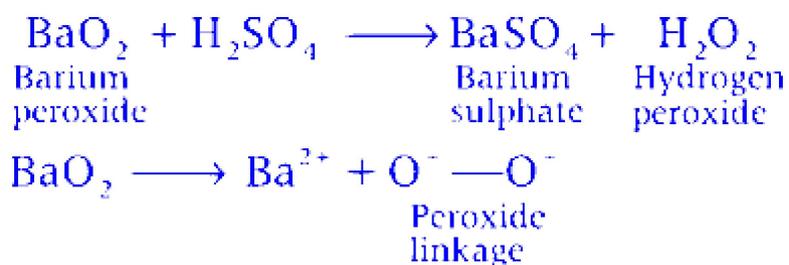
C. MnO_2

D. Al_2O_3

Answer: A

Solution:

Oxides such as BaO_2 , Na_2O_7 etc. which contain peroxide linkage i.e. $-\text{O}-\text{O}-$ or $\frac{2-}{2}$, on treatment with dilute H_2SO_4 give H_2O_2 . Rb, Mn, Al, do not give H_2O_2 on treatment with dilute H_2SO_4 .



Question24

Assertion (A) K, Rb and Cs formsuperoxides.

Reason (R) The stability of superoxidesincreases from K to Cs due to decrease inlattice energy.

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Options:

- A. Both A and R are true and R is a correct explanation of A.
- B. Both A and R are true but R is not a correct explanation of A.
- C. A is true but R is false.
- D. A is false but R is true.

Answer: C

Solution:

K, Rb and Cs form superoxides when they are burned in the air. As we move down the group, the size of an atom from K to Cs increases. So, lattice energy decreases and hence, the stability of superoxide also decreases.

Hence, A is true but R is false.

Question 25

When borax is dissolved in water, it gives an alkaline solution. The alkaline solution consists of the following products

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Options:

- A. NaOH and BH_3
- B. NaOH and H_3BO_3
- C. NaHCO_3 and H_3BO_3
- D. Na_2CO_3 and H_3BO_3

Answer: B

Solution:

When borax is dissolved in water, it forms sodium hydroxide and boric acid (H_3BO_3) which forms a strong base. Hence, it is alkaline in nature.

