

Bond Energy and the Types of Reactions

Homework – Teacher’s Edition

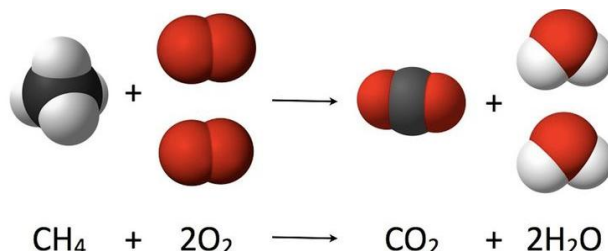
Select the correct answer to each other the following questions:

1. What type of reaction transfers heat energy to the surroundings?
 - a) Endothermic reaction
 - b) Exothermic reaction
 - c) Reversible reaction
 - d) Physical reaction
2. When barium hydroxide and ammonium chloride react, the temperature of the mixture decreases. This is a/an...
 - a) Endothermic reaction
 - b) Exothermic reaction
 - c) Decomposition reaction
 - d) Neutralization reaction
3. What does a negative energy change tell you about a reaction?
 - a) It is an endothermic reaction
 - b) It is an exothermic reaction
 - c) It is a decomposition reaction
 - d) It is a neutralization reaction
4. Which of these is an example of an endothermic reaction?
 - a) Oxidation
 - b) Combustion
 - c) Decomposition
 - d) Synthesis
5. When calcium reacts with water, the temperature changes from 18°C to 39°C. Which of the following statements is correct?
 - a) The final solution is acidic
 - b) The final solution is basic
 - c) The reaction is exothermic
 - d) The reaction is endothermic
6. A reaction releases more energy when forming new bonds compared to the amount of energy absorbed to break bonds in the reactants. Which of the following statement is correct?
 - a) The reaction is endothermic
 - b) The reaction is slow
 - c) The reaction is exothermic
 - d) The reaction is fast

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7. The equation for the combustion of methane is shown below:



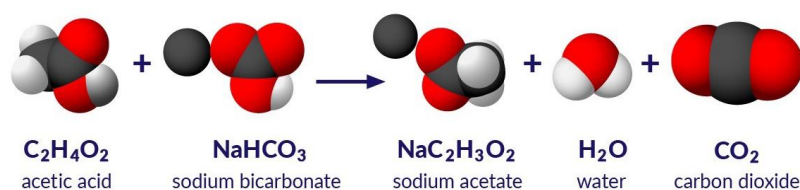
a) The total energy change for this reaction is -808 kJ mol^{-1} . Explain what this number means.

Note: You do not need to perform any calculations for this question.

b) Is this reaction an example of an endothermic reaction, or an exothermic reaction?

c) Justify your answer to b).

8. When acetic acid is added to sodium bicarbonate, there is a decrease in the temperature of the flask. The equation for the reaction between acetic acid (vinegar) and sodium bicarbonate (baking soda) is shown below:



a) Is this reaction an example of an endothermic reaction, or an exothermic reaction?

b) Justify the reason for your answer in a).

9. Steel wool can be made to rust quickly when placed in a beaker of vinegar. Rusting is an example of an oxidation reaction. The acetic acid in the vinegar dissolves the

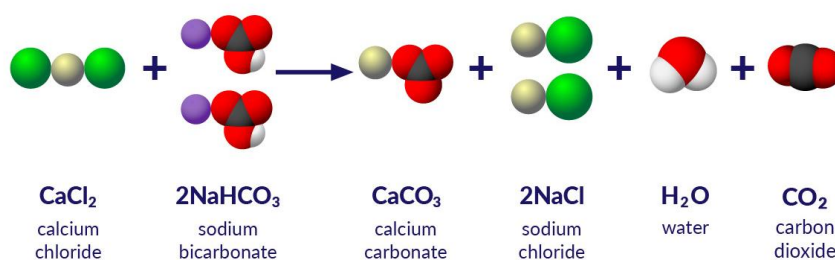
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protective coating which covers the fibers of the steel wool pad, exposing the steel underneath to the atmosphere.

- Is this reaction an example of an endothermic reaction, or an exothermic reaction?
- Justify the reason for your answer in a).

10. Sodium hydrogen carbonate and calcium chloride is an example of a precipitation reaction which demonstrates an increase in temperature. The equation for the reaction is shown below:



- Is this reaction and example of an endothermic reaction or an exothermic reaction?
- Give a reason for your answer in b).
- Explain why there is an increase in temperature for this reaction.

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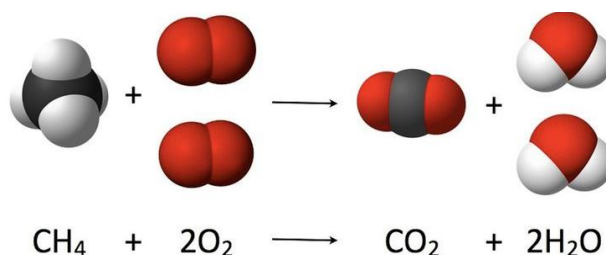
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7. The equation for the combustion of methane is shown below:



- a) The total energy change for this reaction is -808 kJ mol^{-1} . Explain what this number means.

Note: You do not need to perform any calculations for this question.

That more energy is needed to form the new bonds, than to break the reactant bonds, giving the negative energy value.

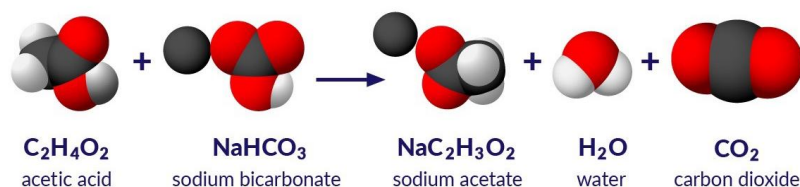
- b) Is this reaction an example of an endothermic reaction, or an exothermic reaction?

Exothermic

- c) Justify your answer to b).

It produces large amounts of heat when the products are formed

8. When acetic acid is added to sodium bicarbonate, there is a decrease in the temperature of the flask. The equation for the reaction between acetic acid (vinegar) and sodium bicarbonate (baking soda) is shown below:



- a) Is this reaction an example of an endothermic reaction, or an exothermic reaction?

Endothermic

- b) Justify the reason for your answer in a).

There is a drop in temperature, indicating that energy needs to be put into the system to break the bonds than form the new bonds in the products.

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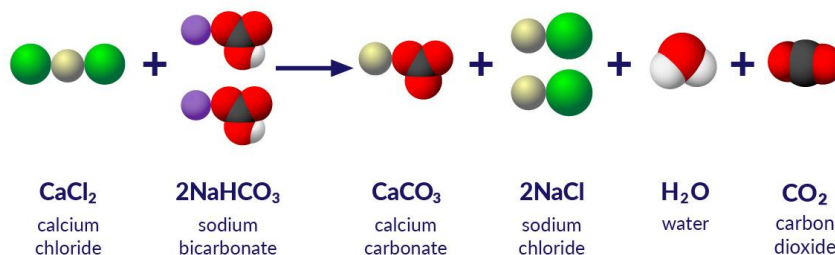
a) Is this reaction an example of an endothermic reaction, or an exothermic reaction?

Exothermic

b) Justify the reason for your answer in a).

Rusting is an oxidation reaction which produces heat when the products are formed.

10. Sodium hydrogen carbonate and calcium chloride is an example of a precipitation reaction which demonstrates an increase in temperature. The equation for the reaction is shown below:



a) Is this reaction and example of an endothermic reaction or an exothermic reaction?

Exothermic

b) Give a reason for your answer in b).

The reaction shows an increase in temperature

c) Explain why there is an increase in temperature for this reaction.

The energy required to initiate the reaction and break the bonds of the reactants is less than that which is needed to make the new bonds in the products.