INKCHEMISTRY FLASHCARDS

Acids and bases

Unit C11 · 37 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: Brønsted–Lowry acid.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Brønsted–Lowry base.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Conjugate acid–base pair.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Amphoteric.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Strong acid.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Weak acid.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: PH.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Basicity.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

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DEFINITION

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

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

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

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Able to act as both an acid and a base, as water does when it donates a proton to ammonia and accepts one from hydrogen chloride.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Two species that differ by one proton, such as NH_4^+ and NH_3; the one with the extra proton is the conjugate acid.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

An acid that only partially dissociates into ions in aqueous solution.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

An acid that dissociates completely into ions in aqueous solution.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

The number of protons (H^+ ions) that one molecule of an acid can donate.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

The negative logarithm to base 10 of the hydrogen ion concentration in mol dm^{-3}, pH = $-\log[H^+]$.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

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DEFINITION

Define: Tribasic acid.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

SPOT THE ERROR

Say what is wrong with this claim:

A strong acid is a concentrated one, so watering hydrochloric acid down turns it into a weak acid.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Define: Ionic product of water, Kw.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: Neutral.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: Strong base.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: Weak base.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: Acid dissociation constant, Ka.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: PKa.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

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SPOT THE ERROR

Strong means fully dissociated in water; concentrated means many moles per cubic decimetre. Hydrochloric acid at 0.001 mol dm^{-3} is still fully dissociated, so it is a dilute strong acid; ethanoic acid at 10 mol dm^{-3} is a concentrated weak acid. Diluting a strong acid tenfold raises its pH by one unit.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

An acid of which each molecule can donate three protons, such as phosphoric(V) acid, H_3PO_4.

BRØNSTED–LOWRY ACIDS AND BASES, PH AND STRONG ACIDS

DEFINITION

Describes a solution in which the concentration of hydrogen ions equals the concentration of hydroxide ions.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

The product of the concentrations of hydrogen ions and hydroxide ions in water or an aqueous solution, $K_w = [H^+][OH^-]$.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

A base that is only partially protonated in aqueous solution, such as ammonia, so $[OH^-]$ is much less than the concentration of the base.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

A base that dissociates completely into ions in aqueous solution, such as sodium hydroxide.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

The negative logarithm to base 10 of the acid dissociation constant, $pK_a = -\log K_a$; the smaller the pKa, the stronger the acid.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

The equilibrium constant for the dissociation of a weak acid, $K_a = [H^+][A^-]/[HA]$, in mol dm^{-3}.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

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DEFINITION

Define: Monoprotic acid.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: PKw.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

SPOT THE ERROR

Say what is wrong with this claim:

Pure water always has a pH of 7, so water at pH 6.6 must have acid in it.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

Define: PH curve.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: Equivalence point.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: Vertical section.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: Half-neutralisation point.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: Indicator.

TITRATION CURVES AND CHOOSING AN INDICATOR

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DEFINITION

The negative logarithm to base 10 of the ionic product of water, pKw = -log Kw, equal to 14.00 at 298 K.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

An acid in which each molecule can donate one proton, such as HCl or CH_3COOH.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

A graph of the pH of the solution against the volume of acid or base added during a titration.

TITRATION CURVES AND CHOOSING AN INDICATOR

SPOT THE ERROR

Pure water is neutral because $[H^+] = [OH^-]$, and that gives pH 7.00 only at 25 °C. Dissociation is endothermic, so Kw rises with temperature: at 50 °C Kw = 5.5×10^{-14} mol^2 dm^{-6} and neutral water has pH 6.6. At 0 °C neutral water has pH 7.47.

WEAK ACIDS, KA AND PKA; KW AND STRONG BASES

DEFINITION

The steep part of a pH curve around the equivalence point, where a very small volume added changes the pH by several units.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

The point in a titration at which the amount of base added exactly reacts with the amount of acid present, according to the balanced equation.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

A weak acid whose undissociated form and conjugate base have different colours, used to show the end point of a titration.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

The point in the titration of a weak acid at which half the acid has been neutralised, so $[HA] = [A^-]$ and pH = pKa.

TITRATION CURVES AND CHOOSING AN INDICATOR

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DEFINITION

Define: End point.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: PKIn.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: Calibration.

TITRATION CURVES AND CHOOSING AN INDICATOR

SPOT THE ERROR

Say what is wrong with this claim:

Every titration ends at pH 7, because that is where the acid and the alkali have cancelled each other out.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Define: Buffer.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

Define: Acidic buffer.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

Define: Basic buffer.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

Define: Common ion effect.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

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DEFINITION

The negative logarithm of an indicator's dissociation constant; the pH at which [HIn] = [In^-] and the colour change is half complete.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

The point in a titration at which the indicator changes colour; with a suitable indicator it coincides with the equivalence point.

TITRATION CURVES AND CHOOSING AN INDICATOR

SPOT THE ERROR

Equivalence is where the moles match, and the pH there depends on the salt formed. Ethanoic acid against sodium hydroxide reaches equivalence near pH 9, because ethanoate is a weak base; hydrochloric acid against ammonia reaches it near pH 5. Only strong against strong gives pH 7.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

Adjusting a pH meter against buffer solutions of known pH, so that its readings are accurate.

TITRATION CURVES AND CHOOSING AN INDICATOR

DEFINITION

A buffer with a pH below 7, made from a weak acid and a salt of that acid, such as ethanoic acid and sodium ethanoate.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

A solution that maintains an approximately constant pH when small amounts of acid or base are added, or when it is diluted.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

The shift in position of an equilibrium involving ions, away from those ions, when a soluble compound supplying one of them is added: ethanoate ions suppress the dissociation of ethanoic acid, and chloride ions lower the solubility of silver chloride.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

A buffer with a pH above 7, made from a weak base and a salt of that base, such as ammonia and ammonium chloride.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

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DEFINITION

Define: Henderson–Hasselbalch equation.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

Define: Buffer range.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

Define: Solubility.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

Define: Solubility product, Ksp.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

SPOT THE ERROR

Say what is wrong with this claim:

A buffer is a neutral solution that keeps the pH at 7 whatever is added to it.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

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DEFINITION

The range of pH, roughly pKa ± 1, over which a buffer resists changes in pH effectively.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

pH = pKa + log([A^-]/[HA]), the Ka expression for a weak acid rearranged in logarithmic form.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

The product of the concentrations of the ions in a saturated solution of a sparingly soluble salt, each raised to the power of its coefficient in the equation.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

DEFINITION

The amount of a solute that dissolves in a stated volume of solvent to give a saturated solution at a stated temperature, here in mol dm^{-3}.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

SPOT THE ERROR

A buffer holds the pH near its own value, which is set by the acid's pKa and the ratio of salt to acid, and that value is rarely 7. Blood is buffered at 7.4, ethanoic acid and sodium ethanoate near 4.8. It resists small additions of acid or alkali; a large enough addition uses up one reservoir and the pH then changes freely.

BUFFER SOLUTIONS AND BUFFER CALCULATIONS

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