



CHEMISTRY

BOOKS - CENGAGE CHEMISTRY (ENGLISH)

S-BLOCK GROUP 2 - ALKALINE EARTH METALS

Illustration

1. Given, the enthalpy of formation of $MgCl_{(s)}$ is $-125 kJ mol^{-1}$ and the enthalpy of formation of $MgCl_{2(s)}$ is $-642 kJ mol^{-1}$. Predict whether $MgCl$

will undergo disproportionation or not? If yes, calculate the enthalpy of disproportion.



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2. The second ionisation enthalpy of the elements of group 1 are higher than those of elements of group 2. Explain.



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3. What is the order of the second ionisation enthalpy of K , Ca and Ba ?



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4. (a) Why alkaline earth metals are harder, have higher melting points and higher densities than the alkali metals?

(b). Why the atoms of alkaline earth metals are smaller than the corresponding alkali metals?

(c). Why alkaline earth metals have high electrical and thermal conductivities?

(d). What is black ash?

(e). Why the variation in physical properties of alkaline earth elements is not as regular as in the case of alkali metals?



5. (a). Mention the most abundant and least abundant alkaline earth

metal in the earth's crust.

b. Arrange alkaline earth metals in order of decreasing hydration enthalpy.

c. Ca , Sr and Ba generally form ionic compounds. why?

d. Mention colours of Ca , Ba and Sr in flame test.



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6. (a). Which alkaline earth metals do not give characteristic colour to the Bunsen flame?

(b). Why alkaline earth metals do not form tripositive ions?

(c). Why alkaline earth metals are diamagnetic, but alkali metals are paramagnetic?

(d). Why the first ionisation enthalpy of alkaline earth metals is higher than those of corresponding alkali metals?

(e). Why alkaline earth metals are less electropositive than corresponding alkali metals?



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7. When Mg metal is burnt in air, a white powder is left behind as ash. What is the white powder?



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8. (a) $[BeF_4]^{2-}$ exists, but $[BeCl_6]^{4-}$ does not. Give reason.

(b). Hydrated beryllium ion exists as $[Be(H_2O)_4]^{2+}$, whereas hydrated magnesium ion exists as $[Mg(H_2O)_6]^{2+}$. Give reason.

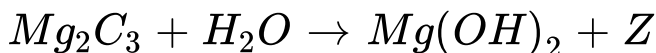
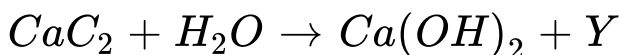
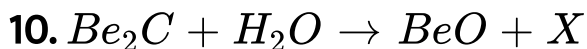


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9. Why does the solubility of alkaline earth metal hydroxides in water increase down the group?



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Identify (X), (Y) and (Z).



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11. Give reasons for the following:

(a). Alkaline earth metals cannot be obtained by chemical reduction.

(b). Alkaline earth metals have stronger tendency to form complexes than alkali metals.

(c). Magnesium nitride on reacting with water gives ammonia, but magnesium chloride does not give *HCl* on reacting with water.

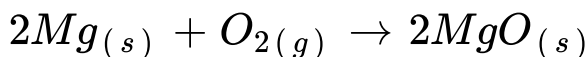


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12. 1.0g of magnesium ribbon was placed in a crucible and heated with the lid on, until the magnesium

began to burn brilliantly. At the end of experiment, there was 1.45g of white powder.

Show that this result does not agree with the equation:



Give an explanation for your answer.



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13. (a). Give an example of laboratory desiccant.

(b). What are the products formed when $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ is heated?



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14. Plaster of Paris on losing water and gaining water gives A and B . Identify A and B .



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15. BaO_2 is a peroxide, but PbO_2 is not a peroxide. Why?



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16. Which is the weakest base among $NaOH$, $Ca(OH)_2$, KOH and $Be(OH)_2$.



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17. Why sodium chloride is added during electrolysis of fused anhydrous magnesium chloride?



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18. Give the names and formula of the compounds indicated in the following statements.

(a). A compounds of Ca used in setting fractured bones.



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19. A : Be is sp hybridized in $BeCl_2$ at room temperature

R : Be is sp^3 hybridized above 1200 K in $BeCl_2$



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Solved Example

1. Chemical 'A' is used for water softening to remove temporary hardness. 'A' reacts with sodium carbonate to generate caustic soda. When carbon dioxide is bubbled through 'A' it turns cloudy. What is the chemical formula of 'A'



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2. Magnesium on heating in air gives (A) and (B). On reaction with water (B) gives a colourless gas (C). (C) when passed through $CuSO_4$ solution, gives a blue coloured solution (D). Identify (C) and (D).

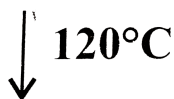
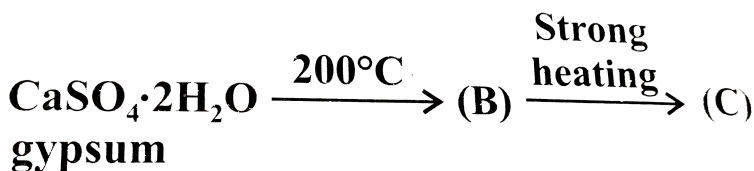


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3. Thermal decomposition of a compound (X) yields, a basic oxide (Y) and an acidic oxide (Z) simultaneously. The acidic oxide (Z) can be absorbed by alkaline KOH . Identify (X), (Y) and (Z).



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4. (A)

Identify (A), (B) and (C).



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5. When a colourless gas (A), which is poisonous and burns with blue flame, is passed through aqueous NaOH solution, gives a compound (B).

Compound (B) on heating gives (C). (C) gives a white precipitate (D) with $CaCl_2$. Both (C) and (D) decolourises $KMnO_4$. Identify (A) to (D).



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6. An element (A) of group 2 gives brick red colour in the Bunsen flame. (A) burns in nitrogen atmosphere to give (B), which gets hydrolysed to produce gas (C) and an alkaline solution (D). The solution (D) on exposure to air produces a thin solid layer (E) on the surface. Identify (D).



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Exercises Linked Comprehension

1. Solubility of an ionic compound in water is mainly dependent on:

a. Lattice enthalpy, b. Hydration enthalpy

Both these factors oppose each other and the resultant of these determines the solubility of an ionic compound in water. If lattice enthalpy has greater value, the compound is less soluble.

In case hydration enthalpy has greater value, the compound is highly soluble in water.

Compound of alkaline earth metals are less soluble than alkali metals, due to:

- A. Their high hydration enthalpy
- B. Their high lattice enthalpy
- C. Their increases covalent character
- D. Their high ionisation enthalpy.

Answer: B



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2. Solubility of an ionic compound in water is mainly dependent on:

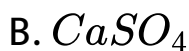
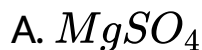
a. Lattice enthalpy, b. Hydration enthalpy

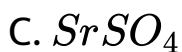
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In case hydration enthalpy has greater value, the compound is

highly soluble in water.

Which of the following is more soluble in water?





Answer: A



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a. Lattice enthalpy, b. Hydration enthalpy

Both these factors oppose each other and the resultant of these determines the solubility of an ionic compound in water. If lattice enthalpy has greater value, the compound is less soluble.

In case hydration enthalpy has greater value, the compound is

highly soluble in water.

BeF_2 is soluble in water while fluorides of other alkaline earth

metals are insoluble because of:

A. Covalent nature of BeF_2

B. Ionic nature of BeF_4

C. Greater hydration enthalpy of Be^{2+} ion

D. Greater lattice enthalpy of Be^{2+} ion

Answer: C



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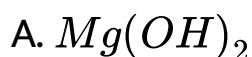
4. Solubility of an ionic compound in water is mainly dependent on:

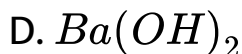
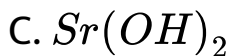
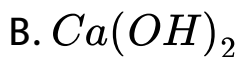
a. Lattice enthalpy, b. Hydration enthalpy

Both these factors oppose each other and the resultant of these determines the solubility of an ionic compound in water. If lattice enthalpy has greater value, the compound is less soluble.

In case hydration enthalpy has greater value, the compound is highly soluble in water.

Which of the following is less soluble in water?





Answer: A



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5. Compound is soluble in water if

A. Hydration enthalpy is greater than lattice enthalpy

B. Hydration enthalpy is less than lattice enthalpy

C. hydration enthalpy and lattice enthalpy are same

D. None of the above

Answer: A



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6. Alkali & alkaline earth metals have low ionisation enthalpies and hence exhibit characteristic flame colouration. They have high negative electrode potentials & hence are strong reducing agents. It dissolve in liquid ammonia to give a solution which conducts electricity and act as strong reducing agent.

being stronger reducing agent than hydrogen, they are usually prepared by the electrolysis of their fused chlorides. Their oxides are basic and the basic strength increases down the group. The solubility of carbonates and sulphates of alkali and alkaline earth metals show opposite trends. Only the carbonates of *Li* and alkaline earth metals decompose on heating. The bicarbonates of both alkali & alkaline earth metals on heating give carbonates.

Which of the following process is used in the extractive metallurgy of sodium?

A. Electrolysis of aqueous solution

B. Thermite reduction

C. Electrolysis of fused salt

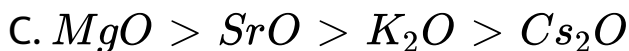
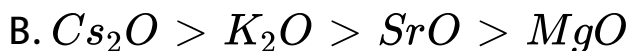
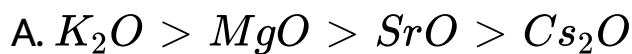
D. Self-reduction

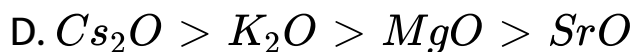
Answer: C



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7. The correct decreasing order of basic character of the oxides is





Answer: B



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8. Property of the alkaline earth metals that increases down the group with their atomic number is

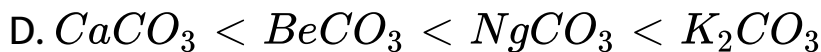
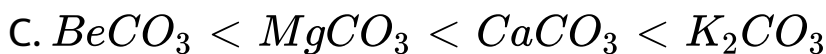
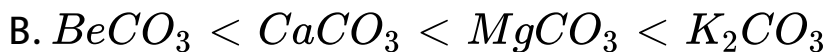
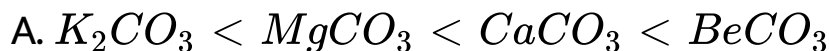
- A. Ionisation enthalpy
- B. Solubility of their hydroxides
- C. Solubility of their sulphates
- D. Electronegativity

Answer: B



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9. Identify the correct order of thermal stabilities.



Answer: B



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10. The compound insoluble in acetic acid is

- A. Calcium oxide
- B. Calcium carbonate
- C. Calcium oxalate
- D. Calcium hydroxide

Answer: C



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11. According to Fajans' rules, the percentage of covalent character in an ionic compound increases if the cation is highly charged or small in size and the anion is large or cation has pseudoinert gas configuration. As a result of the increased covalent character, solubility in less polar solvent increases and the melting point decreases.

Which of the following has the lowest melting point?

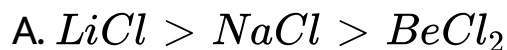


Answer: B



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12. The correct order of decreasing covalent character is

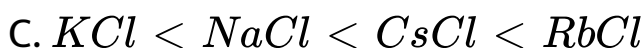
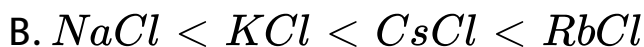
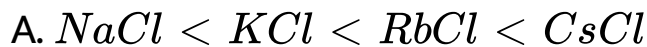


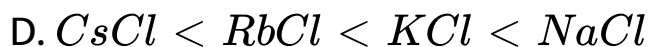
Answer: B



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13. According to Fajans'rules, the percentage of covalent character in an ionic compound increase if the cation is highly charged or small in size and the anion is large or cation has pseudoinert gas configuration. As a result of the increased covalent character, solubility in less polar solvent increases and the melting point decreases. The correct order of increasing ionic character is





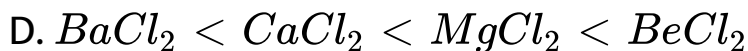
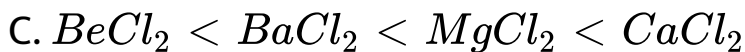
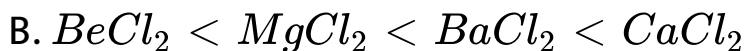
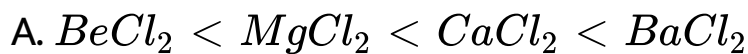
Answer: A



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14. According to Fajans' rules, the percentage of covalent character in an ionic compound increases if the cation is highly charged or small in size and the anion is large or cation has pseudoinert gas configuration. As a result of the increased covalent character, solubility in less polar solvent increases and the melting point decreases.

The correct order of increasing ionic character is



Answer: A



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15. According to Fajans' rules, the percentage of covalent character in an ionic compound increase if the cation is highly charged or small in size and the anion is large or cation has pseudoinert gas

configuration. As a result of the increased covalent character, solubility in less polar solvent increases and the melting point decreases.

Which of the following has highest melting point?

A. $LiCl$

B. $NaCl$

C. KCl

D. $RbCl$

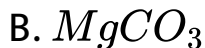
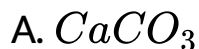
Answer: D



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16. A compound (A) on heating in Bunsen flame imparts brick red colouration. (A) on heating gives CO_2 gas and a residue (B). The residue (B) when treated with water gives (C). On passing an excess of CO_2 through (C) in water, a clear solution (D) is obtained. On boiling (D), compound (A) is reformed.

Compound (A) is



Answer: A



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Residue (B) is

A. CaO

B. CaO_2

C. SrO

D. BaO

Answer: A

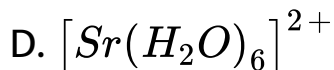
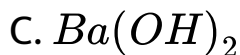
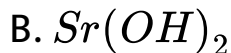
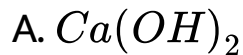


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18. A compound (A) on heating in Bunsen flame imparts brick red colouration. (A) on heating gives CO_2 gas and a residue (B). The residue (B) when treated with water gives (C). On passing an excess of CO_2 through (C) in water, a clear solution (D) is obtained. On boiling (D), compound (A) is

reformed.

Compound (*C*) is



Answer: A

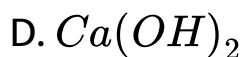
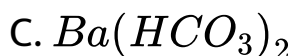
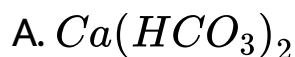


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19. A compound (*A*) on heating in Bunsen flame imparts brick red colouration. (*A*) on heating gives

CO_2 gas and a residue (B). The residue (B) when treated with water gives (c). On passing an excess of CO_2 through (C) in water, a clear solution (D) is obtained. On boiling (D), compound (A) is reformed.

Compound (D) is



Answer: A



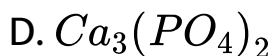
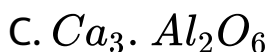
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20. Cement is one of the most important building material of the present time. It is a dirty greyish heavy powder containing calcium aluminates and silicates. The important raw materials needed for the manufacture of cement are limestone, clay and gypsum. The main step in the manufacture of cement is the heating of raw meal or slurr in the rotary kiln at a very high temperature $1400 - 1600^{\circ}C$. Finally 2% or 3% gypsum is added.

When cement is mixed with water and left as such for sometime, it becomes a hard mass. This is known as setting of cement. It is believed that various aluminates and silicates present in the cement form

hydrates with water which separate in the form of gel. the gel formed starts losing water partly by evaporation and partly by forming hydrates with unhydrated constituents. this results in the formation of a hard mass.

Portland cement does not contain



Answer: D



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Setting of cement is

- A. Exothermic reaction
- B. Endothermic reaction
- C. Hydration process
- D. None of these

Answer: A::C



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22. The average composition of portland cement is

A. 20 – 25 %

B. 30 – 45 %

C. 60 – 65 %

D. 40 – 50 %

Answer: C



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gel. the gel formed start losing water partly by evaporation and partly by forming hydrates with unhydrated constituents. this results in the formation of a hard mass.

Concrete is a mixture of

- A. Cement, sand, gravel and water
- B. Cement, sand limestone and water
- C. Cement, slaked lime and water
- D. Cement, sand and water

Answer: A



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24. Cement is one of the most important building material of the present time. It is a dirty greyish heavy powder containing calcium aluminates and silicates. The important raw materials needed for the manufacture of cement are limestone, clay and gypsum. The main step in the manufacture of cement is the heating of raw meal or slurr in the rotary kiln at a very high temperature $1400 - 1600^{\circ}C$. Finally 2 % or 3 % gypsum is added.

When cement is mixed with water and left as such for sometime, it becomes a hard mass. This is known as setting of cement. It is believed that various aluminates and silicates present in the cement form hydrates with water which separate in the form of

gel. the gel formed start losing water partly by evaporation and partly by forming hydrates with unhydrated constituents. this results in the formation of a hard mass.

Gypsum is added to portland cement

- A. To fasten the process of setting
- B. To slow down the process of setting
- C. To improve the colour of the cement
- D. All of the above are incorrect

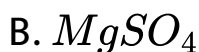
Answer: B

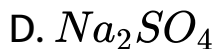
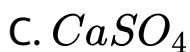


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25. Alkanline earth metal nitrate (A) on heating decompose, leaving a solid residue (B) which goes into solution with dilute HCl . The solution of (B) gives a white precipitate (C) is dissolved in dilute HCl and the solution is treated with potassium chromae to get yellow precipitate (D). The solution (B) with dilute H_2SO_4 also gives a white precipitate (E) insoluble in diute HCl and nitric acid. the precipitate (E) is a part of a white pigment lithopone.

The compound (E) is





Answer: A



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26. Alkanline earth metal nitrate (A) on heating decompose, leaving a solid residue (B) which goes into solution with dilute HCl . The solution of (B) gives a white precipitate (C) is dissolved in dilute HCl and the solution is treated with potassium chromae to get yellow precipitate (D). The solution (B) with dilute H_2SO_4 also gives a white precipitate

(E) insoluble in dilute HCl and nitric acid. the precipitate (E) is a part of a white pigment lithopone.

The yellow precipitate (D) is



D. none of these

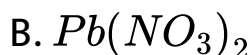
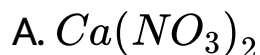
Answer: B

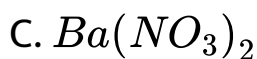


Watch Video Solution

27. Alkanline earth metal nitrate (A) on heating decompose, leaving a solid residue (B) which goes into solution with dilute HCl . The solution of (B) gives a white precipitate (C) is dissolved in dilute HCl and the solution is treated with potassium chromae to get yellow precipitate (D). The solution (B) with dilute H_2SO_4 also gives a white precipitate (E) insoluble in diute HCl and nitric acid. the precipitate (E) is a part of a white pigment lithopone.

The metal nitrate (A) is





Answer: C



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28. Alkanline earth metal nitrate (A) on heating decompose, leaving a solid residue (B) which goes into solution with dilute HCl . The solution of (B) gives a white precipitate (C) is dissolved in dilute HCl and the solution is treated with potassium chromae to get yellow precipitate (D). The solution (B) with dilute H_2SO_4 also gives a white precipitate

(*E*) insoluble in dilute HCl and nitric acid. the precipitate (*E*) is a part of a white pigment lithopone.

The solid residue (*B*) is

A. CaO

B. PbO

C. ZnO

D. BaO

Answer: D



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29. Alkanline earth metal nitrate (A) on heating decompose, leaving a solid residue (B) which goes into solution with dilute HCl . The solution of (B) gives a white precipitate (C) is dissolved in dilute HCl and the solution is treated with potassium chromae to get yellow precipitate (D). The solution (B) with dilute H_2SO_4 also gives a white precipitate (E) insoluble in diute HCl and nitric acid. the precipitate (E) is a part of a white pigment lithopone.

The nitrate (A) can be confirmed by flame test. The colour imparted by the salt to the Bunsen flame is

A. Yellow

B. Green

C. Blue

D. Red

Answer: B



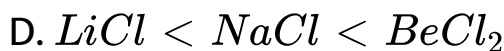
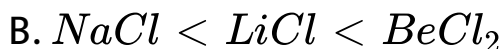
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30. Both alkali metals and alkaline earth metals are s – block elements. They resemble each other in many respects but still there are certain dissimilarities in their properties due to different number of electrons in the valence shell, different atomic radii, ionisation enthalpy, electronegativity,

etc.

Like lithium, Be also differs from rest of the alkaline earth metals on account of its small atomic size and high electronegativity. Be^{2+} ion is very small and exerts a high polarising effect on any anion associated with it.

The correct sequence of increasing covalent character is

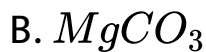
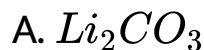


Answer: B



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31. Which is least thermally stable?



Answer: B



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32. Which of the following statements are true for group 2 elements?

A. Lattice enthalpy of oxides, carbonates, fluorides

decreases from Be to Ba .

B. All form nitrides in air.

C. The solubility of the hydroxides increases from

Be to Ba .

D. All are correct.

Answer: D



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33. Both alkali metals and alkaline earth metals are s – block elements. They resemble each other in many respects but still there are certain dissimilarities in their properties due to different number of electrons in the valence shell, different atomic radii, ionisation enthalpy, electronegativity, etc.

Like lithium, Be also differs from rest of the alkaline earth metals on account of its small atomic size and high electronegativity. Be^{2+} ion is very small and exerts a high polarising effect on any anion associated with it.

The alkaline earth metal which does not directly combine with hydrogen is

A. *Be*

B. *Ca*

C. *Sr*

D. *Ba*

Answer: A



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34. Both alkali metals and alkaline earth metals are *s* – block elements. They resemble each other in

many respects but still there are certain dissimilarities in their properties due to different number of electrons in the valence shell, different atomic radii, ionisation enthalpy, electronegativity, etc.

Like lithium, Be also differs from rest of the alkaline earth metals on account of its small atomic size and high electronegativity. Be^{2+} ion is very small and exerts a high polarising effect on any anion associated with it.

The solubility in water of sulphates down the group (\downarrow) is $Be > Mg > Ca > Sr > Ba$. this is due to

A. Increases in melting point

B. Increases in molecular mass

C. Decreases in lattice enthalpy

D. High heat of solvation for smaller ions

Answer: D



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35. Both alkali metals and alkaline earth metals are s – block elements. They resemble each other in many respects but still there are certain dissimilarities in their properties due to different number of electrons in the valence shell, different atomic radii, ionisation enthalpy, electronegativity, etc.

Like lithium, Be also differs from rest of the alkaline earth metals on account of its small atomic size and high electronegativity. Be^{2+} ion is very small and exerts a high polarising effect on any anion associated with it.

Which of the bicarbonate does not exist in solid state?



Answer: C



36. Both alkali metals and alkaline earth metals are s – block elements. They resemble each other in many respects but still there are certain dissimilarities in their properties due to different number of electrons in the valence shell, different atomic radii, ionisation enthalpy, electronegativity, etc.

Like lithium, Be also differs from rest of the alkaline earth metals on account of its small atomic size and high electronegativity. Be^{2+} ion is very small and exerts a high polarising effect on any anion associated with it.

The alkaline earth metal which does not directly combine with hydrogen is

A. *Li*

B. *Be*

C. *K*

D. *Ca*

Answer: C



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37. Limestone is a naturally occurring form of calcium carbonate. It is used as building materials and also

for manufacture of other building materials such as portland cement. It is used for the production of quicklime and slaked lime which have wide applications in chemical, metallurgical and construction industry. The pure $CaCO_3$, called precipitated calcium carbonate, is used extensively as filler, providing bulk to materials such as paint, plastics, printing inks and rubber. It is also used in toothpastes, cosmetics and antacids. Quicklime and slaked lime are the cheapest and the most widely used bases for neutralising unwanted acids. Lime is used to neutralise acidic soils. An important application of quicklime is in air pollution control for the removal of SO_2 in electric power plants. Slaked

lime is used in the manufacture of other alkalis and bleaching powder, in sugar refining, in tanning hide and in water softening.

The substance not likely to contain $CaCO_3$ is

- A. Dolomite
- B. A marble statue
- C. Sea shells
- D. Calcined gypsum

Answer: D



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38. Limestone is a naturally occurring form of calcium carbonate. It is used as building materials and also for manufacture of other building materials such as portland cement. It is used for the production of quicklime and slaked lime which have wide applications in chemical, metallurgical and construction industry. The pure $CaCO_3$, called precipitated calcium carbonate, is used extensively as filler, providing bulk to materials such as paint, plastics, printing inks and rubber. It is also used in toothpastes, cosmetics and antacids. Quicklime and slaked lime are the cheapest and the most widely used bases for neutralising unwanted acids. Lime is used to neutralise acidic soils. An important

application of quicklime is in air pollution control for the removal of SO_2 in electric power plants. slaked lime is used in the manufacture of other alkalis and bleaching powder, in sugar refining, in tanning hide and in water softening.

Slaked lime reacts with chlorine to give



Answer: C

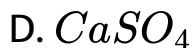
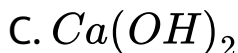
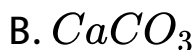


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39. Limestone is a naturally occurring form of calcium carbonate. It is used as building materials and also for manufacture of other building materials such as portland cement. It is used for the production of quicklime and slaked lime which have wide applications in chemical, metallurgical and construction industry. The pure $CaCO_3$, called precipitated calcium carbonate, is used extensively as filler, providing bulk to materials such as paint, plastics, printing inks and rubber. It is also used in toothpastes, cosmetics and antacids. Quicklime and slaked lime are the cheapest and the most widely used bases for neutralising unwanted acids. Lime is

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Quiclime is



Answer: A



40. Limestone is a naturally occurring form of calcium carbonate. It is used as building materials and also for manufacture of other building materials such as portland cement. It is used for the production of quicklime and slaked lime which have wide applications in chemical, metallurgical and construction industry. The pure $CaCO_3$, called precipitated calcium carbonate, is used extensively as filler, providing bulk to materials such as paint, plastics, printing inks and rubber. It is also used in toothpastes, cosmetics and antacids. Quicklime and slaked lime are the cheapest and the most widely

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The drying agent which absorbs CO_2 and reacts violently with water is

A. Sodium carbonate

B. Quicklime

C. Conc H_2SO_4

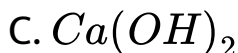
D. Alcohol

Answer: B



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41. Chemical 'A' is used for water softening to remove temporary hardness. 'A' reacts with sodium carbonate to generate caustic soda. When carbon dioxide is bubbled through 'A' it turns cloudy. What is the chemical formula of 'A'



D. $CaCl_2$

Answer: C

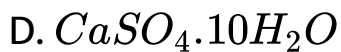
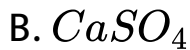
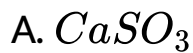


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42. Limestone is a naturally occurring form of calcium carbonate. It is used as building materials and also for manufacture of other building materials such as portland cement. It is used for the production of quicklime and slaked lime which have wide applications in chemical, metallurgical and construction industry. The pure $CaCO_3$, called precipitated calcium carbonate, is used extensively as

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Quicklime is used in electric power plants with carbon to check pollution. What product of calcium is formed?



Answer: A



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Exercises Multiple Correct

1. Which of the following *is/are* example (*s*) if diagonal pairs?

A. *Li* and *Na*

B. *Li* and *Be*

C. *Li* and *Mg*

D. *Be* and *Al*

Answer: C::D



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2. Sodium sulphate is soluble in water, whereas barium sulphate is sparingly soluble because

A. The hydration enthalpy of Na_2SO_4 is more than its lattice enthalpy.

B. The lattice enthalpy of $BaSO_4$ is more than its hydration enthalpy.

C. The lattice enthalpy has no role to play in solubility.

D. The lattice enthalpy of Na_2SO_4 is more than its hydration enthalpy.

Answer: A::B



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3. Which of the following statements are false?

A. $BeCl_2$ exists as dimer in the vapour state and polymeric in the solid state.

B. Calcium hydride is called hydrolith.

C. The oxides of Be and Ca are amphoteric.

D. Bicarbonates of Na and Sr are insoluble in water.

Answer: C::D



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4. Which of the following elements form peroxides when heated in excess of air?

A. K

B. Na

C. Ba

D. Ca

Answer: B::C::D



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5. The alkaline earth metals forming ionic oxides are

A. BeO

B. MgO

C. CaO

D. SrO

Answer: B::C::D



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6. Which of the following groups of elements have properties that are most similar?

A. Sr

B. *Ca*

C. *Ba*

D. *Be*

Answer: A::B::C



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7. Which of the following groups of elements have properties that are most similar?

A. *Na, K, Cs*

B. *Mg, Sr, Ba*

C. Be , Al , Ca

D. Be , Ra , Cs

Answer: A::B::C



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8. Magnesium burns in the atmosphere of the following gases?

A. CO_2

B. N_2O

C. N_2

D. SO_2

Answer: A::B::C::D



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9. Which of the following properties show a reverse trend in moving down the group of alkali and alkaline earth metals?

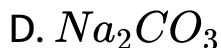
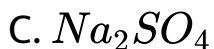
- A. Solubility of hydroxides
- B. Solubility of carbonates
- C. Solubility of sulphates
- D. Solubility of oxides

Answer: B::C



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10. In which of the following, hydration enthalpy is greater than the lattice enthalphy?



Answer: C::D



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11. Which of the following statements (s) is/are not true about the diagonal relationship of Be and Al ?

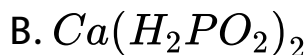
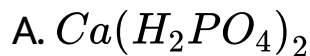
- A. Their oxides are basic
- B. They become passive by conc HNO_3
- C. Both react with $NaOH$ to liberate hydrogen
- D. Their carbides give acetylene on hydrolysis

Answer: A::D



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12. yellow phosphorus on reaction with $Ca(OH)_2$ gives:



Answer: A::C



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13. Which of the following pairs can be distinguished by the action of heat?

A. Na_2CO_3 and $CaCO_3$

B. K_2CO_3 and $MgCO_3$

C. $Ca(NO_3)_2$ and $NaNO_3$

D. $MgCl_2 \cdot 6H_2O$ and $CaCl_2 \cdot 6H_2O$

Answer: A::B



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14. The hydration energy of Mg^{2+} is larger than that of:

A. Al^{3+}



Answer: C::D



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15. Which among the following has the tendency to form covalent compounds?



C. Sr

D. Mg

Answer: A::B



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16. Identify the correct statement(s).

A. Gypsum contains a lower percentage of calcium than plaster of paris.

B. Gypsum is $CaSO_4 \cdot 2H_2O$.

C. Plaster of paris is obtained by hydration of gypsum.

D. Gypsum is obtained by hydration of plaster of paris.

Answer: A::B::D



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17. Select the correct statements about barium:

A. It shows photoelectric effect.

B. It is silvery white metal.

C. It forms $Ba(NO_3)_2$ which is used in preparation of green fire.

D. Its ionisation enthalpy is less than radium.

Answer: B::C::D



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18. Which of the following oxides have rock salt structure with coordination number 6: 6?

A. BeO

B. MgO

C. CaO

D. SrO

Answer: B::C::D



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19. Mg and Zn have the following resemblance:

A. MgO and ZnO are amphoteric.

B. MgCO_3 and ZnCO_3 both on heating give corresponding oxide.

C. Both are used as electrodes.

D. Both are used to prevent corrosion

Answer: B::C::D



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20. *Be* and *Al* have the following resemblance due to diagonal relationship,

A. Have nearly equal electronegativity

B. Form amphoteric oxides

C. Have same charge/radius ratio

D. Both form dimeric halides

Answer: A::B::C::D



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21. The correct statement(*s*)*is / are*

- A. $BeCl_2$ is a covalent compound
- B. $BeCl_2$ can form dimer
- C. $BeCl_2$ is an electron-deficient molecule
- D. The hybrid state of Be in $BeCl_2$ is sp^2

Answer: A::B::C



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22. Which of the following metal(s) do (es) not give characteristic flame colouration?

A. *Ca*

B. *Mg*

C. *Be*

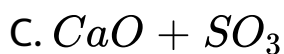
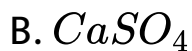
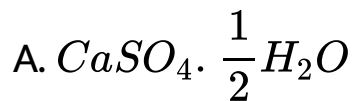
D. *Na*

Answer: B::C



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23. Gypsum on heating gives



Answer: A::B::C



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24. Dolomite is a mineral of

A. Aluminium

B. Magnesium

C. Calcium

D. Potassium

Answer: B::C



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25. Mg^{2+} can be detected and estimated in hard water by titrating with *EDTA* at $pH = 10$ using $NH_4OH + NH_4Cl$ buffer. End point is given by the appearance of blue colour. The indicator used is

- A. Solochrome black
- B. Eriochrome black *T*
- C. Eosin
- D. Bromophenol

Answer: A::B



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Exercises Single Correct

1. Berllium shows diagonal relationship with

A. Mg

B. Na

C. Al

D. B

Answer: C

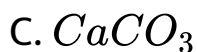


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2. Dolomite is mineral whose formula is

A. $CaCO_3$

B. $MgCO_3$



Answer: C



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3. The ionisation enthalpy of alkaline earth metals is

A. Greater than alkali metals but less than elements of group 13

B. less than alkali metals

C. Greater than elements of groups 1 and 13

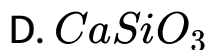
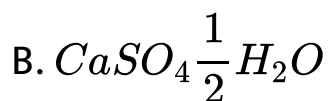
D. Equal to alkali metals

Answer: C



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4. Formula of Gypsum is



Answer: A



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5. CaC_2 reacts with water to give

A. Methane

B. Ethane

C. Ethylene

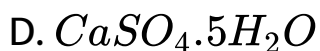
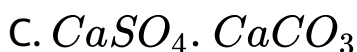
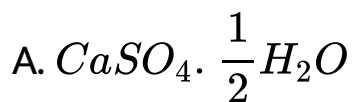
D. Acetylene

Answer: D



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6. Plaster of paris is



Answer: A



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7. Mixture of $CaCN_2$ and C is called

A. Barytes

B. Anhydrite

C. Nitrolim

D. Iceland spar

Answer: C



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8. Lithopone is a mixture of

A. $BaSO_4$ and BaS

B. $BaSO_4$ and ZnS

C. BaO and ZnS

D. $BaCO_3$ and ZnO

Answer: B



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9. Slake lime is prepared by adding water to

A. $CaSO_4 \cdot \frac{1}{2}H_2O$

B. $CaCl_2$

C. CaO

D. $CaCO_3$

Answer: C



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10. Which of the following is not present in cement ?

A. Gypsum

B. Clay

C. Almina

D. Alum

Answer: D



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11. Which of the following metals cannot be obtained by electrolysis /

A. Ag

B. Mg

C. Cu

D. Au

Answer: B



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12. An important ore of magnesium is

A. Malachite

B. Cassiterite

C. Carnallite

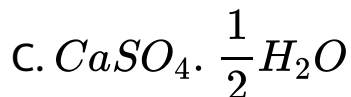
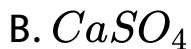
D. Galena

Answer: C



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13. When gypsum is heated to 393K, it forms:

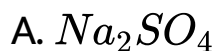


Answer: C



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14. Ripening of fruits can be carried out in presence of



B. NaCl

C. CaCl_2

D. CaC_2

Answer: D



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15. The drying agent which absorbs carbon dioxide and reacts violently with water is

A. Sodium carbonate

B. Alcohol

C. Conc H_2SO_4

D. Calcium oxide

Answer: D



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16. Calcium is obtained by the

A. Roasting of limestone

B. Electrolysis of a solution of calcium chloride in
water

C. Reduction of calcium chloride with carbon

D. Electrolysis of molten anhydrous calcium chloride

Answer: D



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17. The difference of water molecules in gypsum and plaster of Paris is

A. $\frac{5}{1}$

B. 2

C. $\frac{1}{2}$

D. $1\frac{1}{2}$

Answer: D



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18. Solubility of an ionic compound in water is mainly dependent on:

a. Lattice enthalpy, b. Hydration enthalphy

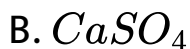
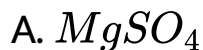
Both these factors oppose each other and the resultant of these determines the solubility of an ionic compound in water. If lattice enthalpy has greater value, the compound is less soluble.

In case hydration enthalpy has greater value, the

compound is

highly soluble in water.

Which of the following is more soluble in water?



Answer: A



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19. Ca^{2+} is isoelectronic with

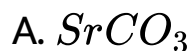


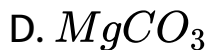
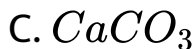
Answer: C



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20. Which of the following decomposes at highest temperature?



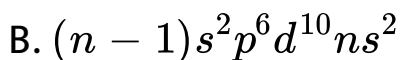
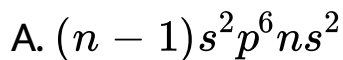


Answer: B



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21. Which of the following electronic configuration in the outermost two shells is characteristic of the alkaline earth metals?



C. $(n - 1)s^2p^2ns^2p^1$

D. none of these

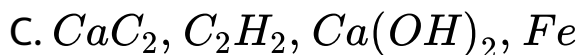
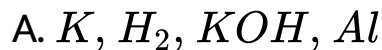
Answer: D



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22. When a substance A reacts with water it produces a combustible gas B and a solution of substance C in water. When another substance D reacts with this solution of C, it also produces the same gas B on warming but D can also produce gas B on reaction with dilute sulphuric acid at room temperature. A imparts a deep

flame of yellow colour to a smokeless flame of Bunsen burner. A, B, C and D, respectively are



Answer: B



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23. The basic strength of which hydroxide is maximum

A. $LiOH$

B. $NaOH$

C. $Ca(OH)_2$

D. KOH

Answer: D

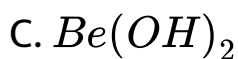


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24. Of the following , and amphoteric hydroxide is

A. $Ca(OH)_2$

B. $NaOH$

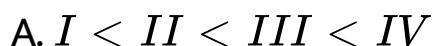
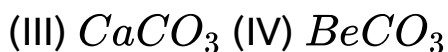
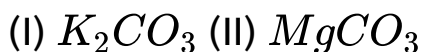


Answer: C



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25. The following compounds have been arranged in order of their increasing stabilities. Identify the correct order.



B. $IV < II < III < I$

C. $IV < II < I < III$

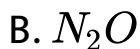
D. $II < IV < III < I$

Answer: B



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26. Magnesium combines with nitrogen to form a nitride, which reacts with water to form a colourless gas. The gas is



C. NO

D. N_2O

Answer: A



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27. Which has the highest electronegativity?

A. Li

B. Be

C. Mg

D. Na

Answer: B



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28. Which of the following undergoes disproportionation?



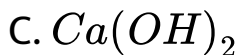
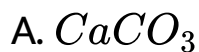
Answer: B



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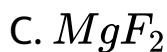
29. Which of the following is soluble in acetic acid?



Answer: B

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30. Which of the following fluoride is more soluble in water?

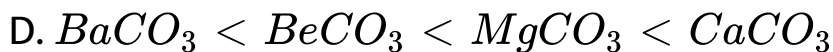
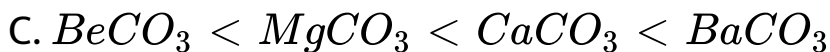
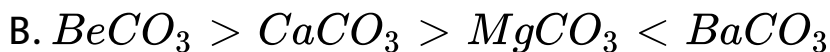
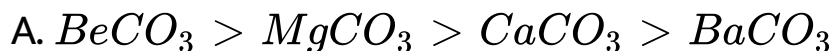


Answer: B



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31. Why does the solubility of alkaline earth metal carbonates and sulphates in water decrease down the group ?



Answer: A



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32. Epsom salt's chemical formula is



Answer: A



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33. Which of the following alkaline earth metal oxide is most basic?

A. BeO

B. MgO

C. CaO

D. BaO

Answer: D



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34. Which of the following metal reacts with cold H_2O with the evolution of H_2 gas?

A. Ca

B. Al

C. Zn

D. Cu

Answer: A



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35. Which of the following salt will give a green colour in fire works?

A. Ca

B. Ba

C. Mg

D. Sr

Answer: B



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36. Which of the following does not contain the true peroxide ion?

A. Na_2O_2

B. H_2O_2

C. BaO_2

D. SrO_2

Answer: B



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37. (a). Mention the most abundant and least abundant alkaline earth

metal in the earth's crust.

b. Arrange alkaline earth metals in order of decreasing hydration enthalpy.

c. Ca , Sr and Ba generally form ionic compounds. why?

d. Mention colours of Ca , Ba and Sr in flame test.

A. Be

B. Mg

C. Ca

D. Sr

Answer: C



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38. The hydration energy of Mg^{2+} is larger than that of:

A. Al^{3+}

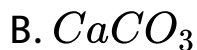


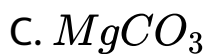
Answer: B



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39. Which of the following alkaline earth metal carbonate is thermally least stable?





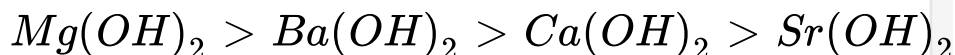
Answer: A



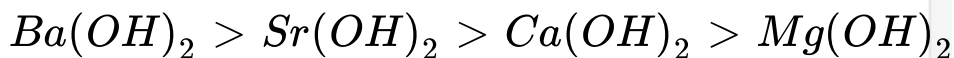
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40. The basic character of the alkaline earth metal hydroxides is as follows:

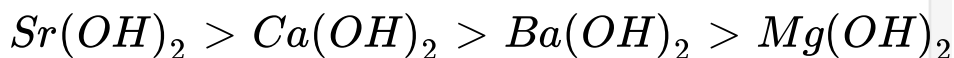
A.



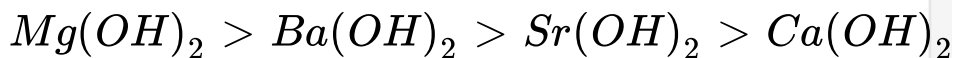
B.



C.



D.

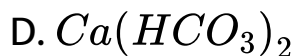
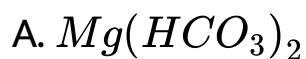


Answer: B



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41. The carbonate of which of the following cation is soluble in water ?



Answer: B



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42. Which of the following metal is the most difficult to extract from its oxide?



B. Ca

C. Mg

D. Ag

Answer: A



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43. The most probable reason that the alkaline earth metals give dipositive ions instead of unipositive ion is

A. The compounds with $+2$ oxidation state have more lattice enthalpy than those with $+1$

oxidation state.

B. The values of their first and second ionisation potential are not very much different.

C. The dipositive ion has greater charge than the unipositive ion.

D. The compounds of $+1$ oxidation state of these metals are not stable.

Answer: A



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44. The oxidation state of the most electronegative element in the products of the reaction between BaO_2 and H_2SO_4 are

A. 0 and -1

B. -1 and -2

C. -2 and 0

D. -2 and $+1$

Answer: B



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45. Anhydrous $MgCl_2$ is obtained by heating hydrate salt, $MgCl_2 \cdot 6H_2O$.

A. Strongly in air

B. In presence of coke

C. In presence of conc H_2SO_4 which absorbs moisture

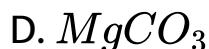
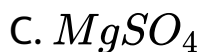
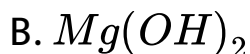
D. In presence of dry HCl gas

Answer: D



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46. Which of the following is used as an antacid?



Answer: B



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47. Typical elements is the name given to the elements of

A. Zero group

B. Group 2

C. 3rd` period

D. Group 1

Answer: B



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48. Assertion : Na_2SO_4 is soluble in water while $BaSO_4$ is water insoluble.

Reason : Lattice energy of $BaSO_4$ exceeds its hydration energy.

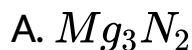
- A. The lattice enthalpy of Na_2SO_4 is less than its hydration enthalpy.
- B. Sodium is monovalent ion whereas barium is a divalent ion.
- C. The hydration enthalpy of sodium sulphate is less than its lattice enthalpy.
- D. The lattice enthalpy of barium sulphate is less than its hydration enthalpy.

Answer: A



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49. Mg burns in air to give

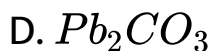
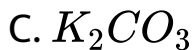
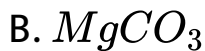
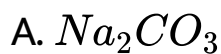


Answer: C



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50. Which of the following is decomposed on heating?



Answer: B



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51. Two metals X and Y belong to the cond group of periodic table. X forms insoluble oxide but soluble sulphate. Y forms a soluble oxide but insoluble sulphate. Hydroxide of metal X is soluble in NaOH

while that of metal Y is insoluble in NaOH. What are metals X and Y?

A. *Ba* and *Mg*

B. *Na* and *K*

C. *Mg* and *Ba*

D. *K* and *Rb*

Answer: C



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52. Which of the following forms covalent compound?

A. *Be*

B. *Mg*

C. *Ca*

D. *Sr*

Answer: A



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53. The compounds of alkaline earth metals have the following magnetic nature:

A. Diamagnetic

B. Antiferromagnetic

C. Ferromagnetic

D. Paramagnetic

Answer: A



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54. For two ionic solids CaO and KI , identify the wrong statement among the following

A. Lattice enthalpy of CaO is much higher than that of KI .

B. CaO has high melting point.

C. KI has low melting point.

D. KI is soluble in benzene.

Answer: D



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55. Which of the following substance can be used for drying neutral or basic gases?

A. Na_2CO_3

B. CaCO_3

C. CaO

D. Na_2CO_3

Answer: C



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56. As the nuclear charge increases from neon to calcium, the orbital energies

A. Increase

B. Increases very rapidly

C. increases very slowly

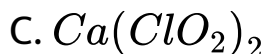
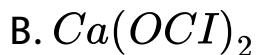
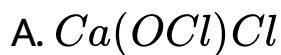
D. Fall

Answer: D



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57. Which one is the active constituent of bleaching powder?



Answer: B



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58. Bleaching powder loses its power on keeping for a long time because

- A. It absorbs moisture
- B. It changes into calcium hypochlorite
- C. It changes into calcium chloride and calcium chlorate

D. It changes salt of calcium chloride and calcium hydroxide

Answer: B



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59. A sodium salt of unknown anion when treated with $MgCl_2$ gives a white *ppt.* On boiling. The anion is



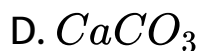
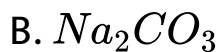


Answer: A



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60. Which of the following on thermal decomposition yields a basic as well as an acidic oxide ?



Answer: D



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61. Limestone is a naturally occurring form of calcium carbonate. It is used as building materials and also for manufacture of other building materials such as portland cement. It is used for the production of quicklime and slaked lime which have wide applications in chemical, metallurgical and construction industry. The pure $CaCO_3$, called precipitated calcium carbonate, is used extensively as filler, providing bulk to materials such as paint, plastics, printing inks and rubber. It is also used in

toothpastes, cosmetics and antacids. Quicklime and slaked lime are the cheapest and the most widely used bases for neutralising unwanted acids. Lime is used to neutralise acidic soils. An important application of quicklime is in air pollution control for the removal of SO_2 in electric power plants. slaked lime is used in the manufacture of other alkalis and bleaching powder, in sugar refining, in tanning hide and in water softening.

The substance not likely to contain $CaCO_3$ is

- A. Dolomite
- B. A marble statue
- C. Calcined gypsum

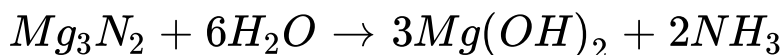
D. Sea shells

Answer: A



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62. One mole of magnesium nitride on reaction with an excess of water gives :



A. One mole of NH_3

B. Two moles of NH_3

C. One mole of HNO_3

D. Two moles of HNO_3

Answer: B



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63. Beryllium and aluminium exhibit many properties which are similar . But, the two elements differ in

- A. Forming covalent bonds
- B. Forming polymeric hydrides
- C. Exhibiting maximum covalency in compounds
- D. Exhibiting amphoteric nature in their oxides

Answer: C



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64. Magnesium is an important component of which biomolecule occurring extensively in living world?

A. Haemoglobin

B. *ATP*

C. Chlorophyll

D. Vitamin B_{12}

Answer: C



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65. Several blocks of magnesium are fixed to the bottom of a ship to

- A. Prevent action of water and salt
- B. Prevent puncturing by under sea rocks
- C. keep away the sharks
- D. Make the ship lighter

Answer: A



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66. The name and formula of the compound of magnesium, chlorine and oxygen used as a drying agent is

A. Magnesium oxychlorite, $Mg(OCl)_2$

B. Magnesium chlorate, $Mg(ClO_3)_2$

C. Magnesium chlorate, $Mg(ClO_4)_2$

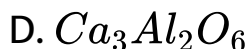
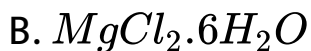
D. None of the above

Answer: C



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67. Salt used as a purgative is



Answer: C



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68. A compound (A) gives brick red flame and breaks down on heating giving oxygen and brown gas. (A)

is

A. Na and Na_2O_2

B. Ba and BaO_2

C. $Ca(NO_3)_2$

D. Ca and CaO

Answer: C



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69. Which of the following pair of substance give same gaseous product on reaction with water?

A. Ca and CaH_2

B. $MgCO_3$

C. $Mg(NO_3)_2$

D. $Ca(NO_3)_2$

Answer: C



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70. An alkaline earth metal gives a salt with chlorine which is sparingly soluble in water at room temperature but fairly soluble in boiling water. It also forms a sulphate whose mixture with a sulphate of a

transition metal is called 'lithopone' and is used as white pigment. the alkaline earth metal is

A. Ca

B. Mg

C. Sr

D. Ba

Answer: D



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71. The metal that is extracted from sea water is

A. Mg

B. Ca

C. Be

D. Ba

Answer: A



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72. The element which shows radioactivity is

A. Mg

B. Sr

C. Ba

D. Ra

Answer: D



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73. Magnesium wire burns in the atomosphere of CO_2 because

A. Magnesium acts as an oxidising agent

B. magnesium has two electrons in the outermost orbital

C. Magnesium acts as a reducing agent and removes oxygen from CO_2

D. None of the above

Answer: C

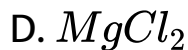
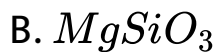


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74. Silica reacts with magnesium to form magnesium compound

(X). (X) reacts with dilute HCl and forms (Y). (Y) is:

A. MgO

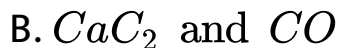


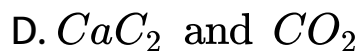
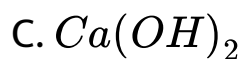
Answer: D



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75. On strong heating of CaO and C , the products formed are





Answer: B



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76. The nature of the oxide of radium is

A. Basic

B. Acidic

C. Neutral

D. Amphoteric

Answer: B



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77. Radium is obtained from

A. Limestone

B. Rutile

C. Pitchblende

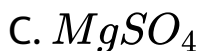
D. Barytes

Answer: C



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78. Which of the following is used for taking the X – ray spectra of the digestive system:



Answer: B



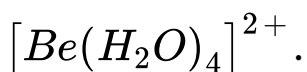
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79. Among the given statements, the incorrect one is

A. Be differs much from other alkali metals than *Li* does from other alkali metals.

B. Be generally forms covalent compounds.

C. Be forms a very strong complex,



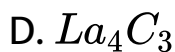
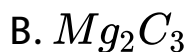
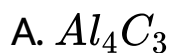
D. Be usually has more than four water of crystallisation associated with it.

Answer: D



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80. Which of the following gives propyne on hydrolysis?

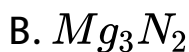
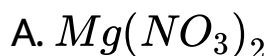


Answer: B



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81. A metal (A) on heating in nitrogen gas given compound B. B on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a dark blue - violet coloured solution. A and B respectively are :

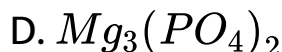
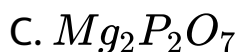


Answer: B



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82. Mg is precipitated and estimated gravimetrically as:



Answer: C



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1. Assertion (A): Magnesium does not impart any characteristic colour to the flame.

Reason (R): Due to small size and high effective nuclear charge, magnesium requires a large amount of energy for excitation of electrons.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A



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2. The atomic radii of alkaline earth metals are smaller than those of the corresponding alkali metals. Explain, why?

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: C



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3. Assertion (A): Beryllium compounds are covalent in nature.

Reason (R): The size of Be^{2+} ion is larger in compariso to the radii of the other divalent ions of alkaline earth metals.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A) .

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: C



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4. $BeSO_4$ is soluble in water but $BaSO_4$ is insoluble.

Reason (R): Lattice enthalpy of $BaSO_4$ exceeds its hydration enthalpy.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A) .

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A) .

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A



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5. Assertion (A): magnesium keeps on burning in CO_2

.

Reason (R): Magnesium reduces CO_2 to C .

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A



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6. Be forms $[BeF_4]^{2-}$, but Al forms $[AlF_6]^{3-}$.

Reason (R): Be does not have d -orbitals in the valence shell but Al has.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A



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7. Assertion (A): Magnesium can be obtained by the electrolysis of aqueous solution of $MgCl_2$.

Reason (R): The electrode potential of Mg^{2+} is much higher than H^{\oplus} .

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D



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8. Assertion: Be and Mg do not impart characteristic colour to the flame.

Reason: both Be and Mg have high ionization energy.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: D



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9. Assertion (A): magnesium is not present in enamel of human teeth.

Reason (R): Magnesium is an essential elements for biological functions of human beings.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

- B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).
- C. If (A) is correct, but (R) is incorrect.
- D. If (A) is incorrect, but (R) is correct.

Answer: B



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10. Assertion (A): Barium is not required for normal biological function in human beings.

Reason (R): Barium does not show variable oxidation states.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A) .

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A) .

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: B



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11. Assertion (A): Addition of NH_4OH to an aqueous solution of $BaCl_2$ in the presence of excess of

NH_4Cl precipitates $Ba(OH)_2$.

Reason (R): $Ba(OH)_2$ is insoluble in water.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A).
- B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).
- C. If (A) is correct, but (R) is incorrect.
- D. If (A) is incorrect, but (R) is correct.

Answer: D



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12. Assertion (A): $BaCO_3$ is more soluble in HNO_3 than in water.

Reason (R): Carbonate is a weak base and reacts with H^{\oplus} ions to form strong acid causing barium salt to dissociate.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A).
- B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).
- C. If (A) is correct, but (R) is incorrect.
- D. If (A) is incorrect, but (R) is correct.

Answer: A



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13. Assertion (A): Sulphur is estimates as $BaSO_4$ and not as $MgSO_4$.

Reason (R): The ionic radius of Mg^{2+} is less than that of Ba^{2+}

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: B



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14. Assertion : Na_2SO_4 is soluble in water while $BaSO_4$ is water insoluble.

Reason : Lattice energy of $BaSO_4$ exceeds its hydration energy.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A



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15. Assertion (A): Calcium and magnesium oxides are not reduced by carbon.

Reason (R): Calcium and magnesium oxides react with carbon to form their respected carbides.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

- B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A) .
- C. If (A) is correct, but (R) is incorrect.
- D. If (A) is incorrect, but (R) is correct.

Answer: A



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16. Assertion (A): $Be(OH)_2$ is soluble in $NaOH$.

Reason (R): $Be(OH)_2$ is amphoteric in nature.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A) .

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A) .

C. If (A) is correct, but (R) is incorrect.

D. If (A) is incorrect, but (R) is correct.

Answer: A



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17. Assertion (A): In curing cement plasters, water is sprinkled from time to time.

Reason (R): It converts sand into silicic acid.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A).
- B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).
- C. If (A) is correct, but (R) is incorrect.
- D. If (A) is incorrect, but (R) is correct.

Answer: C



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1. How many alkaline earth metals are known?



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2. How many water molecules are associated with Epsiom salt?



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3. Calcium carbide reacts with nitrogen and forms an important fertiliser, calcium cynamide. How much calcium cynamide is formed when $6.4g$ of calcium carbide is completely converted into cyanamide?



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4. Magnalium is an alloy of aluminium and magnesium. What is the percentage of magnesium in this alloy?



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5. Magnesium oxide when mixed with a saturated solution of $MgCl_2$, sets to a hard mass known as 'Sorel cement' is formed. The composition of Sorel cement is $MgCl_2 \cdot nMgO \cdot xH_2O$. What is the value of n ?



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6. How many water molecules are present as water of crystallisation in gypsum?



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Exercises Fill In The Balanks

1. Alkaline earth metals are _____ reducing agents than alkali metals.



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2. Why are the second ionisation energies of alkaline earth metals much smaller than those of alkali metals ?



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3. Atomic size of calcium is _____ than that of potassium.



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4. Hydrolith is



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5. Barium salts impart _____ colour to the flame.



Watch Video Solution

6. The most abundant alkaline earth metal is _____.



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7. In chlorophyll, the metal present is _____.



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8. Dead burnt plaster is



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9. Suspension of slaked lime in water is known as



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10. Ordinary black board chalk is made up of _____.



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11. Calcium cyanamide reacts with steam to form _____ and _____.



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12. Mixture of $MgCl_2$ and MgO is called



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13. The formula of calcium cyanamide is _____.



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Exercises True False

1. In some of the reactions thallium resembles aluminium, whereas in others it resembles with group I metals. Support this statement by giving some evidences.



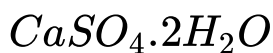
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2. Alkaline earth metals have lower melting point than correspondig alkali metals.



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3. The chemical formula of plaster of paris is



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4. $Ca_3(PO_4)_2$ is presents in bones.



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5. Which is important in blood clotting ?



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6. Chlorophyll is a compound of calcium.



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7. $3Ca_3(PO_4)_2 \cdot CaF_2$ is a part of enamel on teeth.

True or False



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8. BeH_2 contains three centre two electron bond.

True or False



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9. CaH_2 and BaH_2 are covalent in nature.



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10. Beryllium hydride and magnesium hydride are covalent and polymeric. True or False



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11. The process of setting of cement under water is essentially an oxidation process.



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Exercises Archives Multiple Correct

1. Sodium sulphate is soluble in water, whereas barium sulphate is sparingly soluble because

A. The hydration energy of sodium sulphate is more than its lattice energy.

B. The lattice energy of barium sulphate is more than its hydration energy.

C. The lattice energy has no role to play in solubility.

D. The hydration energy of sodium sulphate is less than its lattice energy.

Answer: A::B



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Exercises Archives Single Correct

1. Calcium is obtained by the

A. Electrolysis of molten $CaCl_2$

B. Electrolysis of a solution of $CaCl_2$ in water

C. Reduction of $CaCl_2$ with carbon

D. Roasting of limestone

Answer: A



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2. The following compounds have been arranged in order of their increasing stabilities. Identify the correct order.

(I) K_2CO_3 (II) $MgCO_3$

(III) $CaCO_3$ (IV) $BeCO_3$

A. $I < II < III < IV$

B. $IV < II < III < I$

C. $IV < II < I < III$

D. $II < IV < III < I$

Answer: B



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

A. 1mol of phosphine

B. 2mol of phosphoric acid

C. 2mol of phosphoric acid

D. 1mol of phosphoric pentoxide

Answer: C



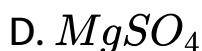
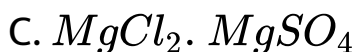
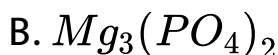
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4. (i) A white solid mixture of two salts containing a common cations is insoluble in water. It dissolves in dilute HCl producing some gases (with effervescence) that turn an acidified dichromate solution green. After the gases are passed through the acidified dichromate solution, the emerging gas turns barium water milky.

(ii) On treatment with dilute HNO_3 , the white solid gives a solution which does not directly give a precipitate with a $BaCl_2$ solution but gives a white precipitate when warmed with H_2O_2 and then treated with a $BaCl_2$ solution.

(iii) The solution of the mixture in dilute HCl , when treated with NH_4Cl , NH_4OH and an Na_2HPO_4 solution, gives a white precipitate.

Q. The white precipitate obtained in (iii) consists of:

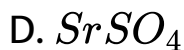
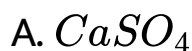


Answer: A



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5. Which one of the following alkaline earth metal sulphates has its hydration enthalpy greater than its lattice enthalpy ?



Answer: B



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Exercises Archives Fill In The Balanks

1. Anhydrous $MgCl_2$ is obatined by heating hydrate salt, $MgCl_2.6H_2O$.



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Exercises Archives True Flase

1. Anhydrous $MgCl_2$ is obatined by heating hydrate salt, $MgCl_2.6H_2O$.



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Exercises Archives Subjective

1. Write down the balanced equations for the reaction when calcium phosphate is heated with a mixture of sand and carbon.



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2. Magnesium oxide is used for the lining in steel making furnace because



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3. The increasing order of basic character of oxides MgO , SrO , K_2O and Cs_2O is



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4. Calcium burns in nitrogen to produce a white powder which dissolves in sufficient water to produce a gas (A) and alkaline solution. The solution on exposure to air produce a thin solid layer of (B) on the surface. Identity the compound (A) and (B)



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5. The crystalline salts of alkaline earth metals contain more water of crystallisation than the corresponding alkali metal salts. Why?



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6. Arrange the following sulphates of alkaline earth metals in order of decreasing thermal stability:
 $BeSO_4$, $MgSO_4$, $CaSO_4$, $SrSO_4$.



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7. Work out the following using chemical equations:

'Chlorination of calcium hydroxide produces bleaching powder'.



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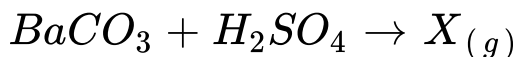
8. Give reasons for the following in one or two sentences only:

$BeCl_2$ can be easily hydrolysed'.



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9. Identify X in the following synthetic scheme and write their structures.



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Ex 5 1 Subjective

1. Name an element which is invariably bivalent and whose oxide is soluble in excess of NaOH and its dipositive ion has a noble gas core.



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2. Differentiate between

a. quicklime b. limewater c. slaked lime



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3. How is plaster of paris prepared? Describe its chief property due to which it is widely used.



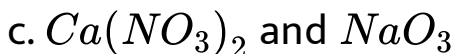
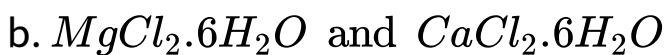
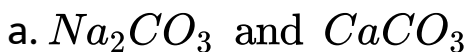
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4. Give reason for, ' $NaHCO_3$ is known in solid state but $Ca(HCO_3)_2$ is not isolated in solid state.



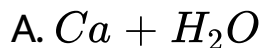
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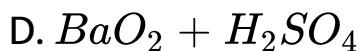
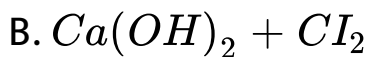
5. Contrast the action of heat on the following with reason:



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6. Complete the following equations for the reaction between



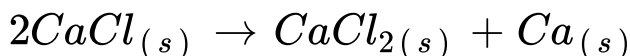


Answer:



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7. The enthalpy of formation of hypothetical $CaCl_{(s)}$ theoretically found to be $-188kJmol^{-1}$ and the $\Delta_f H^\ominus$ for $CaCl_{2(s)}$ is $-795kJmol^{-1}$. Calculate the $\Delta_f H^\ominus$ for the disproportionation reaction.



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8. Compare and contrast the chemistry of alkali metal with that of alkaline earth metal with respect to polarising power of cations.

A. Nature of oxides

B. Solubility and thermal stability of carbonates

C. Polarising power of cations

D. Reactivity and reducing power

Answer:



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9. What happens when:

- A. magnesium is burnt in air
- B. Quicklime is heated with silica
- C. Chlorine reacts with slaked lime
- D. Calcium nitrate is heated

Answer:



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10. Describe two important uses of each of the following: (i) caustic soda (ii) sodium carbonate (iii)



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11. List the raw materials required in the manufacture of portland cement. What is the role of gypsum in it?



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12. Name the chief forms of occurrence of magnesium in nature.



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13. Commercial aluminium always contains some magnesium, name two such alloys of aluminium. What properties are imparted by the addition of magnesium to these alloys?



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14. Why is it that the s-block elements never occur free in nature? What are their usual modes of occurrence and how are they generally prepared?



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15. How will you distinguish between:

a. Magnesium and strontium b. K_2SO_4 and $BaSO_4$



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16. Give reasons for the following:

A. BeO is used as a refractory material.

B. Beryllium halides are polymeric.

C. $Be(OH)_2$ dissolves in $NaOH$, but $Ca(OH)_2$

does not

D. On hydrolysis at room temperature, Mg_3N_2 gives ammonia, whereas $MgCl_2$ gives HCl .

Answer:



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17. How is anhydrous magnesium chloride prepared from magnesium chloride hexahydrate?



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18. Give reasons for the following:

- A. Why is calcium preferred over sodium to remove last traces of moisture from alcohol?
- B. A piece of burning magnesium ribbon continues to burn in SO_2 .
- C. Halides of Be are soluble in organic solvents, while those of Ba are insoluble
- D. $BeCl_2$ fumes in moist air, but other alkline earth metal chloride do not.

Answer:



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19. Lattice enthalpies of BeF_2 , MgF_2 , CaF_2 and BaF_2 are -2906 , -2610 , -2459 and $-2367 kJ mol^{-1}$ respectively. Hydration enthalpies of Be^{2+} , Ca^{2+} , Ba^{2+} and F^{\ominus} are -2194 , -1921 , -1577 , -130 and $-457 kJ mol^{-1}$ respectively. Which of the fluorides has the highest solubility in water?

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20. On treatment with cold water, an element (A) reacted quietly liberating a colourless, odourless gas (B) and a basic solution (C). Lithium reacted with

(*B*) yielding a solid product (*D*) which effervesced with water to give a strongly basic solution (*E*) and gas (*F*). When CO_2 was bubbled through solution (*C*), initially a white ppt. (*G*) was formed, but this redissolved forming solution (*H*) when more CO_2 was passed, precipitate (*G*) effervesced when moistened with conc HCl and gave a brick red colouration to the bunsen flame. When (*G*) was heated with carbon at $1000^\circ C$, a caustic white compound (*I*) was formed, which when heated with N_2O at $1000^\circ C$ gave a solid (*J*) of some commercial importance. Identify (*A*) to (*J*) and explain the reactions.



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21. Give reasons for the following:

a. Anhydrous calcium sulphate (anhydrite) cannot be used as plaster of Paris.



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22. What happens when:

SO_2 is passed through limewater.



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23. Give the chemical formula of the following:

a. Plaster of paris, b. Asbestos, c. Hydrolith



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Concept Application Exercise

1. Which is not considered as a constituent of portland cement?



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2. Like lithium in group 1, beryllium shows anomalous behavior in group 2

Write three such properties of beryllium which make it anomalous in the group.



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3. Beryllium exhibits some similarities with aluminium. Point out three such properties.



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1. A metal M readily forms its sulphate MSO_4 which is water soluble. It forms its oxide MO which becomes inert on heating. It forms its insoluble hydroxide $M(OH)_2$ which is soluble in $NaOH$ solution. What would be M ?

A. Be

B. Mg

C. Ca

D. Sr

Answer: A



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2. A sodium salt of unknown anion when treated with $MgCl_2$ gives a white *ppt.* On boiling. The anion is



Answer: B



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