Elite Private School

Worksheet

Subject: Chemistry	Grade Level:12	Section:	Name:
Topic: Reaction Kinetics			**Standard:** HS-PS1.B HS-PS2.C

Objective:

- To determine the effect of surface area, nature of reactants, concentration, & catalyst on the rate of reaction.

Vocabulary	
catalyst	energy
catalytic converter	heat
collisions	rate of reaction
concentration	surface area
dilute	temperature

A. Use the terms in the vocabulary box to fill in the blanks. You may use each term only once.

1. A freshly exposed surface of metallic sodium tarnishes almost instantly if exposed to air and moisture, while iron will slowly turn to rust under the same conditions. In these two situations, the_____refers to how quickly or slowly reactants turn into products.

2. Adding_____will increase the rate of reaction because this causes the particles of the reactants to move more quickly, resulting in more collisions and more_____.

3. Removing heat will lower the_____, causing the particles of the reactants to slow down, resulting in less frequent collisions.

4. _____ refers to how much solute is dissolved in a solution. If there is a greater concentration of reactant particles present, there is a greater chance that _____among them will occur. More collisions mean a higher rate of reaction.

5. A concentrated acid solution will react more quickly than a _____ acid solution because there are more molecules present, increasing the chance of collisions.

6. Grains of sugar have a greater_____than a solid cube of sugar of the same mass, and therefore will dissolve quicker in water.

7. A_____, for example an enzyme, is used to speed up a chemical reaction but is not used up in the reaction itself.

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8. A_____in a car has metallic catalysts where several reactions occur. Carbon monoxide, which was produced in the combustion of gasoline, is changed into carbon dioxide and water in the presence of these metallic catalysts.

B. Indicate whether each of the following would increase or decrease the rate of reaction.

a. adding heat _____

b. removing heat _____

c. adding a catalyst _____

d. diluting a solution _____

e. removing an enzyme _____

f. lowering the temperature _____

g. increasing the temperature _____

h. decreasing the surface area _____

i. increasing the concentration of a solution _____

j. breaking a reactant down into smaller pieces _____

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C. Identify which situation would have a higher reaction rate. Then state the factor that affected the rate of reaction in each situation.

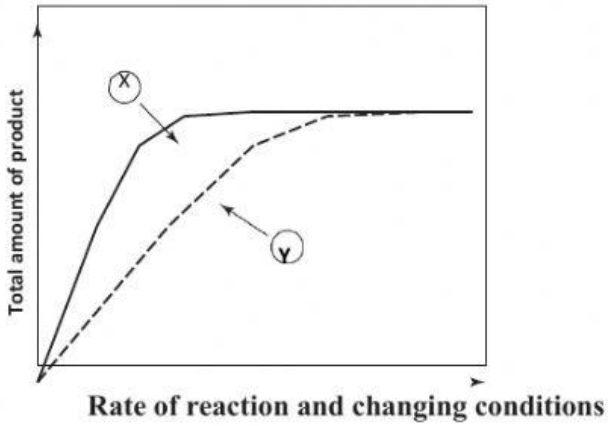
	Situation X	Situation Y	Situation with a higher reaction rate (X or Y)	Factor affecting the rate of reaction
(a)	1 g of sugar (cubes) 	1 g of sugar (grains) 		
(b)	5O °C 	O °C 		

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(c)	low number of particles = few collisions 	high number of particles = more collisions 		
(d)	enzyme added 	no enzyme added 		
(e)	twigs 	logs 		

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D. Use the following graph to answer question 1.



1. The graph above shows the differences in the rate of reaction at different temperatures, concentrations, surface area, and the presence or absence of a catalyst. A steeper line represents a greater rate of reaction. Indicate which line (X or Y) each of the following are associated with.

(a) lower temperature_____ (b) higher temperature _____

(c) lower concentration_____ (d) higher concentration _____

(e) absence of a catalyst_____ (f) presence of a catalyst _____

(g) larger pieces (small surface area) _____

(h) smaller pieces (large surface area) _____

2. Which of the four factors affecting reaction rate is most important in each of the following examples? Choose from concentration, temperature, surface area, and catalyst.

(a) Raw carrots are cut into thin slices for cooking. _____

(b) Protein is broken down in the stomach by the enzyme pepsin. ____

(c) A woolly mammoth is found, perfectly preserved, near the Arctic. _____

(d) More bubbles appear when a concentrated solution of hydrochloric acid is added to a magnesium strip than when a dilute solution of the acid is added. _____

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E. Match the Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
1. _____ Catalyst	A. a measure of how much area of an object is exposed.
2. _____ Temperature	B. the amount of substance dissolved in a given volume of solution.
3. _____ Surface area	C. a measure of the average kinetic energy of all the particles in a sample of matter.
4. _____ Concentration	D. a substance that speeds up the rate of a chemical reaction without being used up itself or changed.
5. _____ Rate of reaction	E. a measure of how quickly products form, or given amounts of reactants react, in a chemical reaction.
6. _____ Catalytic converter	F. a stainless steel pollution-control device that converts poisonous gases from the vehicle's exhaust into less harmful substances.

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F. Which of the following are true about how temperature affects the rate of reaction?

I.	heating causes the particles of the reactants to move more quickly
II.	lowering the temperature will raise the energy level of the particles
III.	increasing the temperature results in more collisions between the particles

a. I and II only
b. I and III only
c. II and III only
d. I, II, and III

G. Increasing which of the following will increase the frequency of collisions?

I.	temperature
II.	surface area
III.	concentration

a. I and II only
b. I and III only
c. II and III only
d. I, II, and III

H. Which of the following will lower the rate of reaction?

a. adding an enzyme to the reaction
b. decreasing the temperature from 40°C to 10°C
c. breaking a chunk of calcium up into smaller pieces
d. increasing the amount of solute dissolved in a solution

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