Collision Theory

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

For a collision to produce a reaction, particles must collide with enough energy and in a suitable orientation.

1 Which collision is most likely to produce a reaction?

(1) Particles miss each other but have high energy.

(2) Particles meet in a suitable orientation with enough energy.

(3) Particles meet in a suitable orientation with too little energy.

(4) Particles meet with enough energy in an unsuitable orientation.

2 Equal masses of the same solid react with a solution. Explain why the powdered solid generally reacts faster than a single piece. [1]

Answer and work

3 At a higher temperature, which change helps explain a faster reaction?

(1) More particles have enough energy to react when they collide.

(2) Every collision now makes product.

(3) Each reactant particle has more protons.

(4) The activation energy necessarily increases.

4 Two particles collide with enough energy but do not react. Give one collision-theory explanation. [1]

Answer and work

Model Reaction Trials

Use the information below to answer the questions.

A particle simulation records successful collisions for the same reaction during equal 1.0 s intervals. The container volume and the concentration of Y are fixed. All runs begin with fresh reactants.

Run	Relative concentration of X	Temperature (K)	Successful collisions
A	1	290	12
B	2	290	23
C	1	310	20

5 Which pair of runs isolates the effect of changing the concentration of X?

(1) A and B

(2) A and C

(3) B and C

(4) No pair isolates that change.

6 Which run has the fastest reaction during its measured interval?

(1) A

(2) B

(3) C

(4) All three have the same rate.

7 Use two rows and collision theory to explain the effect of temperature at the lower concentration of X. [1]

Answer and work

8 Propose one additional run that, compared with run B, would isolate the effect of increasing temperature to 310 K. State the concentration of X and what to measure. [1]

Answer and work