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**DEPARTMENT OF CHEMISTRY,**

**JEE/NEET CRASH COARSE 2019-2020**

**TOPIC- HYDROGEN & s-BLOCK ELEMENTS-05**

1. 100m L of a water sample contains 0.81g of calcium bicarbonate and 0.73g of magnesium bicarbonate. The hardness of this water sample expressed in terms of equivalents of CaCO3 is (molarmass of CaCO3 = 162u, MgCO3 = 146u).

1) 10,000ppm 2) 100ppm 3) 1,000 pm 4) 5,000ppm.

**ANS: 1 ppm of CaCO3 = ( x 106 = 104 ppm.**

1. For two ionic solids, CaO and KI, which of the following statements is false?

1) Lattice enthalpy of CaO is much higher than that of KI.

2) CaO has high melting point.

3) CaO is soluble in water.

4) KI is soluble in benzene.

**ANS: 4 Due to lower lattice enthalpy of KI as compared to CaO, the melting point of KI is lower than that of CaO. KI is ionic, so insoluble in benzene.**

1. A metal M readily forms its sulphate MSO4 which is water-soluble. It forms its oxide MO which becomes inert on heating. It forms an insoluble hydroxide M(OH)2 which is soluble in NaOH solution. Then M is

1) Mg 2) Ba 3) Ca 4) Be

**ANS: 4 metal Be forms water soluble sulphate and forms BeO which on heating turns inert. Be forms insoluble hydroxide which is soluble in NaOH.**

1. Which of the following sequences represents the increasing order of the polarising power of the cationic species, K+, Ca2+, Mg2+, Be2+.

1) Ca2+< Mg2+<Be2+< K+ 2) Mg2+< Be2+< K+<Ca2+.

3) Be2+< K+< Ca2+< Mg2+ 4) K+< Ca2+< Mg2+ < Be2+.

**ANS: 4**

1. Which of the following has the correct combination considering Column I and Column II ?

|  |  |
| --- | --- |
| COLUMN I  (Hydride) | COLUMN II  (type of hydride) |
| P. BeH2 | I. Complex |
| Q. SiH4 | II. Interstitial |
| R. LaH3 | III. Covalent |
| S. LiAlH4 | IV. Polymeric. |

1) P →II 2) Q →IV 3) R→III 4) S → I

**ANS: BeH2 is polymeric. SiH4covalent , LaH3 is interstitial, LiAlH4 is complex.**

1. What is formed when calcium carbide reacts with heavy water?
2. C2D2 2) CaD2 3) Ca2D2O 4) CD2

**ANS: 1 CaC2 +2D2O C2D2 + Ca(OD)2**

1. Chemical A is used for water softening to remove temporary hardness. A reacts with sodium carbonate to generate caustic soda. When CO2 is bubbled through a solution of A, it turns cloudy. What is the chemical formula of A?

1) CaCO3 2) CaO 3) Ca(OH)2 4) Ca(HCO3)2

**ANS: 3 Ca(OH)2 is used for the softening of temporary hard water.**

**Ca(OH)2(aq)+ CO2(g)CaCO3(cloudiness)+ H2O**

1. 2g of aluminium is treated separately with excess of dilute H2SO4 and excess of NaOH. The ratio of volumes of hydrogen evolved under similar conditions of pressure and temperature is

1) 2:3 2) 1:1 3) 2:1 4) 1:2.

**ANS: 2 2Al + 2H2SO4→ Al2(SO4)3 + 3H2.**

**2Al + 2NaOH + 2H2O → 2NaAlO2 + 3H2.**

1. Reaction between following pairs will produce hydrogen except

1) Cu + HCl 2) Fe + H2SO4  3) Mg + steam 4) Na + alcohol

ANS: 1 No H2 evolved with Cu + HCl.

1. The correct order of increasing ionic character?

1) BeCl2 < MgCl2< CaCl2< BaCl22) BeCl2 < MgCl2< BaCl2< CaCl2

3) BeCl2 < BaCl2< MgCl2< CaCl2 4) BaCl2 < CaCl2< MgCl2< BeCl2

**ANS: 1):Ionic character of compounds of metals increases down the group.**

1. Oxidation state of oxygen atom in potassium superoxide is
2. 0 2) -1/2 3) -1 4) -2.

**ANS: 2**

1. In which of the following species, the size of the first species is not more than the second?

**1) Na+, F─**  2) Fe2+, Fe3+ 3) Li, F 4) S, O

**ANS: a):Na+ and F─ are isoelectronic ions. Since amongst isoelectronic ions, the size of the anion is larger than that of the cation, therefore, Na+< F─**

1. Select the correct statement.

1) Blue solution of Na in liq.NH3 is unstable with respect to amide formation.

2) Na2O2 reacts with CO and evolve O2.

3) Li+ does not form alum due to its high hydration energy.

4) NaNO3 when heated at 8000C produces two gases, both are paramagnetic.

**ANS: 1 2) Na2O2 + CO → Na2CO3. 3) Li+ does not form alum due its small size.**

**4) NaNO3 NaNO2 + ½ O2., 2NaNO2 Na2O + N2 + 3/2 O2.**

**N2 is diamagnetic.O2 is paramagnetic.**

1. One mole of magnesium nitride on reacting with an excess of water gives

1) One mole of ammpnia. 2) Two moles of nitric acid.

3) Two moles of ammonia. 4) One mole of nitric acid.

**ANS: 3Mg3N2 + 6H2O →3Mg(OH)2 + 2NH3.**

1. 1 mole of a mixture of CO and CO2 requires exactly 1L solution of 1M NaOH for complete neutralisation.

If CO present in mixture is now converted to CO2 and again the mixture is treated wthNaOH, then after this conversion

a) moles of CO2 present initially in mixture = 1

b) 2 L solution of 1M NaOH is required more for neutralisation.

c) 40g NaOH in aqueous solution is required more for neutralisation.

d) 2L solution of M/2 NaOH is required more for neutralisation.

Which are correct

1) a,b,c 2) b only 3) a &b 4) c & d

**ANS: 4 2NaOH + CO2 → Na2CO3 + H2O.**

**1mole 1/2mole**

**n CO + n CO2  = 1, n CO = 1/2 , CO + ½ O2 → CO2**

**1/2mole 1/2mole**

**More NaOH required = 1mole, so , ½ M NaOH = 2L, n = M x V= ½ x 2 = 1 mole.**

1. The correct statements among (I) to (IV) are:

I. Saline hydrides produce H2 gas when react with H2O.

II. Reaction of LiAlH4 with BF3 leads to B2H6.

III. PH3 and CH4 arte electron – rich and electron precise hydrides, respectively.

IV. HF and CH4 are called as molecular hydrides.

1) I,II,III and IV 2) III & IV only 3) I,II & IV 4) I,II & only.III (JEE main2019)

**ANS: 1**

1. On heating which of the following releases CO2 most easily?

1**)** MgCO3 2) CaCO3 3) K2CO3 4) Na2CO3.

**ANS: 1 Thermal stability order K2CO3>Na2CO3>CaCO3>MgCO3.**

**Hence, MgCO3 release CO2 most easily.**

1. The alkaline earth metal nitrate that does not crystallise with water molecules is

1) Ba(NO3)2 2) Ca(NO3)2 3) Sr(NO3)2 4) Mg(NO3)2.

**ANS: 1**

1. X Residue + colourless gas

↑heat ↓water

Z Y

Identify X,Y and Z.

X Y Z

1) Ca(HCO3)2 CaCO3 Ca(OH)2

2) CaCO3 Ca(OH)2 Ca(HCO3)2

3) CaCO3 CaO Ca(OH)2

4) CaCO3 CaO Ca(HCO3)2.

**ANS: 2**

**CaCO3 CaO + CO2**

**↑heat ↓water**

**Ca(HCO3)2 Ca(OH)2**

1. The oxide which is paramagnetic in nature is

1) Na2O2 2) CsO2 3) Na2O 4) O3.

**ANS: 2 super oxides are paramagnetic in nature due to presence of unpaired electron.**

1. The bond angle and dipole moment of water respectively are

1) 109.5o, 1.84 D 2) 104.5o, 1.56 D 3) 104.5o, 1.84 D 4) 102.5o, 1.56D.

**ANS: 3**

1. The method used to remove temporary hardness of water is

1) Synthetic resins method 2) Calgon’s method.

3) Clark’s method 4) Ion exchange method. ( NEET2019)

**ANS: 3**

1. Microcosmic salt on heating gives

1) NaPO3 + NH3 + 5H2O. 2) Na3PO3 + NH3+ 5H2O.

3) NaPO3 + NH3 + 4H2O 4) NaPO3 + N2 + 5H2O.

**ANS: 1 Na(NH4)HPO4.4H2O NaPO3 + NH3 + 5H2O.**

1. Which of the following pairs are chemically dissimilar?

1) Na and K 2) Ba and Sr 3) Zr and Hf 4**) Ca and Zn**

**ANS: 4): Ca and Zn have different outer electronic configuration and belong to s and d –block respectively.**

1. The pair in which both the species are used in the preparation of antacid is
2. NaHCO3 and Mg(OH)2 3) Na2CO3 and Ca(HCO3)2
3. Ca(HCO3)2 and Mg(OH)2 4) Ca(OH)2 and NaHCO3.

**ANS:1**

1. Two metals X and Y belong to the second 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?

1) X = Be, Y= Ba 2) X = Ba , Y = Ca 3) X = Ca, Y = Sr 4) X= Ba, Y = Mg.

**ANS: 1 BeO = insoluble, BeSO4 – soluble, BaO – soluble, BaSO4 – insoluble. Be(OH)2-soluble in NaOH Ba(OH)2 – insoluble in NaOH.**

1. **Assertion**: Ortho and para- hydrogen are nuclear spin isomers.

**Reason**: They have same nuclear spins.

1) Assertion and reason are true and reason is the correct explanation of assertion.

2) Assertion and reason are true but reason is not correct explanation of assertion.

3) Assertion is true but reason is false.

4) Both assertion and reason are false.

**ANS: 3 they differ by nuclear spins.**

1. The order in which the following oxides are arranged according to decreasing basic nature is

1) Na2O, MgO, Al2O3, CuO

2) CuO, Al2O3, MgO, Na2O

3) Al2O3,CuO, MgO, Na2O

4) CuO, MgO, Na2O,Al2O3

**ANS: 1): As we move left to right in a period the basic character of oxides of s and p block elements decreases while their acidic character increases. The basic character of oxides of d – block elements is, lower than alkali and alkaline earth metals. Thus Na2O is most basic followed by MgO and Al2O3 while CuO is least basic.**

1. Among NH3, H2O,HF and H2S which would have highest magnitude of hydrogen bonding?

1) HF due to maximum polarity.

2) H2O du to lone pairs of electrons.

3) NH3 due to small size of nitrogen.

4) H2S due to higher electron affinity of sulphur.

**ANS: 1**

1. Which of the following has the correct combination considering Column I and Column II ?

|  |  |
| --- | --- |
| COLUMN I  (comound) | COLUMN II  (use) |
| P. CaCO3 | I. Used in gun powder |
| Q. Na2S2O3.5H2O | II. Used in fire extinguisher |
| R. NaNO3 | III. Used as a flux in metallurgy |
| S. NaHCO3 | IV. Used in black and white phtograhy |

P Q R S

1) II III I IV

2) III IV I II

3) I II III IV

4) IV III II I

**ANS: 2**

1. In which of the following reactions, H2O2 acts as a reducing agent?

i) H2O2 + 2H+ + 2e- 2H2O.

ii) H2O2 -2e- → O2 + 2H+.

iii) H2O2 + 2e- → 2 OH-

iv) H2O2 + 2OH- -2e- →O2 + 2H2O.

1) (ii),(iv) 2) (i), (ii) 3) (iii),(iv) 4) (i), (iii)

**ANS: 1**

1. Syngas is a mixture of

1) CO2+ H2 2) CO + H2 3) CO + CO2 4) CO + O2.

**ANS: 2**

1. The deep colour produced when iodine is dissolved in a solution of potassium iodide is caused by the presence of

1) I2 2) I- 3) I3- 4) I2-

**ANS : 3 KI + I2 → KI3(deep blue)**

1. The lattice energies of the following have the order

1) BaO<SrO<CaO<MgO

2) BaO<CaO<SrO<MgO

3) MgO<CaO<SrO<BaO

4) MgO<BaO<SrO<CaO

**ANS: 1):The stronger the charge on an ion, the stronger the attractive forces that will result in an ionic lattice. Larger the ionic radius, the lower the lattice enthalpy as the amount of interaction between the ions is smaller and the packing of ions is less efficient.**

**MgO ─3791kJ/mol CaO ─34011kJ/mol**

**SrO** **─3223kJ/mol BaO ─3054 kJ/mol**

1. Which of the following statements about alkaline earth metals are correct?

i) Hydration energy of Sr2+ is greater than that of Be2+

ii) CaCO3 decomposes at a higher temperature than BaCO3.

iii)Ba(OH)2 is a stronger base than Mg(OH)2.

iv) SrSO4 is less soluble in water than CsSO4.

1) only (iv) 2) (i) & (iii) 3) (i) & (iv) 4) (iii) & (iv).

**ANS: 4**

1. On heating a mixture containing 1 mole each of Li2CO3 and K2CO3 will produce

1) 2 moles of CO2 2) 1mol of CO2 3) 1.5mols of CO2 4) 1mol of O2.

**ANS: 2 Li2CO3 decompose but K2CO3 do not decompose.**

1. Strongest reducing agent in the aqueous solution is

1) Na 2) Rb 3) Ca 4) Li.

**ANS: 4**

1. A metal M reacts with N2 to give a compound ‘A ‘ (M3N).’A’ on heating at high temperature gives back ‘M’ and ‘A’ on reacting with H2O gives a gas ‘B’.’B’ intensifies color of CuSO4 solution when passes through it. M and B can be

1) Mg & NH3 2) Na & NH3 3) Li & NH3 4) Al & NH3.

**ANS: 3 6Li + N2 → 2Li3N. Li3N + 3H2O → 3LiOH + NH3. NH3 + H2O → NH4OH .**

**4NH4OH + CuSO4 → Cu(NH3)4SO4 + 4H2O.**

1. Chile salt petre is

1) NaNO3 2) Ba(NO3)2 3) NaNO2 4) KNO3.

**ANS: 1**

1. Some large white transparent crystals are left out in a bowl for several days. They are then observed to have changed their form into white powder. The crystals may have been of

1) Ammonium chloride 2) Sodium chloride.

3) Sodium carbonate 4) Calcium oxide.

**ANS: 3 Na2CO3.10H2O is efflorescent hence it changes to white powder of.**

1. On reaction with water, which of the following does not produce any hydride?

1) Be2C 2) Mg2N3 3) CaH2 4) Ca3P2.

**ANS: 3**

1. Calgon used as a water softner is

1) Na2[Na4(PO4)5] 2) Na4[Na2(PO3)6] 3) Na2[Na4(PO3)6] 4) Na4[Na4(PO4)6]

**ANS: 3**

1. A dilute solution of H2O2 is labelled as 20volume. Its percentage strength is

1) 10% 2) 6% 3) 30% 4) 3%.

**ANS: 2 volume strength = N x 5.6, % strength = 20/5.6 x = 6%**

1. In acidic medium, H2O2 acts as a reducing agent in its reaction with

1) FeSO4 2) KMnO4 3) K2MnO4 4) K4[Fe(CN)6]

**ANS: 2**

1. Hydrogen behaves as an oxidising agent in its reaction with

1) Chlorine 2) nitogen 3) Sodium 4) sulphur.

**ANS: 3 2Na+ H2 → 2NaH.**