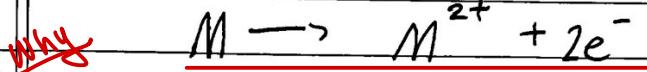


- Assumptions
(need confirmation)
- Raj bhaiya imp notes
- Stuff I added
(confirmed)

Group - 2

Trend in Physical and Chemical properties down the Group

- Down the group, reactivity of group-2 elements increases
 - When a group-2 metal reacts, it reacts by losing $2e^-$ forming ions. Thus it is oxidized during its reaction and acts as a reducing agent.



- Down the grp, due to increase in shell number, atomic radius and shielding effect increases which causes ionization energy to decrease due to decrease in effective nuclear attractive force. Thus e^- can be removed more easily down the group.

- All group-II metals burn in O_2 to produce different coloured flames AND white salts of Grp-II oxides

Magnesium

Intense Bright White Flame

Sodium

Brick-red Flame

Sodium

Scarlet Flame

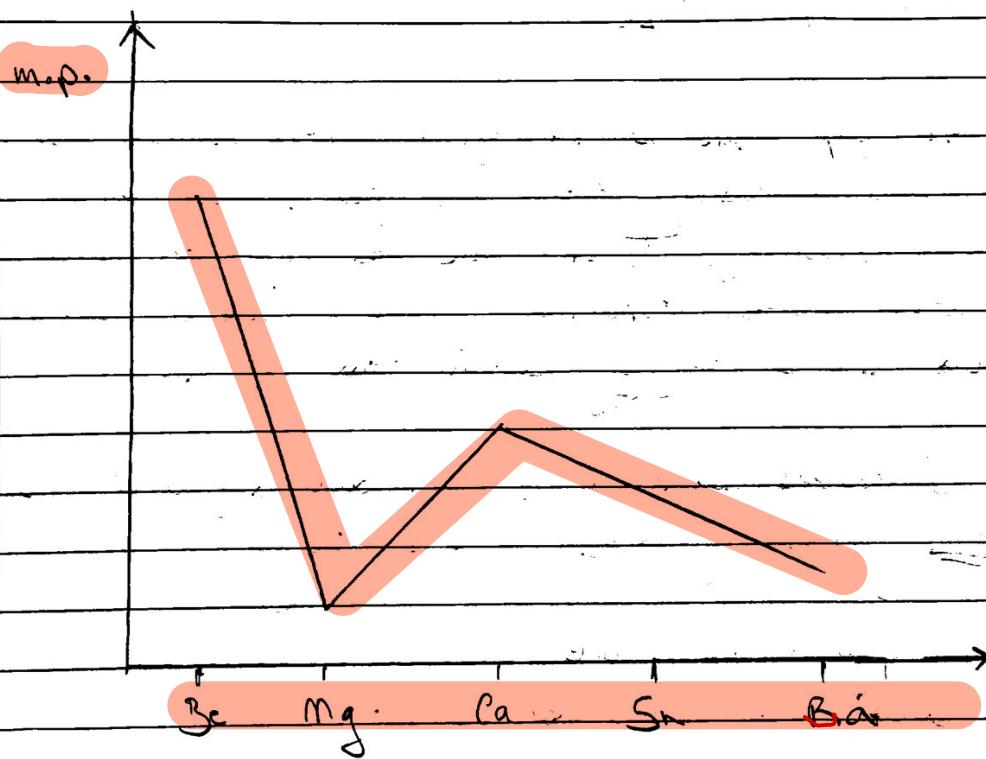
Rubidium

Apple Green Flame

(4) ms: ionic radius increase • overall charge on cation is constant // decreasing charge density • no. of delocalised e^- stays the same • unshared shielding

→ Down the Group, melting point of Group 1 elements decreases

↳ Down the group, size of cations increases due to increase in the number of Y_{hell} . This increases the distance between the delocalised e^- and the nuclei of the positive ion, as a result electrostatic force of attraction decreases causing strength of metallic bond to decrease.



Melting Point of Radium is higher than that of Mg

M1 thermal stability increases (down the group)

M2 (cat)ionic radius / ion size increases (down the group)
OR charge density of M²⁺ decreases

M3 less polarisation / distortion of anion

- m.s

of group-II compounds

- # Down the group, thermal stability increases.
- ↳ Down the grp. charge stays the same, ionic radius increases, thus polarising ability decreases, thus distortion decreases, hence ionic character increases. They m.p. increases. Thermal stability increases.

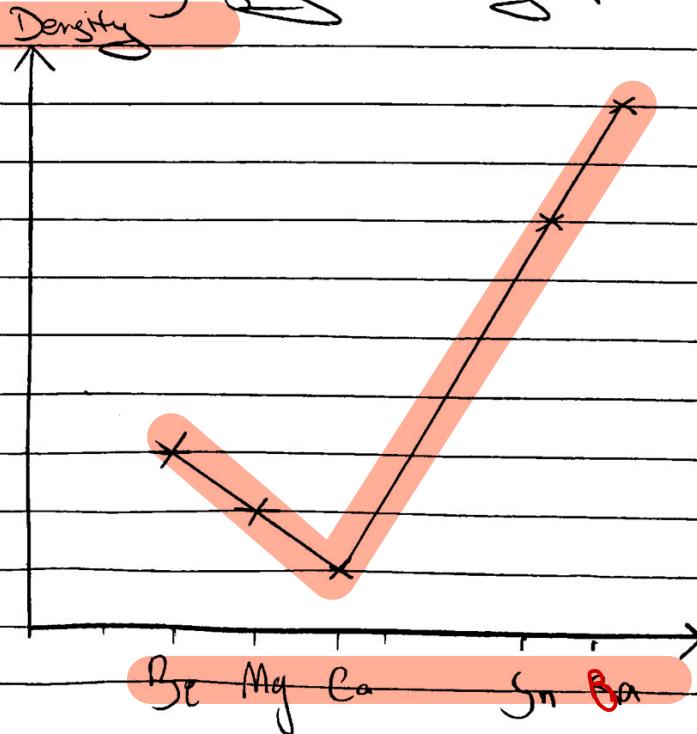
Solubility of Group-II hydroxides and sulphates

- ↳ Down the group, solubility of Group-II sulphates decreases.

BaSO₄, white ppt., insoluble, CaSO₄ partially soluble

- ↳ Down the group, solubility of Group-II hydroxides increases.
- # Ba(OH)₂ dissolves completely (pH 12), Mg(OH)₂ not or partially soluble

Trend in Density down group-II



Group - VII

↳ Reactivity of Halogens

→ All halogen molecules react by gaining e^- to form halide ions



↳ Down the group, Reactivity of halogen decreases, this is due to increase in the size of halogen atom.

Distance of the nucleus from the e^- increases and shielding effect increases resulting in decrease in effective nuclear attractive force. Thus, ease of acceptance of e^- decreases.

↳ During their reaction, all halogen molecules act as oxidising agents.

↳ Down the group, oxidising ability of halogen molecules decreases

oxidising power decreases down the group.

ora

ability to accept electrons decreases (down the group)

ora

because (outer shell experiences) more shielding

OR

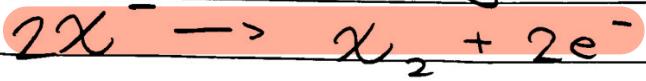
increased distance from nucleus (to outer shell) (outweighs the increasing nuclear charge down the group)

Shell no. increases → shielding effect increases

→ Atomic radius increases → distance between nucleus and e^- increases

↳ (altogether) outweighing the increase in nuclear charge

Reactions of Halide ions



- ↳ All halide ions will react by losing e^-
- ↳ Down the group, reactivity of halide ion increases. Ionic radius \uparrow
- ↳ Down the group, ionic radius increases, and shielding effect increases, which causes effective nuclear attractive force to decrease. As a result, ease of losing e^- increases.
- ↳ Down the group, reducing ability of halide ion increases.

Since Halide ions React by losing e^- , their trend in reactivity will follow this.

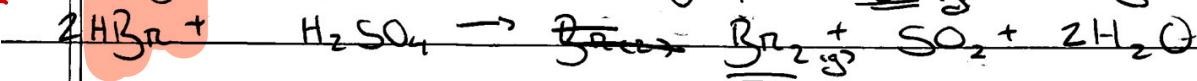
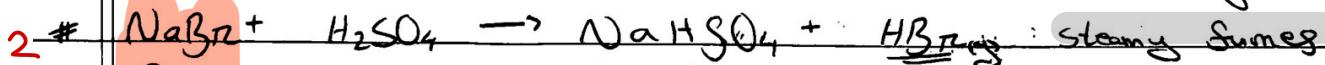
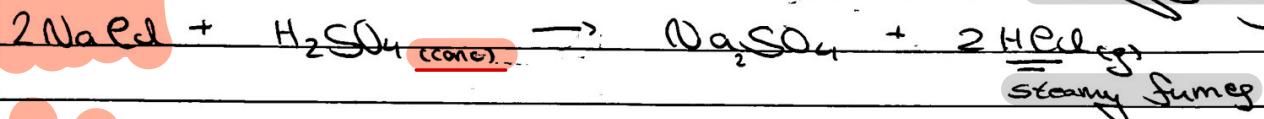
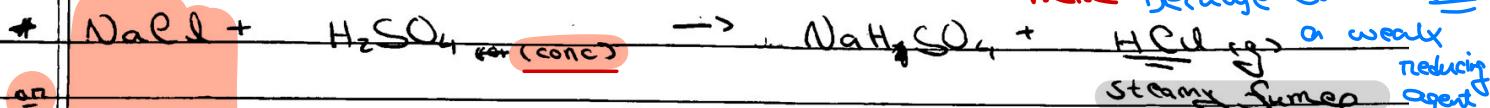
Cl^- only reacts with concⁿ H_2SO_4

All the hydrogen halides (HX) formed here are in gaseous state and NOT aqueous (acidic) state.

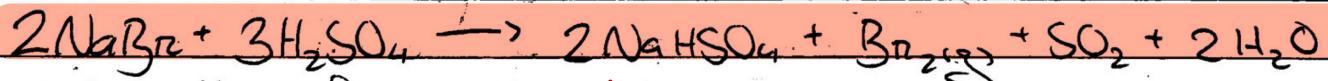
Testing Reducing ability of Halide ions

The stronger the reducing agent (halide ion), the further the reaction progresses.

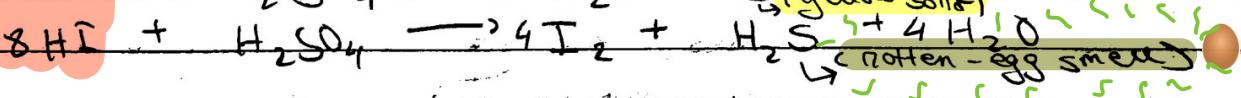
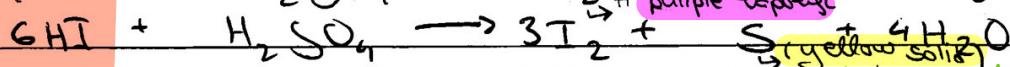
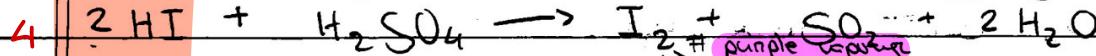
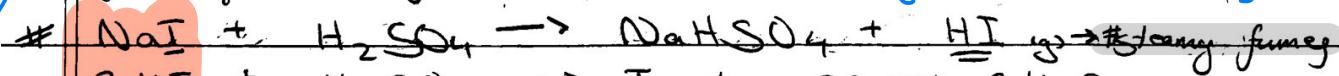
$\rightarrow \text{H}_2\text{SO}_4$ is not acting as an oxidizing agent here because Cl^- is not reduced.



overall: * reddish-brown gas



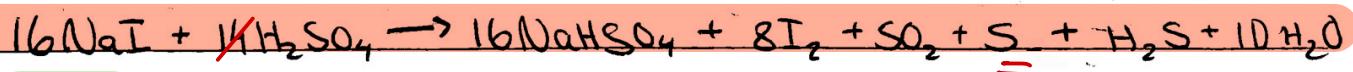
* Overall steamy fumes are not observed because all the HBr gets used up in the subsequent reactions before it can escape as steamy fumes.
(multiply with 16 for overall) \rightarrow 16. HI used in the reactions below



overall: *

ONLY S NOT S₈

19



concⁿ

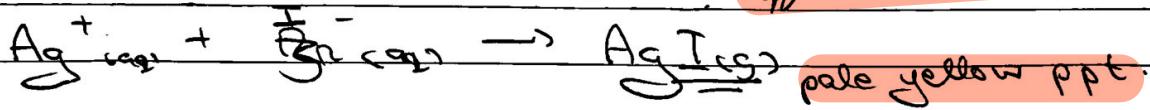
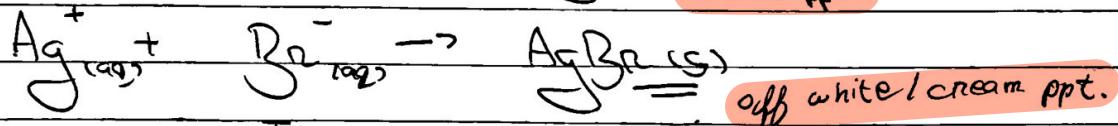
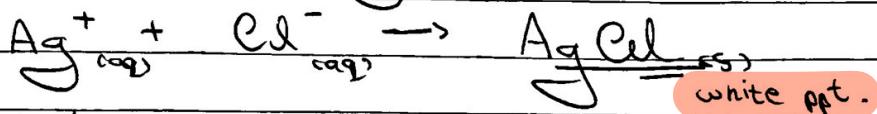
$\text{H}_2\text{SO}_4(\text{aq})$ is a strong oxidizing agent
L. may if because on heating, concⁿ $\text{H}_2\text{SO}_4(\text{aq})$ decomposes to give a strong oxidizing agent O_2

Br_2 and I_2 are formed in gaseous state

HX react with H_2SO_4 to produce water always

Testing Halide ions

→ All Halide ions form ppt. on adding Nitric acid followed by Silver Nitrate.



→ The ppt. of AgCl dissolves on adding a few drops dilute NH_3 whereas the ppt. of AgBr dissolves on adding excess dilute NH_3 or few drops of conc NH_3 . However the ppt. of AgI do not dissolve on adding dilute of conc NH_3 .

→ When NH_3 is added, the Ag^{+} ion of AgCl or AgBr forms a complex molecule with NH_3 in

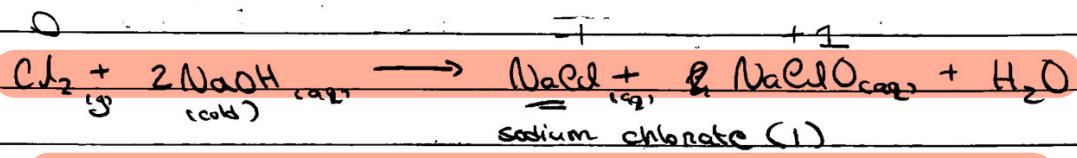


Excess means double the volume of adding anymore may give the illusion of the ppt. dissolving where it is actually just the ppt. becoming less due to more water

Disproportionation Reaction

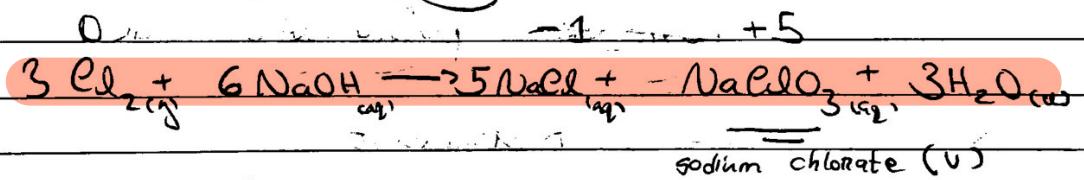
→ Define: It is a special type of Redox Reaction where the same element is reduced as well as oxidized.

Reaction 1: When Cl_2 is bubbled through cold (15°C) $\text{NaOH}_{(\text{aq})} \parallel \text{NaOH}_{(\text{aq})}$



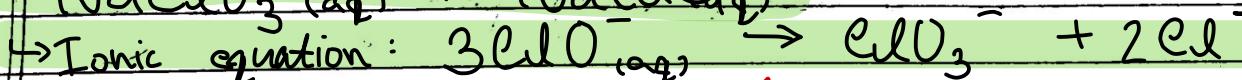
; The NaClO produced acts as bleach
; $\text{Cl}_2 + 2\text{OH}^- \rightarrow \text{Cl}^- + \text{ClO}^- + \text{H}_2\text{O}$

Reaction 2: When Cl_2 is passed through hot (60°C) $\text{NaOH}_{(\text{aq})}$



; NaClO_3 is used as weed killer

When $\text{NaClO}_{(\text{aq})}$ solⁿ is heated, it forms NaClO_3 + $\text{NaClH}_{(\text{aq})}$

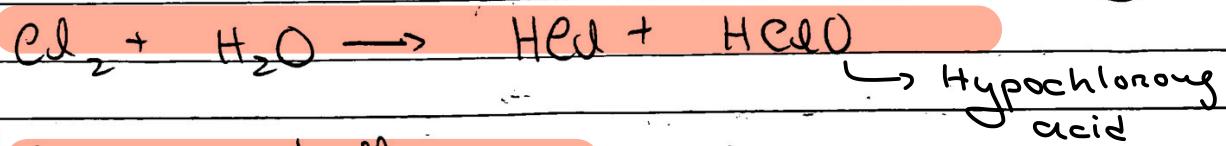


ClO^- decomposes to give

chlorate (I) ion

Chlorination of Water

When Chlorine gas is bubbled through water, it reacts with water to form hydrochloric acid and hypochlorous acid. The ~~hypoto~~ ^{nascent} hypochlorous acid formed has the ability to form ~~nascent~~ oxygen atom which can kill micro-organisms.



Uses of halogens

* Cl_2 : Cl_2 is mainly used to disinfect drinking water and swimming pool water. It is also used in ~~for~~ making pvc (polyvinyl chloride).

* Br_2 : Flame Retardant

Br_2 : Used to develop photographic film (AgBr)

* I_2 : Antiseptic

I_2 : Used to develop photographic films (AgI)

The Periodic Table of Elements

1		2		Group												13		14		15		16		17		18				
				Key																										
				atomic number name relative atomic mass																										
3	Li	4	Be	beryllium lithium 9.0	1.0													1	H	hydrogen 1.0										
11	Na	12	Mg	magnesium sodium 24.3	23.0													2	He	helium 4.0										
19	K	20	Ca	calcium potassium 40.1	39.1	21	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	B	C	carbon	10.8	5	He	helium 4.0	10	Ne	neon 20.2	18			
37	Rb	38	Sr	strontium rubidium 87.6	85.5	39	Y	Zr	Nb	Mo	Ru	Rh	Pd	Ag	Cd	In	Ge	N	nitrogen 14.0	13	He	helium 4.0	10	O	oxygen 16.0	17				
55	Cs	56	Ba	barium caesium 137.3	132.9	57–71	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	As	P	phosphorus	31.0	14	He	helium 4.0	9	F	fluorine 19.0	16			
87	Fr	88	Ra	radium francium –	–	89–103	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Er	Tm	Ho	erbium	167.3	68	He	helium 4.0	8	Ar	argon 39.9	15		
57	La	58	Ce	cerium lanthanum 140.1	138.9	59	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Tm	Yb	Lu	Ytterbium lutetium 173.1	71	He	helium 4.0	10	Ne	neon 20.2	19				
89	Ac	90	Th	thorium actinium 232.0	–	91	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Md	No	Lr	nobelium lawrencium –	103	He	helium 4.0	11	Og	ogallesson –	20				
Lanthanoids																														
actinoids																														

Misc. Notes

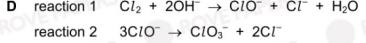
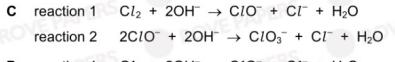
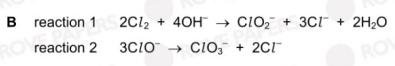
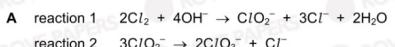
Redox

19

Reaction 1: chlorine reacts with cold aqueous sodium hydroxide to form solution Z.

Reaction 2: solution Z is heated and forms ClO_3^- (aq) and Cl^- (aq).

Which equations represent reaction 1 and reaction 2?



Paper 1 Variant 3 Winter 2018 | Q17

Answer:

D

[Hide Answer](#)

From the notes: Down the Group -

i) Atomic / Ionic Radius Increases
↳ Ag shell number increases

ii) Shielding Effect increases
iii) Distance of the e^- from the nucleus increases }
Effective Nuclear attractive force // Electrostatic forces }
of attraction (only for metals) acting on the e^- delocalized } e^- decreases ↳

Thermal Decomposition of Group -I and Group - II Nitrate

↳ Group (I) Nitrate \rightarrow Group (I) Nitrite + O_2

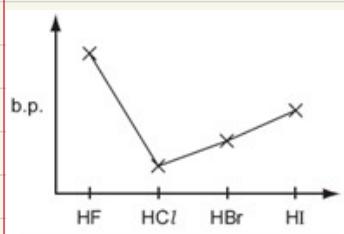
↳ Group (II) Nitrate \rightarrow Group (II) Oxide + NO_2 + O_2
All Nitrites (NO_2^-) \hookrightarrow brown fumes

Group (II) Nitrates react with acids to give NO_2 gas
 NO_2 gas \rightarrow brown fumes # All Bromides react with concn H_2SO_4 to give brown (Br_2) vapour

Conditions for the reacⁿ of Cl_2 with H_2 at room temperature: UV-light

Arrangement of I_2 molecules within its crystal lattice structure:
↳ held in regular/uniform arrangement

All hydrogen halides from HF to HI are POLAR.



Explain the trend in b.p. : Sum of hydrogen bonds and induced dipole in HF are stronger than the sum of induced dipole and permanent dipole in HCl , HBr and HI .

Acidic character increases Thermal Stability increases

(Not mg) From HCl to HI b.p. increases because the no. of e^- in the molecule increases thus strength of induced dipole - instantaneous dipole^{"ind"} increases which outweighs the decrease in polarity. The sum of induced dipole and permanent dipole is greater in HI than HBr which is greater than that in HCl .

AgBr(s) ppt is PARTIALLY soluble in dilute $\text{NH}_3\text{(aq)}$ BUT FULLY soluble in Concentrated $\text{NH}_3\text{(aq)}$ — This is for p2

MgO is used as a refractory lining in Kilns

$\text{AgNO}_3\text{(aq)}$ reacts with Halogenoalkanes to form their characteristic AgX ppt. This "reac" is a HYDROLYSIS reac".

Identify the reagent used to identify that a halide containing compound contains Bromide ion.

↳ reagent: Concentrated $\text{H}_2\text{SO}_4\text{(aq)}$
observation: brown vapour

Test to identify WHICH halide ion is present in MX (where M is a metal and X is a Halide ion).

↳ Add concⁿ $\text{H}_2\text{SO}_4\text{(aq)}$: Cl^- : No react
: Br^- : Brown vapour
: I^- : Purple vapour

→ Test to identify IF a halide ion is present in a compound is still reacting with few drops of $\text{HNO}_3\text{(aq)}$ (dilute) followed by $\text{AgNO}_3\text{(aq)}$, solⁿ

Ammonium nitrate is an acidic salt as its solution is acidic because of it being a salt of weak base(ammonium hydroxide) and strong acid(nitric acid).

Group 2 12

Ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$, and ammonium nitrate, NH_4NO_3 , are used as fertilisers.

These salts have different percentages by mass of nitrogen. They have the same effect as each other on the pH of wet neutral soil.

Which row is correct?

	higher percentage of nitrogen by mass	effect on pH of soil
A	ammonium nitrate	decrease
B	ammonium nitrate	increase
C	ammonium sulfate	decrease
D	ammonium sulfate	increase

Paper 1 Variant 2 Summer 2019 | Q18

Answer:

A

Group 2 14

How many of the solutions shown, when added to separate portions of magnesium sulfate solution, produce a white precipitate?

HCl(aq) NH₃(aq) $(\text{NH}_4)_2\text{CO}_3$ (aq) Ba(NO₃)₂(aq)

Paper 1 Variant 2 Summer 2019 | Q15

Answer:

D

Hide Answer

Group 2 15

A mixture of magnesium carbonate and magnesium nitrate is heated strongly in a hard-glass test-tube.

Which gases are formed?

bonding
The A
free
form
of
water

Google

why does mg produce white

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ৰাকলাঙ অনুসংক্ষিপ্ত কক্ষ

This is because ammonia solution is alkaline which ionizes in water to form hydroxide ions, and magnesium nitrate dissociates in water to give magnesium ions. The reaction between magnesium ions and hydroxide ions forms a white precipitate of magnesium hydroxide.

Metal oxides react with water to form the corresponding metal hydroxides, which are basic in nature. During these reactions a large amount of energy gets released.

Explain the difference in the reactions of concentrated sulfuric acid with NaI and with NaCl. Your answer should refer to the role of the sulfuric acid in each reaction.

M1 sulfuric acid acts as an acid with NaCl (and NaBr)

OR



OR



sulfuric acid acts as an oxidising agent with NaI / I

OR

NaI is a reducing agent

I⁻ more powerful reducing agent than Cl⁻

OR

sulfuric acid can oxidise I⁻ but not Cl⁻

OR

sulfuric acid is a stronger oxidising agent than iodide ions

OR

sulfuric acid is not as strong an oxidising agent than chloride ions

Which statement about the halogens is correct?

- A Iodine cannot behave as an oxidising agent.
- B The volatility of the elements increases from chlorine to iodine because of the increase in molecular size down the group.
- C When an equimolar mixture of chlorine and hydrogen is exploded, only one product is formed.
- D When concentrated sulfuric acid is added to solid sodium bromide, hydrogen sulfide is one of the products.

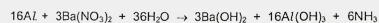
Paper 1 Variant 2 Winter 2018 | Q16

Answer:

C

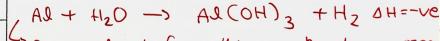
~~A~~ ~~B~~

8 When making sparkler fireworks, a mixture of barium nitrate powder with aluminium powder, water and glue is coated onto wires and allowed to dry. At this stage, the following exothermic reaction may occur.



Which conditions would be best to reduce the rate of this reaction during the drying process, and would also keep the aluminium and barium nitrate unchanged?

	temperature/K	pH
A	298	7
B	298	14
C	398	7
D	398	14



↳ Energy released from this reaction decomposes



* Solⁿ to form aqueous Al³⁺ which exposing the Al underneath # Since Al powder has a protective coating of Al₂O₃(s), it does not react with NEUTRAL water thus the series of reactions never occur.
allowing it to react with the H₂O and start the reaction sequence
But Al₂O₃ coating reacts with alkaline *