INKCHEMISTRY FLASHCARDS

Chemical equilibria

Unit C06 · 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: Reversible reaction.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Dynamic equilibrium.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Closed system.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Open system.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Position of equilibrium.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Le Chatelier's principle.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Catalyst.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Equilibrium yield.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

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DEFINITION

The state of a reversible reaction in a closed system in which the forward and reverse reactions proceed at equal rates, so the concentrations of reactants and products remain constant.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

A reaction that can proceed in both the forward and the reverse direction under the same conditions.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

A system that substances can enter or leave, so a reversible reaction in it cannot reach equilibrium.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

A system that no substance can enter or leave, although energy may be transferred to or from it.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

If a system at equilibrium is subjected to a change in conditions, the position of equilibrium shifts in the direction that opposes the change.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

The relative proportions of reactants and products in a mixture at equilibrium.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

The proportion of the reactants converted into products once the reaction mixture has reached equilibrium.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

A substance that increases the rate of a reaction without being changed in chemical composition or amount, by providing an alternative reaction route with a lower activation energy.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

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DEFINITION

Define: Compromise conditions.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

SPOT THE ERROR

Say what is wrong with this claim:

At equilibrium the reaction has stopped, and there are equal amounts of reactants and products.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Define: Equilibrium constant, Kc.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Equilibrium concentration.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Homogeneous equilibrium.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Heterogeneous equilibrium.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Phase.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: ICE table.

THE EQUILIBRIUM CONSTANT KC

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SPOT THE ERROR

Both reactions carry on at equilibrium, at equal rates, so the concentrations stay constant without being equal. The Haber mixture at 450 °C is mostly unreacted nitrogen and hydrogen. The position depends on the reaction and the conditions, and it is rarely 50 : 50.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

Conditions chosen to give an acceptable equilibrium yield at an acceptable rate and cost, where the conditions for the highest yield would make the reaction too slow or the plant too expensive.

DYNAMIC EQUILIBRIUM, LE CHATELIER'S PRINCIPLE AND INDUSTRIAL COMPROMISE

DEFINITION

The concentration of a substance, in mol dm^{-3}, in a mixture that has reached equilibrium; it is what each term in Kc stands for.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

The concentrations of the products at equilibrium, each raised to the power of its coefficient and multiplied together, divided by the same expression for the reactants, at a stated temperature.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

An equilibrium in which the reactants and products are in more than one phase, such as a solid with a gas.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

An equilibrium in which all the reactants and products are in the same phase.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

A table of the initial amount, the change in amount and the equilibrium amount of each species, with the changes in the ratio of the coefficients in the equation.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

A part of a system with the same composition and properties throughout: a solid, a liquid, a gas or a solution.

THE EQUILIBRIUM CONSTANT KC

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DEFINITION

Define: Quenching.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Reaction quotient, Q.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Partition coefficient, Kpc.

THE EQUILIBRIUM CONSTANT KC

SPOT THE ERROR

Say what is wrong with this claim:

Adding more reactant pushes the equilibrium to the right, so Kc goes up.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Define: Mole fraction.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

Define: Partial pressure.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

Define: Total pressure.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

Define: Kp.

KP: EQUILIBRIA IN THE GAS PHASE

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DEFINITION

The ratio with the same form as Kc but using the concentrations at any moment; it equals Kc only when the mixture is at equilibrium.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

Slowing a reaction almost to a stop, by cooling, dilution or removing a reactant or catalyst, so that the composition of a sample does not change while it is analysed.

THE EQUILIBRIUM CONSTANT KC

SPOT THE ERROR

Kc depends on temperature and nothing else. Adding reactant makes the concentration ratio smaller than Kc, so the forward reaction runs faster than the reverse until the ratio is back at Kc; the position moves right and the constant is exactly what it was. For an exothermic reaction, raising the temperature lowers Kc.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

The ratio of the concentrations of a solute in two immiscible solvents at equilibrium, at a stated temperature.

THE EQUILIBRIUM CONSTANT KC

DEFINITION

The pressure that one gas in a mixture would exert if it alone occupied the whole volume; its mole fraction multiplied by the total pressure.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

The amount in moles of one gas in a mixture divided by the total amount in moles of all the gases.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

The equilibrium constant for a reaction between gases, written with the partial pressure of each gas at equilibrium in place of its concentration.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

The pressure of a gas mixture, equal to the sum of the partial pressures of all the gases in it.

KP: EQUILIBRIA IN THE GAS PHASE

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DEFINITION

Define: Degree of dissociation.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

Define: Reaction quotient, Qp.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

Define: Atmosphere, atm.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

Define: Heterogeneous equilibrium.

KP: EQUILIBRIA IN THE GAS PHASE

SPOT THE ERROR

Say what is wrong with this claim:

Raising the pressure moves the equilibrium to the side with fewer moles of gas, so Kp must change as well.

KP: EQUILIBRIA IN THE GAS PHASE

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DEFINITION

The Kp expression evaluated with the partial pressures at any moment; it equals Kp only when the mixture is at equilibrium.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

The fraction of the molecules of a substance that have dissociated when equilibrium is reached, written α.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

An equilibrium with species in more than one phase; only the gases appear in Kp, and a solid is left out of both the expression and the total amount of gas.

KP: EQUILIBRIA IN THE GAS PHASE

DEFINITION

A unit of pressure equal to 101.325 kPa, the mean pressure of the air at sea level.

KP: EQUILIBRIA IN THE GAS PHASE

SPOT THE ERROR

Kp, like Kc, depends only on temperature. Raising the total pressure raises every partial pressure, and where the expression has more pressure terms below than above, the ratio falls below Kp. More of the side with fewer gas moles forms until the ratio equals Kp again, so ammonia's yield rises at high pressure with Kp unchanged.

KP: EQUILIBRIA IN THE GAS PHASE

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