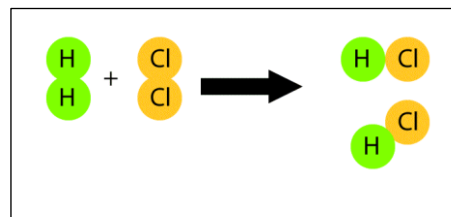


## Collision Theory and Rates of reactions

1. Consider the image on the right.  
Which statement is true?
- a. This image represents a physical change.



- b. The particles have collided with the right amount of energy but not the right orientation.
- c. This image represents a chemical change as a new product is formed.
- d. The particles have collided with the right orientation but not the necessary amount of energy to break apart.

Explain, with reference to collision theory, why you selected the answer above.

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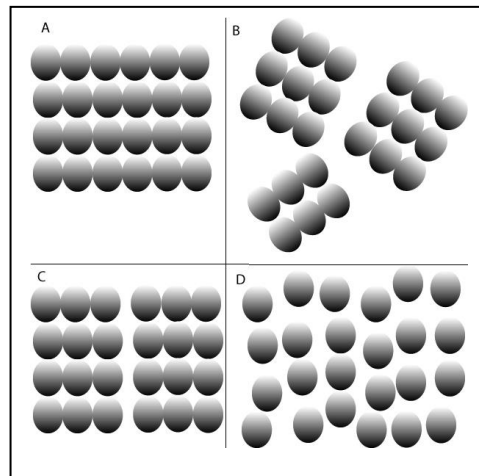
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2. Consider the representation of a substance in four different physical states. Which physical state will have the fastest rate of reaction during a chemical reaction?

- a. A. because all the particles are perfectly aligned.
- b. B. Because all the particles are capable of reacting at the same time.
- c. C. Because there is only two particles and so will react the fastest out of all the options.
- d. D. Because all the particles are capable of colliding with the reactant particles simultaneously.



Explain, with reference to collision theory, why you selected the answer above.

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3. The instrument shown on the right is used to increase the rate of a reaction. How does it make the reaction proceed at a fast rate?

- a. By increasing the surface area of the solid reactants.
- b. By increasing the speed of all the particles.
- c. By helping to dissolve and stir substances in water.
- d. By preventing particles from colliding thus reaching their destination quicker.



Explain, with reference to collision theory, why you selected the answer above.

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4. Consider the launch of a Saturn 5 rocket. It uses liquid fuels to generate an enormous amount of thrust. The fuels must react with each other at a very fast rate in order to release the energy to launch this massive rocket. Which option below will help to increase the rate of the reaction?

- a. Cool the fuel before it enters the reaction chamber to slow the particles down and ensure fruitful collisions.
- b. Heat the fuel particles before they enter the reaction chamber.
- c. Store the reactants separately in round, strong containers.
- d. Vent all the heat out through exhaust nozzle so that the reaction chamber remains cool.



Explain, with reference to collision theory, why you selected the answer above.

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5. Consider the reaction taking place on the right between copper metal and nitric acid to produce a very dangerous gas. Which option from the list below will successfully slow the reaction down and stop the formation of large amounts of toxic gas?

- a. Add more acid to concentrate the acid solution.
- b. Heat the contents of the beaker with a Bunsen burner to stop the reaction.
- c. Add water to the beaker to dilute the contents.
- d. Insulate the beaker with foam to prevent the heat from escaping.



Explain, with reference to collision theory, why you selected the answer above.

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6. Cooking is all about chemical reactions. Consider the frying pan with the meat, shown on the right. How is the chef increasing the speed, commonly known as the rate, of the chemical reaction taking place in the frying pan?

- a. By adding more meat to the frying so that it fills the entire frying pan.
- b. Making sure the heat is not too high by allowing most of the heat to escape by not placing a lid on the frying pan.
- c. Heating the food and chopping it into small pieces.
- d. The chef is using high quality, tender meat.



Explain, with reference to collision theory, why you selected the answer above.

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7. The spoilage of food is a chemical reaction the produces new products such as foul odours and foul tasting chemicals. We often cool or even freeze food to keep them longer.



- a. Explain, with reference to collision theory, why cooling will preserve the food for a longer period of time. In your explanation use the term ,"**Fruitful collisions**".

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- b. Robyn wishes to preserve a large fish that she caught whilst fishing. Her friend suggested that she not cut the fish into small pieces but just freeze it instead as one whole piece.

- i. Will this help prevent the fish from producing foul odours?

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- ii. Using your knowledge of chemistry explain your answer to question i. above.

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