INKCHEMISTRY FLASHCARDS

Electrochemistry

Unit C10 · 29 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: Half-cell.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Electrode potential.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Standard hydrogen electrode.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Standard electrode potential.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Standard conditions.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Inert electrode.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Conventional representation.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Standard cell potential.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

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DEFINITION

The potential difference between an electrode and the solution it is in; it can be measured only against a second electrode.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

An element in contact with a solution of its ions, or an inert electrode in a solution of an oxidised and a reduced form, at which a redox equilibrium is set up.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

The EMF of a cell made from the half-cell and the standard hydrogen electrode, measured under standard conditions.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

A half-cell in which hydrogen gas at 100 kPa is bubbled over a platinum electrode in a solution of H^+ ions at 1.00 mol dm^{-3} at 298 K; its electrode potential is defined as 0.00 V.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

An electrode, usually platinum, that conducts electrons to and from a redox equilibrium in the solution without reacting or setting up an equilibrium of its own; used when neither species of the couple is a metal.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

A temperature of 298 K, a pressure of 100 kPa for any gas, and a concentration of 1.00 mol dm^{-3} for every ion in the half-equation.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

The EMF of a cell in which both half-cells are under standard conditions, $E^\circ cell = E^\circ right - E^\circ left$.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

A one-line description of a cell: the electrodes at the ends, single vertical lines for phase boundaries, a double line for the salt bridge, and the oxidised form of each couple next to the salt bridge.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

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DEFINITION

Define: Salt bridge.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: EMF.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

SPOT THE ERROR

Say what is wrong with this claim:

The salt bridge is there to carry the electrons from one beaker to the other.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

Define: Electrochemical series.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Oxidising agent.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Reducing agent.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Feasible.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Disproportionation.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

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DEFINITION

The potential difference between the two electrodes of a cell when no current flows.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

A connection between two half-cells, usually filter paper soaked in saturated potassium nitrate solution, that allows ions to move between them to complete the circuit without the solutions mixing.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

A list of half-equations written as reductions, in order of their standard electrode potentials.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

SPOT THE ERROR

Electrons travel through the wire; the salt bridge carries ions. As one half-cell gains positive charge and the other loses it, ions from the bridge, usually potassium nitrate, drift into each solution to keep both neutral. Without that the charges build up and the current stops within a fraction of a second.

ELECTRODE POTENTIALS AND THE STANDARD HYDROGEN ELECTRODE

DEFINITION

A species that donates electrons to another species and is itself oxidised.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

A species that accepts electrons from another species and is itself reduced.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

A redox reaction in which the same element in one species is simultaneously oxidised and reduced.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Able to take place; a redox reaction is feasible under standard conditions when E°_{cell}, calculated with the half-cell in which reduction occurs on the right, is positive.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

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DEFINITION

Define: Kinetically stable.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Nernst equation.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Faraday constant.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

SPOT THE ERROR

Say what is wrong with this claim:

If E°_{cell} is positive, the reaction happens as soon as the chemicals are mixed.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Define: Non-rechargeable cell.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

Define: Rechargeable cell.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

Define: Fuel cell.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

Define: Electrolyte.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

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DEFINITION

$E = E^\circ + (0.059/z) \log_{10}([\text{oxidised form}] / [\text{reduced form}])$ at 298 K, giving the electrode potential of a half-cell at concentrations that are not standard.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

Describes a mixture that does not react at a measurable rate although the reaction is feasible, because the activation energy is high.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

SPOT THE ERROR

A positive E°cell says the reaction is feasible, not that it is fast. Acidified manganate(VII) should oxidise water by 0.28 V and sits unchanged in a burette for hours, because the activation energy is high. E° values are also for standard conditions, 1.00 mol dm^{-3} and 298 K, and a change of concentration changes the EMF.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

The charge on one mole of electrons, 96 500 C mol^{-1}.

THE ELECTROCHEMICAL SERIES AND PREDICTING FEASIBILITY

DEFINITION

A cell in which the reaction can be reversed by applying an external voltage greater than its EMF, regenerating the reactants.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

A cell in which the reaction cannot be reversed, so the cell is discarded when its reactants are used up.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

The ionic solution, melt or solid between the electrodes of a cell, through which ions move to complete the circuit.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

A cell that generates an electric current from a fuel and oxygen supplied continuously from outside, and does not need to be electrically recharged.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

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DEFINITION

Define: Anode.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

Define: Cathode.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

Define: Electrolysis.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

Define: Faraday constant.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

SPOT THE ERROR

Say what is wrong with this claim:

A hydrogen fuel cell causes no pollution, because the only thing that comes out of it is water.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

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DEFINITION

The electrode at which reduction takes place; in a cell delivering a current it is the positive electrode.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

The electrode at which oxidation takes place; in a cell delivering a current it is the negative electrode.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

The charge carried by one mole of electrons, 96 500 C mol^{-1}, equal to Le.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

DEFINITION

The decomposition of an ionic compound, molten or in solution, by an electric current from an external supply.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

SPOT THE ERROR

The cell itself gives out only water, but the hydrogen has to be made. Most is produced from methane and steam, which releases carbon dioxide, and the rest by electrolysis using whatever generated the electricity. The cell also needs a platinum catalyst, mined and refined, and the hydrogen is stored in high-pressure tanks.

COMMERCIAL CELLS, RECHARGEABLE CELLS AND FUEL CELLS

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