INKCHEMISTRY FLASHCARDS

Kinetics

Unit C05 · 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: Rate of reaction.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Initial rate.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Activation energy.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Successful collision.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Collision frequency.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Transition state.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Enthalpy profile.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Mean rate.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

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DEFINITION

The rate of reaction at the start, when t = 0, found from the gradient of the tangent to a concentration–time graph at t = 0.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

The change in the concentration of a reactant or a product per unit time, measured in mol dm^{-3} s^{-1}.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

A collision between particles that have at least the activation energy and are in the correct orientation, so that it leads to a reaction.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

The minimum energy that colliding particles must have for a reaction to take place.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

The highest-energy arrangement of atoms on the route from reactants to products, in which bonds are partly broken and partly formed.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

The number of collisions between reactant particles per unit time in a given volume.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

The total change in the amount or concentration of a substance divided by the time interval over which it changed.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

A diagram of enthalpy against the progress of a reaction, showing the reactants, the transition state at the peak and the products, from which Ea and ΔH are read.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

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DEFINITION

Define: Tangent.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

SPOT THE ERROR

Say what is wrong with this claim:

Heating, stirring, crushing and concentrating all speed a reaction up for the same reason: the particles hit each other harder.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

Define: Maxwell–Boltzmann distribution.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

Define: Most probable energy.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

Define: Mean energy.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

Define: Activation energy.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

Define: Catalyst.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

Define: Heterogeneous catalyst.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

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SPOT THE ERROR

Only heating makes collisions more energetic. Crushing a solid, raising a concentration or pressure, and stirring all raise the number of collisions per second at the same energy: the same fraction succeed, but there are more of them. A catalyst lowers the activation energy, so a larger fraction succeed.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

A straight line that touches a curve at one point without crossing it there; its gradient is the rate at that moment.

COLLISION THEORY, ACTIVATION ENERGY AND THE RATE OF REACTION

DEFINITION

The energy at the peak of the Maxwell–Boltzmann distribution, the energy possessed by the greatest number of molecules.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

The distribution of the energies of the molecules in a gas at a given temperature, shown as the number of molecules with each energy.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

The minimum energy that colliding particles must have for a reaction to take place.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

The average energy of the molecules, which lies to the right of the most probable energy because the distribution is not symmetrical.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

A catalyst in a different phase from the reactants, such as solid iron in the Haber process.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

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.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

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DEFINITION

Define: Homogeneous catalyst.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

SPOT THE ERROR

Say what is wrong with this claim:

Heating a reaction speeds it up because the molecules move faster and so collide more often.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

Define: Continuous monitoring.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: End point.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Independent variable.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Dependent variable.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Control variable.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Calibration curve.

MEASURING THE RATE OF A REACTION

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SPOT THE ERROR

A 10 °C rise makes molecules collide only about 2% more often, but roughly doubles the rate. What changes is the energy distribution: the curve flattens and spreads to the right, so the fraction of molecules with at least the activation energy rises sharply, and a larger proportion of collisions succeed.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

A catalyst in the same phase as the reactants, such as iodide ions dissolved with hydrogen peroxide.

THE MAXWELL–BOLTZMANN DISTRIBUTION, TEMPERATURE AND CATALYSTS

DEFINITION

The moment at which a fixed, observable change has taken place, such as a cross disappearing, when the timing is stopped.

MEASURING THE RATE OF A REACTION

DEFINITION

Following a single reaction mixture by reading a property that changes, at intervals, through the whole reaction.

MEASURING THE RATE OF A REACTION

DEFINITION

The variable that is measured in each run to see the effect of the change.

MEASURING THE RATE OF A REACTION

DEFINITION

The variable that is deliberately changed from one run to the next.

MEASURING THE RATE OF A REACTION

DEFINITION

A graph of a measured property, such as absorbance, against known concentrations of a substance, used to convert a reading into a concentration.

MEASURING THE RATE OF A REACTION

DEFINITION

A variable kept the same in every run so that it cannot affect the result.

MEASURING THE RATE OF A REACTION

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DEFINITION

Define: Resolution.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Random error.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Systematic error.

MEASURING THE RATE OF A REACTION

DEFINITION

Define: Percentage uncertainty.

MEASURING THE RATE OF A REACTION

SPOT THE ERROR

Say what is wrong with this claim:

If a reaction gives off a gas, its rate can always be followed by standing the flask on a balance and watching the mass fall.

MEASURING THE RATE OF A REACTION

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DEFINITION

An error that makes repeated readings scatter unpredictably on both sides of the true value; its effect is reduced by repeating the measurement and taking a mean.

MEASURING THE RATE OF A REACTION

DEFINITION

The smallest change in a quantity that an instrument can show, such as 0.01 g on a balance reading to two decimal places.

MEASURING THE RATE OF A REACTION

DEFINITION

The uncertainty in a measurement divided by the measured value and multiplied by 100.

MEASURING THE RATE OF A REACTION

DEFINITION

An error that shifts every reading from the true value in the same direction by a similar amount; repeating the measurement neither reveals it nor reduces it.

MEASURING THE RATE OF A REACTION

SPOT THE ERROR

Mass loss works only when the gas is heavy enough to register. Carbon dioxide, Mr 44, from marble and acid gives a clear fall; hydrogen, Mr 2, from magnesium and acid loses so little mass that the balance cannot resolve it. For a light gas, collect it in a gas syringe or over water and follow the volume instead.

MEASURING THE RATE OF A REACTION

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