CHEMISTRY

BOOKS - MTG CHEMISTRY (HINGLISH)

THE S-BLOCK ELEMENTS

Group 1 Elements Alkali Elements

1. Alkali metals are not found in free state due to their highly reactive nature. This is due to

A. their large size and low ionisation enthalpy

B. their large size and high ionisation enthalpy

C. their low ionisation enthalyp and high electron gain enthalpy

D. their tendency to impart colour to the flame.

Answer: A

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2. The ionisation energy of alkali metals decreases from Li to Cs bacause

A. the atomic size increases from Li to Cs

B. The sitance betweenn nucleus and outermost orbital decreases from Li to Cs

C. electropositive character decreases down the group

D. melting point decreases from Li to Cs.

Answer: A

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3. First ionisation energy of alkali metals is very low but second ionisation energy is very high because

A. alkali metals acquire noble gas configuration after losing one electron

B. a large amount of energy is required to remove electron from a cation

C. alkali metals can form only univalent ions

D. first group elements can lose only one electron.

Answer: A

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4. The solubility of alkli metals salts in water is due to the fact that the cations get hydrated by water molecules. The degree of hydration depends upon the size of the cation. If the trend of relative ionic radii is $Cs^+ > Rb^+ > K^+ > Na^+ > Li^+$.

What is the relative degree of hydration?

A. $Cs^+_{(aq)} > Pb^+_{(aq)} > K^+_{(aq)} > Na^+_{(aq)} > Li^+_{(aq)}$

B. $Li^+_{(aq)} > Na^+_{(aq)} > K^+_{(aq)} > Rb^+_{(aq)} > Cs^+_{(aq)}$

C. $Na^+_{(aq)} > K^+_{(aq)} > Rb^+_{(aq)} > Cs^+_{(aq)} > Li^+_{(aq)}$

D. $Cs^+_{(aq)} > Na^+_{(aq)} > Li^+_{(aq)} > K^+_{(aq)} > Rb^+_{(aq)}$

Answer: B

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5. The mobilities of the alkali metal ions in aqueous solution are $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$ because

A. greater is the degree of hydration, lesser is the mobility in aqueous aqueous medium

B. larger the size of cation, greater is the mobility in aqueous medium

C. larger the size of cation, lesser is the mobility of ions in aqueous medium

D. lesser the degree of hydration, lesser is the mobility of ions in aqueous medium

Answer: A

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6. Arrange the following elements in the order of the increasing electropositive character.

Li, Na, K, Rb, Cs

A. $Li > Na > K > Rb > Cs$

B. $Li < Na < K < Rb < Cs$

C. $Li > Na < K < Rb < Cs$

D. $Na > Li > K < Rb < Cs$

Answer: B

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7. Which is the characteristic flame colouration of Li?

A. Yellow

B. Violet

C. Blue

D. Crimson red

Answer: D

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8. Which of the following is not true about alkali metals?

A. Alkali metals do not occur free in nature.

B. Alkali metals are good oxidising agents.

C. Alkali metals salts impart colour to the flame

D. Alkali metal salts are generally ionic.

Answer: B

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9. Which of the following alkali metals when burnt in air forms a mixture of oxide as well as nitride?

A. K

B. Na

C. Li

D. Cs

Answer: C

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10. A metal M reaccts with nitrogen to give nitride which on reaction with water produces ammonia gas. Metal M can be

A. Na

B. K

C. Li

D. Rb

Answer: C

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11. Alkali metals cannot be extracted by reduction of their oxides and other compounds because

A. alkali metals are strong reducing agents

B. alkali metals have low ionisation enthalpy

C. alkali metals have high latice enthalpy

D. alkali metals are strongly basic in nature.

Answer: A

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12. When sodium reacts with excess of oxygen, oxidation number of oxygen changes from

A. 0 to -1

B. 0 to -2

C. -1 to -2

D. No change.

Answer: A

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13. In all oxides, peroxides and superoxides, the oxidation sate of alkali metals is

A. $+1 \text{ and } -1$

B. $+1$ and $+2$

C. $+1$ only

D. $+1, -1$ and $+2$

Answer: C

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14. Match column I wht colun II and mark the appropriate choice.

Column I		Column II	
(A)	Li	(i)	M_2O_2
(B)	Na	(ii)	MO_2
(C)	Rb	(iii)	M_2O

A. $A \to i, B \to ii, C \to iii$

B. $A \to iii, B \to ii, C \to i$

C. $A \to iii, B \to i, C \to ii$

D. $A \to ii, B \to iii, C \to i$

Answer: C

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15. The normal oxide contains_____ion, peroxide contains____ion and superoxide contains___ion.

A. O^{2-}, O_2^{2-}, O_2^-

B. O^{2-}, O_2^-, O_2^{2-}

C. O^-, O^{2-}, O^{3-}

D. O^-, O^{2-}, O_2^{2-}

Answer: A

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16. When sodium is added in scanty water, it catches fire. In this process which one of the following burns ?

A. Na

B. H_2O

C. H_2

D. NaOH

Answer: C

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17. What happens when H_2 is passed over lithium at 1073K?

A. Covalent lithium hydride is formed

B. Coloured complex is formed

C. Ionic lithium hydride is formed

D. No reaction

Answer: C

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18. On reaction with dihydrogen the alkali metals

A. form hydrides which are ionic solids with high melting points

B. form hydrides which are molcular solids with low melting points

C. form hydrides which are ionis solids with low melting points

D. form hydrides which are non-stoichiometric.

Answer: A

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19. Lithium is the strongest reducing agent though it has highest ionisation enegy in its group. Which of the followinng factors is responsible for making Li the strongest reducing agent?

A. Large heat of atomisation

B. Smaller size

C. Large sublimation energy

D. Large amount of hydration enthalpy

Answer: D

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20. E° for $CL_2/Cl^- = +1.36, I_2/I^- = +0.53, Ag^+/Ag = +0.79, Na^+/Na =$. What is the order of decreasing reducing sterngth for these species?

A. $Li > Cl^- > Ag > I^- > Na$

B. $Li > Na > I^- > Ag > Cl^-$

C. $Cl^- > Ag > I^- > Na > Li$

D. $Na > Li > Ag > Cl^- > I^-$

Answer: B

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21. The alkali metals dissolve in ammonia to give a deep blue solution which is cnducting in nature.

$M + (x + y)NH_3 \rightarrow \left[M(NH_3)_x\right]^{2+} + 2\left[e(NH_3)_y\right]^-$ which of the followin is not true about the solutions of alkali metals in liquid ammonia?

A. The blue colour is due to ammoniated electron

B. the solution is paramagnetic.

C. The blue colour changes to brown on standing

D. In concentrated solution blue colour changes to bronze and becomes diamagnetic

Answer: C

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General Characteristic Of The Compounds Of The Alkali Metals

1. Superoxides of alkali metals act as oxidising agents while normal oxids are basic in nature. The oxide which is paramagnetic in nature due to presence of unparied electron is

A. Na_2O_2

B. KO_2

C. Na_2O

D. K_2O_2

Answer: B

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2. Complete the following equations:

(i) $Na_2O_2 + 2H_2O \rightarrow \underline{(W)} + H_2O_2$

(ii) $2KO_2 + 2H_2O \rightarrow \underline{(X)} + \underline{(Y)} + O_2$

(iii) $Na_2O + CO_2 \rightarrow \underline{(Z)}$

A. W-4Na, X-K_2O,Y-H_2O,$Z - Na_2O_2$

B. $W - 4Na, X - K_2O, Y - H_2O_2, Z - Na_2CO_3$

C. $W - 4NaOH, X - 2KOH, Y - H_2O, Z - Na_2O_2$

D. $W - 2NaOH, X - 2KOH, Y - H_2O_2, Z - Na_2CO_3$

Answer: D

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3. Crystalline sodium chloride is a bad conductor of electricity while molten NaCl and its aqueous solution conduct electricity. This is because

A. crystalline sodium chloride contains molecules only

B. the ions present in it are not free to move in solid state

C. sodium chloride is a covalent crystal

D. solid substrances do not conduct electricity.

Answer: B

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4. All alkali halides are soluble in water except LiF. The low solublity of LiF in water is due to its (i)_____ the low solubility of CsI is due to (ii)____. LiF is soluble in (iii)_____ solvents.

A. (i) low lattice enthalpy, (ii) large hydration enthalpy, (iii) polar solvents

B. (i) high lattice enthalpy, (ii) smaller hydration enthalpy, (iii)-non-polar solvents

C. (i) high hydration enthalpy, (ii)-high lattice enthalpy, (iii)- non-polar solvents

D. (i)-smaller hydration enthalpy, (ii)-high lattice enthalpy, (iii)-polar solvents

Answer: B

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5. Which one of the following material conducts electricity?

A. Crystalline potassium chloride

B. Fused sulphates

C. Molten sodium chlroide

D. Diamond

Answer: C

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6. Which of the following increasing order is not correct as per the property indicated against it?

A. $CsCl < RbCl < KCl < NaCl < LiCl$ (lattice energy)

B. $LiOH < NaOH < KOH$ (solubility in water)

C. $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$ (size of hydrated ion)

D. $NaI < NaBr < NaCl < NaF$ (Lattice energy)

Answer: C

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7. Wwhich of the following statements are true about the alkali metals?

A. All alkali metals form oxo salts such as carbonates, sulphates and nitrates

B. the basic character of oxides increases down the group

C. Carbonates and sulphates of lithium are stable and their stability decreases down the group

D. Solubility of carbonates and sulphates increases down the group.

Answer: C

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8. Which of the following has lowest thermal stability ?

A. Li_2CO_3

B. Na_2CO_3

C. K_2CO_3

D. Rb_2CO_3

Answer: A

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9. A solution of a compound X in dilute HCl on treatment with a solution of $BaCl_2$ gives a white precipitate of compound Y which is insoluble in conc. HNO_3 and and conc. HCl. Compound X imparts golden yellow colour to the flame.

$$\underset{(\text{immparts golden yellow colour})}{X(\text{Solution in dilute HCl})} + BaCl_2 \rightarrow \underset{\text{White}}{Y} \xrightarrow[\text{Conc. HCl}]{\text{Conc. } HNO_3} \text{Insoluble}$$

What are compounds X and Y?

A. X is $MgCl_2$ and Y is $BaSO_4$

B. X is $CaCl_2$ and Y is $BaSO_4$

C. X is Na_2SO_4 and Y is $BaSO_4$

D. X is $MgSO_4$ and Y is $BaSO_4$

Answer: C

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Anomalous Properties Of Lithium

1. The properties of lithium are similar to those of Mg. This is because

A. both have nearly the same size

B. both have similar electronic configuration

C. both are found together in nature.

D. Both are found together in nature

Answer: B

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2. Lithium salts are mostly hydrated like $LiCl \cdot 2H_2O$ due to

A. maximum ionisation enthalpy

B. maximum degree of hydration of Li^+

C. maximum hygroscopic nature

D. maximum chemical reactivity.

Answer: B

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3. Which nitrate will decompose to give NO_2 on heating?

A. $NaNO_3$

B. KNO_3

C. $RbNO_3$

D. $LiNO_3$

Answer: D

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4. Which of the following does not show the amomalous behaviour of lithium?

A. Lithium reacts with nitrogen to form a nitride

B. Lithium carbonate decomposes on heating

C. Lithium nitrate gives NO_2 on heating

D. lithium is the strongest reducing agent.

Answer: D

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5. Fill up the blanks with appropriate choice.

Lithium and magnesium react slowly with water.

their hydroxides are____soluble in water.

Carbonates of Li and Mg___easily on heating. Both LiCl and $MgCl_2$ are____in ethanol and are_____.they crystallise from their aqueous solutions as____.

A. More, do not decompose, soluble, hygroscopic, hydrates

B. less, decompose, soluble, deliquescent, hydrates

C. freely, sublime, insoluble, deliquescent, anhydrous

D. freely, docompose, soluble, hygroscopic, crystals

Answer: B

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Some Important Compounds Of Sodium

1. In Solvay ammonia process, sodium bicarbonate is precipitated due to

A. presence of NH_3

B. reaction with CO_2

C. reaction with brine solution

D. reaction with NaOH.

Answer: C

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2. k_2CO_3 cannot be prepared by solvay process because

A. $KHCO_3$ is less soluble than $NaHCO_3$

B. $KHCO_3$ is more soluble to be precipitated by KCl and NH_4HCO_3

C. K_2CO_3 is less soluble than Na_2CO_3.

D. Both are equally soluble

Answer: B

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3. What are the raw materials used in solvay's process?

A. $NaCl$, NH_3, $CaCO_3$

B. $NaOH$, CO_2

C. $NaCl$, $CaCO_3$, C, H_2SO_4

D. NH_3, H_2O, H_2SO_4

Answer: A

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4. When washing soda is heated

A. CO is released

B. CO+CO_2 is released

C. CO_2 is released

D. Water vapour is released.

Answer: D

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5. Which of the following reaction is not a part of solvay's process for preparation of sodium carbonate?

A. $2NH_3 + H_2O + CO_2 \rightarrow (NH_4)_2CO_3$

B. $(NH_4)_2CO_3 + H_2O + CO_2 \rightarrow 2NH_4HCO_3$

C. $2NH_4HCO_3 \rightarrow (NH_4)_2CO_3 + H_2O + CO_2$

D. $NH_4HCO_3 + NaC < oNH_4Cl + NaHCO_3$

Answer: C

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6. When kept open in air, the crystals of washing soda lose 9 molecules off water to form a monohydrate.

$Na_2CO_3 \cdot 10H_2O \xrightarrow[\text{to air}]{\text{exposed}} Na_2CO_3 \cdot H_2O + 9H_2O$ this process is called

A. efflorescence

B. deliquescence

C. dehydration

D. hydration

Answer: A

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7. A white solid X on heating gives a white solid Y and an acid gas Z. gas Z is also given out when X reacts with an acid. The compound Y is also formed if caustic soda is left open in the atmosphere. X, Y and Z are

A. $X - NaHCO_3, Y - Na_2CO_3, Z - CO_2$

B. $X - Na_2CO_3, Y - NaOH, Z - CO_2$

C. $X - Na_2CO_3, Y - NaHCO_3, Z - CO_2$

D. $X - NaOH, Y - NaHCO_3, Z - CO_2$

Answer: A

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8. Which of the following statements is correct?

A. Sodium carbonate decomposes on heating

B. sodium biarbonate is more soluble in water than potassium bicarbonate.

C. sodium when heated with excess of O_2, gives peroxide

D. Lithium halides are highly ionic in nature.

Answer: C

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9. Which of the following statements in not correct regarding preparation of NaOH/

A. NaOH is prepared by electrolysis of sodium chloride in castner-kellner cell.

B. sodium metal discharged at cathode cmbines with mercury to form sodium amalgam,.

C. Chlorine is evolved at anode.

D. Amalgam is heated to separate Na and Hg.

Answer: D

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10. In the given chemical reaction,

$$2P + H_2O + CO_2 \rightarrow Q \xrightarrow{H_2O+CO_2} 2R \xrightarrow{NaCl} S + NH_4Cl$$

Identify S.

A. Na_2CO_3

B. $NaOH$

C. $NaHCO_3$

D. NH_3

Answer: C

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11. Baking soda is

A. $NaHCO_3$

B. $NaHCO_3 \cdot 6H_2O$

C. Na_2CO_3

D. $Na_2CO_3 \cdot 10H_2O$

Answer: A

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12. Which of the following is not a use of baking soda?

A. In medicines as antacid

B. as a component of baking powder

C. in remvoing permanent hardness of water.

D. In fire extinguishers.

Answer: C

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13. A certain compound X impats golden yellow flame. Whenzinc powder is heated with concenrated solution of X, H_2 gas is evolved. X combines with CO_2 to give a salt Y. Y is a hydrated salt which on reaction with HCl or ecess of CO_2 gives another salt Z which is an important part of baking powder. identify X, Y and Z.

A. $X - NaOH, Y - Na_2CO_3, Z - NaHCO_3$

B. $X - HCl, Y - NaOH, Z - NaHCO_3$

C. $X - KOH, Y - K_2CO_3, Z - KHCO_3$

D. $X - NaCl, Y - Na_2CO_3, Z - NaOH$

Answer: A

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14. A white solid X reacts with dil. HCl to give colourless gas which is used in fire extinguishers. The solid X is

A. NaCl

B. CH_3COONa

C. Na_2CO_3

D. $NaHCO_3$

Answer: D

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15. A metal X reacts with water to produce a highly combustible gas Y, and a solution Z. another metal P reacts with Z to give the same gas Y. X,Y,Z and P respectively are

A. $Zn, H_2, Zn(OH)_2, Al$

B. $Na, H_2, NaOH, Zn$

C. K, H_2, KOH, Al

D. $Li, H_2, LiOH, K$

Answer: B

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16. What is the biological important of Na^+ and K^+ ions in cell fluids like blood plasma?

A. They participate in transmission of nerve signals.

B. They regulate the number of red and white blood corpuscles in the cell

C. They ca be presence in any amount in the blood since they are absorbed by the cells.

D. They regulate the viscosity and colour of the blood

Answer: A

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Group 2 Elements Alkaline Earth Metals

1. Ca^{2+} is isoelectronic with

A. Na

B. Mg^{2+}

C. Ba^{2+}

D. Ar

Answer: D

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2. Which of the following is not true about s-block elements?

A. They have large atomic sizes

B. They have lower ioinisation enthalpies

C. they have variable oxidation state

D. They form basic oxides

Answer: C

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3. The decreasing order of the second ionization potential of Mg, Ca and Ba is

A. $Mg > Ca > Ba$

B. $Ca > Ba > Mg$

C. $Ba > Mg > Ca$

D. $Mg > Ba > Ca$

Answer: A

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4. The first ionisation enthalpies of the alkline earth metals are higher than that of alkali metals but second ionisation ethalpies are smaller, why?

A. In alkli metals, second ionisation enthylpy involves removal of electron from noble gas electronic configuration while in alkaline

earth metals, second electron is removed from ns^1 configuration

B. Alkaline earth metals hae very high melting point as compared to alkali metals.

C. Electrons in s-orbital aremore closely packed in alkaline earth metals than alkali metals.

D. due to smalle size alkaline earth metals do not form divalent ions very easily

Answer: A

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5. What is the formula of hydrated $BeCl_2$?

A. $BeCl_2 \cdot H_2O$

B. $BeCl_2 \cdot 2H_2O$

C. $BeCl_2 \cdot 3H_2O$

D. $BeCl_2 \cdot 4H_2O$

Answer: D

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6. Which among the following is kinetically inert towards water?

A. Na

B. Be

C. Ca

D. K

Answer: B

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7. An oxide of alkaline earth metals X reacts with C and Cl_2 to give a compound Y. Y is found in polymeric chain structure and is electron deficient molecule. The compound Y is

A. BeO

B. $BeCl_2$

C. $Be(OH)_2$

D. $BeCO_3$

Answer: B

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8. When alkaline earth metals dissolve ini ammonia, they form coloured solution like alkali metals. Which of the following observations regarding the reaction are correct?

(i) Dilute solutions are bright blue in colour due to solvated electrons.

(ii) These solutions decompose to form amides and hydrogen.

(iii) From this solution the ammoniates $\left[M(NH_3)_6\right]^{2+}$ can be recovered by evaporation.

A. Only (i) and (ii)

B. Only (i), (ii) and (iii)

C. Only (ii) and (iii)

D. Only (i)

Answer: B

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General Characteristic Of The Compounds Of The Alkaline Earth Metals

1. Which of the following statements is correct regarding alkaline earth metals?

A. Alkaline earth meals are weaker reducing agents than alkali metals

B. Alkaline earth metal salts are paramagnetic in nature

C. Alkaline earth metal salts are more soluble than corresponding alkali meal salts.

D. solubility of sulphates of alkaline earth metals increases from top to bottom in the group

Answer: A

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

A. $MgO < SrO < K_2O < Cs_2O$

B. $CrO < MgO < Cs_2O < K_2O$

C. $Cs_2O < K_2O < SrO < MgO$

D. $K_2O < Cs_2O < SrO < MgO$

Answer: A

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3. Which of the following is arranged according to increasing basic strength?

A. $CaO < MgO < \ < SrO < BaO < BeO$

B. $BaO < SrO < CaO < MgO < BeO$

C. $BeO < MgO < CaO < BaO < SrO$

D. $BeO < MgO < CaO < SrO < BaO$

Answer: D

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4. BeO is insoluble but BaO is soluble as

A. lattice energy of BeO is higher than BaO due to small size of Be^{2+} ion and its covalent nature

B. hydration energy of BeO is lower than BaO due to small size Be^{2+} ion

C. BeO is amphoteric in nature while BaO is basic

D. BeO forms hydrated salts while BaO forms anhydrous salts

Answer: A

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5. The pairr of amphoteric oxides is

A. BeO, ZnO

B. Al_2O_3, Li_2O

C. BeO, BO_3

D. BeO, MgO

Answer: A

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6. One word answers are givenn for the following, Mark the example which is not correct.

A. Alkali metals with lowest melting point- Cs

B. Alkaline earth metal with higher hydration ethalpy- Ba^{2+}

C. Alkaline earth metal which imparts brick red colour to the flame- Ca^{2+}

D. Oxide of alkaline earth metal which is amphoteric in nature -BeO

Answer: B

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7. Which of the following will have lowest value of K_{sp} at room temperature?

A. $Be(OH)_2$

B. $Mg(OH)_2$

C. $Ca(OH)_2$

D. $Ba(OH)_2$

Answer: A

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8. 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. X=Be,Y=Ba

B. X=Mg,Y=Ca

C. X=Ca,Y=Sr

D. X=Ba,Y=Mg

Answer: A

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9. Calcium chloride is used as a dehydrating agent because

A. it has a strong affinity for water

B. it has water of crystalline attached to it

C. it loses water when exposed to air

D. it has a high melting point.

Answer: A

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10. What happens when magnesium is burnt in airr and the products X and Y are treated with water?

$$Mg \xrightarrow{\text{Air}} \underset{\downarrow H_2O \atop P}{X} + \underset{\downarrow H_2O \atop P+Q}{Y}$$

A. $X - MgO, Y - Mg(OH)_2, P - Mg(OH)_2, Q - N_2$

B. $X - MgO, Y - Mg_3N_2, P - Mg(OH)_2, Q - NH_3$

C. $X - MgO, Y - Mg_3N_2, P - Mg(OH)_2, Q - N_2$

D. $X - MgO, Y - MgCO_3, P - Mg(OH)_2, Q - CO_2$

Answer: B

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11. When $BeCl_2$ is hydrolysed, white fumes of gas are given out. The intensity of fumesintensifies when a rod dipped in moist ammonia is brought near the mouth of the test tube. The gas which comes out during hydrolysis is

A. Cl_2

B. HCl

C. NH_4OH

D. NH_4Cl

Answer: B

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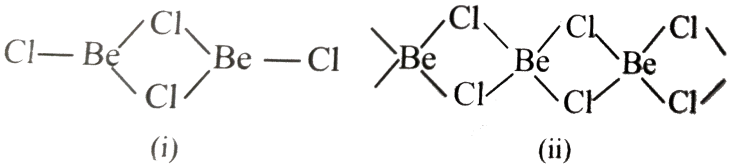
12. The following two figures represent



(i) (ii)

A. (i) $BeCl_2$ is a dimer in vapour phase, (ii) $BeCl_2$ is chain structure in solid state

B. (i) $BeCl_2$ is solid state, (ii) $BeCl_2$ is in vapour phase

C. (i) $BeCl_2$ is monomer in solid state, (ii) $BeCl_2$ is linear polymer in vapour phase

D. (i) $BeCl_2$ is linear monomer, (ii) $BeCl_2$ is three dimensional dimer

Answer: A

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13. Which is the correct sequence of solubility of carbonates of alkaline earth metals?

A. $BaCO_3 > SrCO_3 > CaCO_3 > MgCO_3$

B. $MgCO_3 > CaCO_3 > SrCO_3 > BaCO_3$

C. $CaCO_3 > BaCO_3 > SrCO_3 > MgCO_3$

D. $BaCO_3 > CaCO_3 > SrCO_3 > MgCO_3$

Answer: B

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14. Which of the following bicarbonate does not exist in solid state?

A. $NaHCO_3$

B. $KHCO_3$

C. $Ca(HCO_3)_2$

D. $RbHCO_3$

Answer: C

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15. Which of the following compounds are not arranged in correct order as indicated?

A. $SrCL_2 < CaCl_2 < MgCl_2 < BeCl_2$ (increasing of hydrolysis)

B. $SrCl_2 < CaCl_2 < MgCl_2 < BeCl_2$ (increasing lattice energy)

C. $CaSO_4 < MgSO_4 < BeSO_4$ (increasing stability)

D. $Be(OH)_2 < Mg(OH)_2 < Ca(OH)_2$ (increasing solubility)

Answer: C

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16. Sulphates of Be and Mg are readily soluble in water but sulphates of Ca, Sr and Ba are insoluble. This is due to the fact

A. the greater hydration enthapies of Be^{2+} and Mg^{2+} overcome the lattice enthalpy

B. high lattice enthalpy of Be^{2+} and Mg^{2+} makes them soluble in water

C. solubility decreases from $BeSO_4$ to $BaSO_4$ due to increase in ionic size

D. $BeSO_4$ and $MgSO_4$ are ionic in nature while other sulphates are covalent

Answer: A

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17. The correct order of solubility of the sulphates of alkaline earth metals in water is

A. $Be > Ca > Mg > Ba > Sr$

B. $Mg > Be > Ba > Ca > Sr$

C. $Be > Mg > Ca > Sr > Ba$

D. $Mg > Ca > Ba > Be > Sr$

Answer: C

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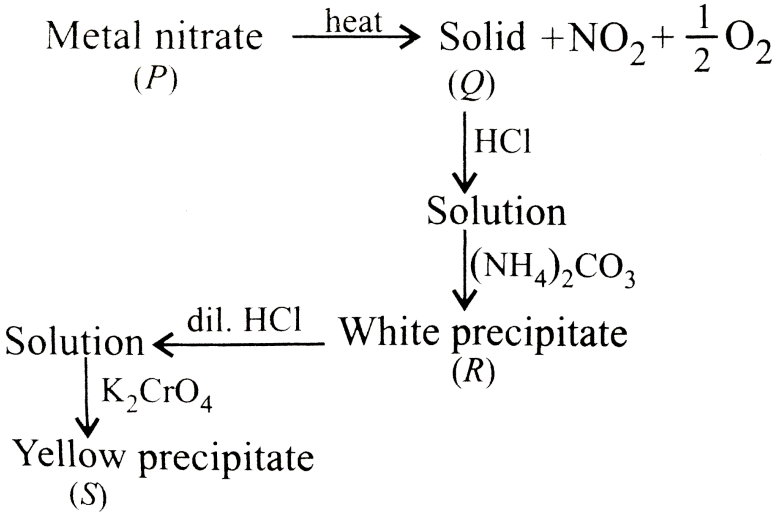
Mcqs



1.

What are (P),(Q),(R) and (S)?

A. $P - Be(NO_3)_2, Q - BeO, R - BeCO_3, S - BeCrO_4$

B. $P - NaNO_3, Q - Na_2O, R - Na_2CO_3, S - Na_2CrO_4$

C. $P - Ba(NO_3)_2, Q - BaO, R - BaCO_3, S - BaCrO_4$

D. $P - KNO_3, Q - K_2O, R - K_2CO_3, S - K_2CrO_4$

Answer: C

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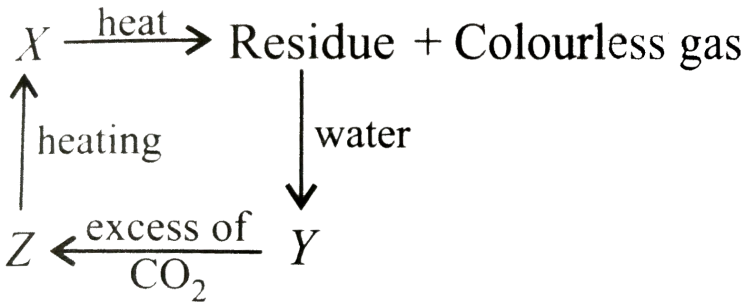

2. Identify X, Y and Z.

Identify X, Y and Z.

A. $X - Ca(HCO_3)_2, Y - CaCO_3, Z - Ca(OH)_2$

B. $X - CaCO_3, Y - Ca(OH)_2, Z - Ca(HCO_3)_2$

C. $X - CaCO_3, Y - CaO, Z - Ca(OH)_2$

D. $X - CaCO_3, Y - CaO, Z - Ca(HCO_3)_2$

Answer: B

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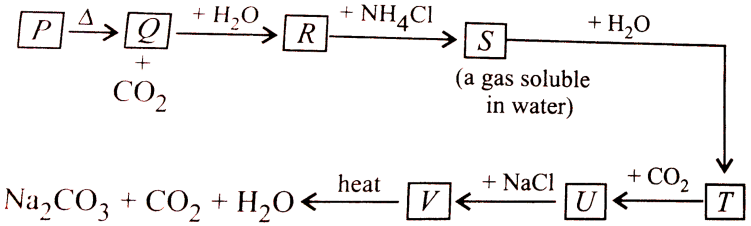
3. Study the road map for preparation of washing soda and fill the blanks



A.

$P - CaCO_3, Q - CaO, R - Ca(OH)_2, S - NH_3, T - NH_4OH, U -$

B.

$P - CaCl_2, Q - CaO, R - Ca(OH)_2, S - HCl, T - HCl, U - Na$

C.

$P - CaCl_2, Q - CaO, R - CaCO_3, S - NH_3, T - HCl, U - NH_4$

D.

$P - CaCO_3, Q - CaO, R - Ca(OH)_2, S - HCl, T - Cl_2, U - Ca$

Answer: A

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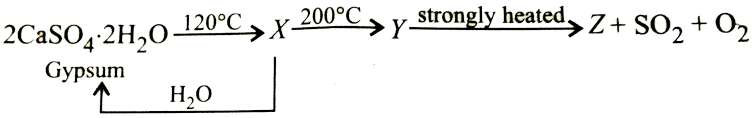
4. Identify X, Y and Z



A. X-Plaster of paris $\left(CaSO_4 \cdot \frac{1}{2}H_2O\right)$, Y-Zburnt plaster $(CaSO_4)$, Z-Quick lime (CaO)

B. X-Calcium sulphate $(CaSO_4)$, Y-Plaster of Paris $\left(CaSO_4 \cdot \frac{1}{2}H_2O\right)$,Z-Quick lime (CaO)

C. X-Quick lime (CaO), Y-Plaster of paris $\left(CaSO_4 \cdot \frac{1}{2}H_2O\right)$, Z-Lime water $\left(Ca(OH)_2\right)$

D. X-Plaster of paris $\left(CaSO_4 \cdot \frac{1}{2}H_2O\right)$, Y-Burnt plaster (CaO), Z-slaked lime $\left(ca(OH)_2\right)$

Answer: A

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Anomalous Behaviour Of Beryllium

1. Beryllium shows diagonal relationship with aluminium. Which of the following similarly is incorrect?

A. Be_2C like Al_4C_3 yields methane on hydrolysis

B. Be like Al is rendered passive by HNO_3

C. $Be(OH)_2$ like $Al(OH)_3$ is basic

D. Be forms beryllates and Al forms aluminates.

Answer: C

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2. Which of the following does not show diagonal relationship between beryllium and aluminium?

A. Both BeO and Al_2O_3 are amphoteric in nature.

B. Both beryllium and aluminium form polymeric covalent hydrides.

C. Both beryllium and aluminium form nitrides with nitrogen which evolve NH_3 with water.

D. Both metal carbonates are highly stable.

Answer: D

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3. Which of the following is not the point of difference between Be and other alkline earth metals?

A. It has a tendency to form covalent bonds.

B. It dissolves in alkalies with evolution of hydrogen

C. Its oxides and hydroxides are amphoteric.

D. its carbide gives acetylene on hydrolysis.

Answer: D

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4. Which of the following is not a similarly of beryllium with aluminium?

A. It becomes passive when treated with conc. HNO_3.

B. It forms polymerric covalent hydrides

C. Carbonate of Be is extremely stable

D. saltts of Be do not impart colour to the flame.

Answer: C

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Some Important Compounds Of Calcium

1. Identify W, X, Y and Z respectively in the given reactions.

$$CaCO_3 \xrightarrow{\Delta} W + X$$

$W + H_2O \rightarrow Y$

$Y + Z \rightarrow NaOH + CaCO_3$

A. $CaO, CO_2, CaCO_3, Na_2CO_3$

B. $CO_2, Ca(OH)_2, Ca(HCO)_3, NaHCO_3$

C. $CaO, CO_2, Ca(OH)_2, Na_2CO_3$

D. $CO_2, CaO, H_2CO_3, Na_2CO_3$

Answer: C

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2. Slaked lime reacts with chlorine to form

A. $CaCl_2$

B. CaO

C. $Ca(OCl)_2$

D. $CaCO_3$

Answer: C

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3. An element X burns in nitrogen to give a compound Y which on reaction with water gives a compound Z and a gas with a pungent smell. Z can be used during construction and white washing. When excess of CO_2 is bubbled through Z, a compound P is formed which on heeating decomposes to give a compourless, odourless gas. identify X, Y, Z and P.

A. $X - Ca, Y - Ca_3N_2, Z - Ca(OH)_2, P - Ca(HCO_3)_2$

B. $X - Mg, Y - MgO, Z - Mg(OH)_2, P - MgCO_3$

C. $X - Ca, Y - Ca_3N_2, Z - Ca(OH)_2, P - CaCO_3$

D. $X - Ca, Y - CaO, Z - Ca(OH)_2, P - Ca(HCO_3)_2$

Answer: A

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4. when plaster of paric comes in contact with water it sets into a hard mass. The composition of the hard mass is

A. $CaSO_4 \cdot H_2O$

B. $CaSO_4 \cdot Ca(OH)_2$

C. $CaSO_4 \cdot 2H_2O$

D. $CaSO_4 \cdot 2Ca(OH)_2$

Answer: C

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5. Which of the following is not present in portland cement?

A. $Ca_3Al_2O_6$

B. Ca_3SiO_5

C. Ca_2SiO_4

D. $Ca_3(PO_4)_2$

Answer: D

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6. The difference of number of water molecules in gypsum and plaster of Pairs is

A. $\frac{5}{2}$

B. 2

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

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

Answer: D

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7. Gypsum is added to portland cement to

A. fasten the process of setting

B. slow down the process of setting

C. improve the colour of the cement

D. increase the melting point of cement.

Answer: B

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8. The average composition of portland cement is

A. $CaO: 40-50\,\%$, $SiO_2: 30-40\,\%$, Al_2O_3, $Fe_2O_3: 10-20\,\%$

B.

$CaO: 50-60\,\%$, $SiO_2: 20-25\,\%$, $Al_2O_3: 5-10\,\%$, $MgO: 2-3\,\%$

C. $SiO_2: 40-50\,\%$, $CaO: 30-40\,\%$, $Al_2O_3: 10-20\,\%$

D. $CaO: 50\,\%$, $SiO_2: 50\,\%$

Answer: B

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Biological Importance Of Magnesium And Calcium

1. The metal ion which plays an important role in muscle contraction is

A. Be^{2+}

B. Mg^{2+}

C. Ca^{2+}

D. Ba^{2+}

Answer: C

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2. Which of the following metals is required as cofactor byh all enzymes utilisation ATP in phosphate transfer?

A. K

B. Ca

C. Na

D. Mg

Answer: D

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Higher Order Thinking Skills

1. The low solubility of LiF and that of CsI in water are respectively due to which of the properties of the alkali metal ions?

A. Higher hydration enthalpy of Li^+, higher lattice enthalpy of Cs^+

B. Smaller hydration enthalpy of Li^+, higher latttice enthalpy of Cs^+

C. Smaller lattice enthalpy of Li^+, higher hydration enthalpy of Cs^+

D. Higher lattice enthalpy of Li^+, smaller hydration enthalpy of Cs^+.

Answer: D

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2. The violet flame shown by potassium in bunsen flame is due to jumping of the electron from

A. 1s to 4p

B. 1s tto 5p

C. 4p to 4s

D. 5p to 4s

Answer: D

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3. A compound of sodium does not give CO_2 when heated but it gives CO_2 when treated with dilute acids. A crystalline compound is found to

have 37.1% Na and 14.52% H_2O. Hence, compound is

A. $NaHCO_3 \cdot 10H_2O$

B. $NaHCO_3 \cdot 5H_2O$

C. $Na_2CO_3 \cdot 10H_2O$

D. $Na_2CO_3 \cdot H_2O$

Answer: D

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4. Nuclear attraction is often the deciding control factor for the association of neutral molecules to a given metal ion. Which onee of the following represents the correct order of stability of the ions?

$\left[Be(H_2O)_4\right]^{2+}$, $\left[Mg(H_2O)_4\right]^{2+}$, $\left[Ca(H_2O)_4\right]^{2+}$ and $\left[Sr(H_2O)_4\right\}^{2+}$

A.

$$\left[Be(H_2O_4\right]^{2+} > \left[Sr(H_2O_4\right]^{2+} > \left[Mg(H_2O)_4\right]^{2+} > \left[Ca(H_2O)_4\right]^{2+}$$

B.

$$[Ca(H_2O)_4]^{2+} > [Mg(H_2O)_4]^{2+} > [Be(H_2O)_4]^{2+} > > [S(H_2O)$$

C.

$$[Sr(H_2O)_4]^{2+} > [Ca(H_2O)_4]^{2+} > [Mg(H_2O)_4]^{2+} > [Be(H_2O)_4]$$

D.

$$[Be(H_2O)_4]^{2+} > [Mg(H_2O)_4]^{2+} > [Ca(H_2O)_4]^{2+} > [Srr(H_2O)_4$$

Answer: D

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5. Be and Al exhibit diagonal relationship. Which of the following statements about them is/are not true?

(i) both react with HCl to liberate H_2.

(ii) Theey are made passive by HNO_3.

(iii) Their carbides give acetylene on treatment with water.

(iv) Their oxides are amphoteric.

A. (iii) and (iv)

B. (i) and (iii)

C. (i) only

D. (iii) only

Answer: D

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6. 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. Then M is

A. Be

B. Ba

C. Ca

D. Mg

Answer: A

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7. A metal salt solution forms a yellow precipitate with potassium chromate in acetic acid, a white precipitate with dilute sulphuric acid but does not give precipitate with sodium chloride or iodide. The white precipitate obtained when sodium carbonate is added to the metal salt solution will consist of

A. lead carbonate

B. basic lead carbonate

C. barium carbonate

D. strontium carbonate.

Answer: C

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8. The element A burns in nitrogen to give an ionic compound B. the compound B reacts with water to give C and D. A solution of C becomes milkly on bubbling carbon dioxide. What is the natrue of compound (D)?

A. Acidic

B. Basic

C. Amphoteric

D. Neutral

Answer: B

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9. The stability off K_2O, K_2O_2 and KO_2 is in order $K_2O < K_2O_2 < KO_2$. This increasing stability as the size of metal ion increases is due to stabilisation of

A. larger cation by smaller anions through lattice energy effects

B. larger cation by larger anions through lattice energy effects

C. smaller cations by smaller anions through melting point

D. smaller cations by larger anions through melting point.

Answer: B

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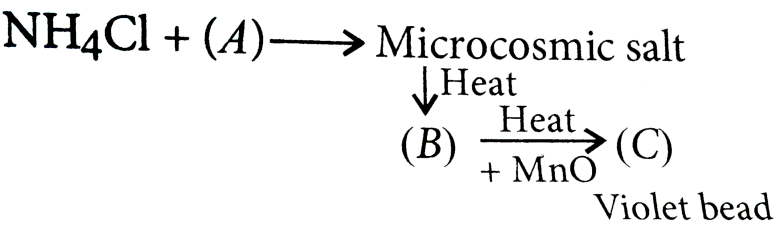
Higher Order Thinkin Skills



1.

(A), (B) and (C) respectively are

A. $Na_3PO_4, NaPO_3, (Mn)_3(PO_4)_2$

B. $Na_2HPO_4, Na_3PO_4, Mn_3(PO_4)_2$

C. $Na_2HPO_4, NaPO_3, Mn(PO_3)_2$

D. $Na_2HPO_4, NaPO_3, NaMnPO_4$

Answer: D

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Ncert Exemplar

1. The alkali metals have low melting point. Which of the following alkali metal is expected to melt if the room temperature rises to $30^\circ C$?

A. Na

B. K

C. Rb

D. Cs

Answer: D

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2. Alkali metals react with water vigorously to form hydroxides and dihydrogen. Which of the following alkali metals reacts with water least vigorously ?

A. Li

B. Na

C. K

D. Cs

Answer: A

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3. The reducing power of a metal depends on various factors. Suggest the factor which makes Li, the strongest reducing agent in aqueous solution.

A. Sublimation enthalpy

B. Ionisation enthylpy

C. Hydration enthalpy

D. Electron-gain enthalpy

Answer: C

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4. Metal carbonates decompose on heating to give metal oxide and carbon dioxide. Which of the metal carbonates is most stable thermally?

A. $MgCO_3$

B. $CaCO_3$

C. $SrCO_3$

D. $BaCO_3$

Answer: D

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5. Which of the carbonates given below is unstable in air and is kept in CO_2 atmosphere to avoid decomposition?

A. $BeCO_3$

B. $MgCO_3$

C. $CaCO_3$

D. $BaCO_3$

Answer: A

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6. Metals form basic hydroxides. Which of the following metal hydroxide is the least basic?

A. $Mg(OH)_2$

B. $Ca(OH)_2$

C. $Sr(OH)_2$

D. $Ba(OH)_2$

Answer: A

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7. Some of the Group 2 metal halides are covalent and soluble in organic solvents. Among the following metal halides, the one which is soluble in ethanol is

A. $BeCl_2$

B. $MgCl_2$

C. $CaCl_2$

D. $SrCl_2$

Answer: A

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8. The order of decreasing ionisation ethalpy in alkali metals is

A. $Na > Li > K > Rb$

B. $Rb < Na < K < Li$

C. $Li > Na > K > Rb$

D. $K < Li < Na < Rb$

Answer: C

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9. The solubility of metal halides depends on their nature, Lattice enthalpy and hydration enthalpy of the individual ions. Amongst fluorides of alkali metals, the lowest solubility of LiF in water is due to

A. ionic nature of lithium fluoride

B. high lattice enthalpy

C. high hydration enthalpy for lithium ion

D. low ionisation enthalpy of lithium atom

Answer: B

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10. Amphoteric hydroxides react with both alkalies and acids. Which of the following Group 2 metal hydroxides is soluble in sodium hydroxide?

A. $Be(OH)_2$

B. $Mg(OH)_2$

C. $Ca(OH)_2$

D. $Ba(OH)_2$

Answer: A

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

A. $CaCl_2$

B. $NaCl$

C. $NaOH$

D. $NaHCO_3$

Answer: A

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12. When sodium is dissolved in liquid ammonia, a solution of deep blue colour is obtained. The colour of the solution is due to

A. ammoniated electron

B. sodium ion

C. sodium amide

D. ammoniated sodium ion

Answer: A

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13. By adding gypsum to cement

A. setting time of cement becomes less

B. setting time of cement increases

C. colour of cement becomes light

D. shining surface is obtained

Answer: B

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14. Dead burnt plaster is

A. $CaSO_4$

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

C. $CaSO_4 \cdot H_2O$

D. $CaSO_4 \cdot 2H_2O$

Answer: A

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15. Suspension of slaked lime in water is known as

A. lime water

B. quick lime

C. milk of lime

D. aqueous solution of slaked lime

Answer: C

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16. Which of the followingg elements does not form hydride by direct heating with dihydrogen?

A. Be

B. Mg

C. Sr

D. Ba

Answer: A

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17. The formula of soda ash is

A. $Na_2CO_3 \cdot 10H_2O$

B. $Na_2CO_3 \cdot 2H_2O$

C. $Na_2CO_3 \cdot H_2O$

D. Na_2CO_3

Answer: D

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18. A substance which gives a brick red flame and breaks down on heating to give oxygen and a brown gas is

A. magnesium nitrate

B. calcim nitrate

C. barium nitrate

D. strontium nitrate

Answer: B

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19. Which of the following statements is true about $Ca(OH)_2$?

A. It is sued in the preparation of bleaching powder.

B. It is a light blue solid.

C. it does not possess disinfectant property

D. it is used in the manufacture of cement.

Answer: A

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20. A chemical A is used for the preparation of washing soda to recover ammonia. When CO_2 is bubbled through an aqueous solution of A, the solution turns milky. It is used in white washing due to disinfectant nature what is the chemical formula of A?

A. $Ca(HCO_3)_2$

B. CaO

C. $Ca(OH)_2$

D. $CaCO_3$

Answer: C

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21. Dehydration of hydrates of halides of calcium, barium and strontium i.e., $CaCI_2.6H_2O$, $BaCI_2.2H_2O$, $SrCI_2.2H_2O$, can be achieved by heating. These become wet on keeping in air. Which of the following statements is correct about these halides?

A. Act as dehydrating agent.

B. Can adsorb moisture from air

C. Tendency to form hydrate decreases from calcium to barium

D. All of the above

Answer: D

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Assertion And Reason

1. Assertion: Elements of group 1 are called 'alkali metals'.

Reason: All the alkali metals react with water.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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2. Assertion: Lithium resembles magnesium diagonally placed in next group.

Reason: The size of Li^+ and Mg^{2+} are different and their electropositive character is same.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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3. Assertion: Alkali metals are obtained by electrolysis of molten salt and not aqueous solution.

Reason: The discharge potential of H^+ ions is lower than alkali metals cation hence hydrogen is dicharged at cathode instead of metal.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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4. Assertion: Lithium salts are mostly hydrated.

Reason: The hydration enthalpies of alkalie metal ions decrease with increase in ionic sizes.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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5. Assertion: The melting and boiling points of the alkali metals are low.

Reason: Alkali metals have weak metalli bonding.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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6. Assertion: Lithium fluoride is most covalent in nature.

Reason: Small anion an be easily distorted.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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7. Assertion: The carbonate of lithium decomposes easily on heating.

Reason: Lithium being very small in size polarises large carbonate ion leading to the formation of more stable Li_2O and CO_2.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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8. Assertion : Super-oxides of alkali metals are para-magnetic.

Reason : Super-oxides contain the ion O_2^- which has one unpaired electron.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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9. Assertion: Be and Mg do not impat characteristic colour to the flame.

Reason: both Be and Mg have high ionization energy.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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10. Assertion: The fluorides of alkaline earth metals are relatively less soluble than chlorides.

Reason: Fluorides have high latttice energies.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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11. Assertion: Be is readily attacked by acids.

Reason: Be shows diagonal relationship to Na.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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12. Assertion: Alkaline earth metal oxides are quite stable to heat.

Reason: Enthalpies of formation of alkaline earth metal oxides are quite high.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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13. Assertion: $BeSO_4$ and $MgSO_4$ are insoluble in water.

Reason: Be^{2+} and Mg^{2+} have low hydration enthalpies.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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14. Assertion: $CaCO_3$ is prepared by passing carbon dioxide gas through slaked lime.

Reason: Passingg excess of CO_2 through slaked lime leads to the formation off quick lime.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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15. Assertion: For biological functions in human body, barium is not required.

Reason: Barium is a divalent ion.

A. If both assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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