1. The rate equation of a reaction:

   ☐ is read straight off the balanced equation

   ☐ is always second order

   ☐ never includes a rate constant

   ☐ can only be found by experiment, not from the balanced equation

2. A reaction whose half-life stays the same as it proceeds is:

   ☐ not happening

   ☐ second order

   ☐ first order

   ☐ zero order

3. The rate-determining step is:

   ☐ the slowest step, which controls the overall rate

   ☐ always the first step

   ☐ the fastest step

   ☐ the step with no intermediate

4. A heterogeneous catalyst:

   ☐ is in a different physical state from the reactants and works by adsorption and desorption

   ☐ changes the enthalpy change of the reaction so that it is more negative

   ☐ is used up permanently, so it must be replaced after each reaction

   ☐ is in the same state as the reactants and works by forming an intermediate

5. If doubling [A] doubles the rate, the order with respect to A is:

   ☐ 1 (first order)

   ☐ 3

   ☐ 0 (zero order)

   ☐ 2 (second order)

6. A first-order reaction has a half-life of 100 s. What is k? ($k = 0.693/t_{½}$)

   _____

exercises.lol exercises.com.cn

   _____

8. A heterogeneous catalyst is in the same physical state as the reactants.

   ☐ True ☐ False

9. The power to which a reactant's concentration is raised in the rate equation is its _____.

   _____

10. A constant half-life can be used to identify a first-order reaction.

    ☐ True ☐ False

1. **can only be found by experiment, not from the balanced equation**

   Orders must be measured experimentally; they cannot be deduced from the stoichiometric equation.

2. **first order**

   A constant half-life (independent of concentration) is the signature of a first-order reaction.

3. **the slowest step, which controls the overall rate**

   The slowest step is the bottleneck, so it determines the overall rate.

4. **is in a different physical state from the reactants and works by adsorption and desorption**

   Heterogeneous = different state (e.g. solid + gases); reactants adsorb, react, then products desorb.

5. **1 (first order)**

   Rate $\propto$ $[A]^1$, so doubling [A] doubles the rate – first order.

6. **0.00693**

   k = 0.693 / 100 = 0.00693 (per second).

7. **determining**

   Only species up to and including it appear in the rate equation.

8. **False**

   False. A heterogeneous catalyst is in a different state, e.g. a solid catalyst with gaseous reactants. A homogeneous catalyst is in the same state.

9. **order**

   The orders are found experimentally.

10. **True**

    Only first-order reactions have a half-life that is independent of the concentration.

exercises.lol exercises.com.cn