INKCHEMISTRY FLASHCARDS

Ions in aqueous solution

Unit C15 · 21 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions to learn and misconceptions to correct. These cards, and a check-yourself question for every lesson, run on the website with spaced-repetition scheduling, at inklearning.co.uk/chemistry/flashcards.

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DEFINITION

Define: Metal-aqua ion.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Ligand.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Coordinate bond.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Coordination number.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Hydrolysis (of a metal-aqua ion).

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Brønsted–Lowry acid.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Weak acid.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Charge/size ratio.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

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DEFINITION

A molecule or ion that donates a lone pair of electrons to a central metal ion to form a coordinate bond.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

A complex ion in which water molecules are the ligands, each bonded to the central metal ion by a coordinate bond from a lone pair on its oxygen atom.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

The number of coordinate bonds from the ligands to the central metal ion; six in a hexaaqua ion.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

A covalent bond in which both electrons of the shared pair come from the same atom.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

A species that donates a proton (an H^+ ion) to another species.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

The reaction of a metal-aqua ion with water in which a coordinated water molecule loses a proton to a solvent water molecule, forming H_3O^+.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

The charge on an ion divided by its radius; also called charge density. A small, highly charged ion has a high ratio.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

An acid that is only partially dissociated in solution, so the equilibrium lies to the left.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

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DEFINITION

Define: Polarisation.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Acid dissociation constant, Ka.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

SPOT THE ERROR

Say what is wrong with this claim:

A solution of a salt is neutral, because a salt is what is left once an acid has been neutralised.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

Define: Brønsted–Lowry base.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Precipitate.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Deprotonation.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Amphoteric.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Excess (of a reagent).

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

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DEFINITION

The equilibrium constant for the dissociation of a weak acid, Ka = $[H^+][A^-] \div [HA]$; a larger Ka means a stronger acid.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

The distortion of the electron density in a bond by a nearby charge, which makes the bond more polar and here weakens it.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

A species that accepts a proton (an H^+ ion) from another species.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

SPOT THE ERROR

A dissolved metal ion holds water ligands, and a small, highly charged ion polarises their O–H bonds. $[Fe(H_2O)_6]^{3+}$ releases H^+ to the water, so iron(III) chloride solution has a pH near 2, and solutions of 2+ ions are weakly acidic. Only ions of low charge density leave the water neutral.

METAL-AQUA IONS AND THE ACIDITY OF THEIR SOLUTIONS

DEFINITION

The removal of a proton from a species; here, from a water ligand bonded to a metal ion, leaving a hydroxide ligand.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

An insoluble solid that forms when two solutions are mixed.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

More of a reagent than is needed to react with all of the other reactant present.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Able to react both as an acid and as a base; aluminium hydroxide dissolves in acids and in excess alkali.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

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DEFINITION

Define: Ligand substitution.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Weak base.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Effervescence.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Define: Aerial oxidation.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

SPOT THE ERROR

Say what is wrong with this claim:

Ammonia solution is a weaker version of sodium hydroxide, so it does exactly what sodium hydroxide does, only less.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

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DEFINITION

A base that is only partially protonated in solution; aqueous ammonia holds far fewer OH^- ions than sodium hydroxide of the same concentration.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

A reaction in which one ligand in a complex ion is replaced by another, such as ammonia replacing water around copper(II).

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Oxidation of a substance by oxygen from the air; the hydroxides of iron(II), manganese(II) and cobalt(II) darken on standing because of it.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

DEFINITION

Bubbles of gas produced in a liquid by a reaction; here carbon dioxide, which turns limewater milky.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

SPOT THE ERROR

A few drops of either give the same hydroxide precipitate, because both are bases. In excess they differ. Excess sodium hydroxide dissolves the amphoteric $Al(OH)_3$ as $[Al(OH)_4]^-$. Excess ammonia dissolves the copper precipitate instead, acting as a ligand to give deep blue $[Cu(NH_3)_4(H_2O)_2]^{2+}$.

REACTIONS OF AQUA IONS WITH HYDROXIDE, AMMONIA AND CARBONATE

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