A student observed that the temperature of water increased when a salt was dissolved in it. The student should conclude that dissolving the salt caused

A.) an exothermic reaction
B.) an endothermic reaction
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A.) an exothermic reaction
B.) an endothermic reaction

The energy RELEASED in the reaction caused the temperature of the water to rise
What change occurs when pellets of NaOH are added to water and stirred?

\[ \text{NaOH}(s) + \text{H}_2\text{O}(l) \rightarrow \text{NaOH}(aq) + \text{heat} \]

A.) The water temperature increases as chemical energy is converted to heat energy.

B.) The water temperature increases as heat energy is stored as chemical energy.

C.) The water temperature decreases as chemical energy is converted to heat energy.

D.) The water temperature decreases as heat energy is stored as chemical energy.
What change occurs when pellets of NaOH are added to water and stirred?

NaOH(s) + H₂O(l) → NaOH(aq) + heat

A.) The water temperature increases as chemical energy is converted to heat energy.
B.) The water temperature increases as heat energy is stored as chemical energy.
C.) The water temperature decreases as chemical energy is converted to heat energy.
D.) The water temperature decreases as heat energy is stored as chemical energy.

Heat is a product, exothermic.
HEAT
Heat vs. Temperature

- Heat is a form of energy
- Temperature is a measure of the average kinetic energy (movement) of particles
  - **Temperature = Kinetic Energy**
The average kinetic energy of water molecules is greatest in which of these samples?

A.) 10 g of water at 35°C
B.) 10 g of water at 55°C
C.) 100 g of water at 25°C
D.) 100 g of water at 45°C
The average kinetic energy of water molecules is greatest in which of these samples?

A.) 10 g of water at 35°C

B.) 10 g of water at 55°C

C.) 100 g of water at 25°C

D.) 100 g of water at 45°C

Temperature is Kinetic Energy
Kinetic Theory of Matter

- Particles are in constant motion
- Heat is a form of energy produced by molecular motion
- When heat is added the particles move faster
- When the particles move faster the temperature goes up
Which change in the temperature of a 1-gram sample of water would cause the greatest increase in the average kinetic energy of its molecules?

A.) 1°C to 10°C
B.) 10°C to 1°C
C.) 50°C to 60°C
D.) 60°C to 50°C
Which change in the temperature of a 1-gram sample of water would cause the greatest increase in the average kinetic energy of its molecules?

A.) 1ºC to 10ºC
B.) 10ºC to 1ºC
C.) 50ºC to 60ºC
D.) 60ºC to 50ºC
Heat Flow

- Heat flows spontaneously from hot to cold
- This flow continues until both systems have reached the same temperature (equilibrium)
- *There is no such thing as cold; only lack of heat*
Two samples of gold that have different temperatures are placed in contact with one another. Heat will flow spontaneously from a sample of gold at 60°C to a sample of gold that has a temperature of

A.) 50°C  
B.) 60°C  
C.) 70°C  
D.) 80°C
Two samples of gold that have different temperatures are placed in contact with one another. Heat will flow spontaneously from a sample of gold at 60°C to a sample of gold that has a temperature of

A.) 50°C
B.) 60°C
C.) 70°C
D.) 80°C

Heat flows from the hot 60 to a lower temperature of 50
Solid X is placed in contact with solid Y. Heat will flow spontaneously from X to Y when

A.) X is 20°C and Y is 20°C
B.) X is 10°C and Y is 5°C
C.) X is -25°C and Y is -10°C
D.) X is 25°C and Y is 30°C
Solid X is placed in contact with solid Y. Heat will flow spontaneously from X to Y when

A.) X is 20°C and Y is 20°C

B.) X is 10°C and Y is 5°C

C.) X is -25°C and Y is -10°C

D.) X is 25°C and Y is 30°C
Several cubes of ice are added to a warm drink to make the drink cold. This is because

A.) ice is a good conductor of heat.
B.) ice is a poor conductor of heat.
C.) ice releases coldness when it melts.
D.) ice absorbs heat when it melts.
Several cubes of ice are added to a warm drink to make the drink cold. This is because

A.) ice is a good conductor of heat.

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C.) ice releases coldness when it melts.

D.) ice absorbs heat when it melts.

Heat is released from the higher temperature drink and absorbed by the lower temperature ice.
Several cubes of ice are added to a warm drink. After a few minutes the ice is almost gone and the temperature of the drink is

A.) lower than before the ice was added to it.
B.) higher than before the ice was added to it.
C.) the same as that of the ice.
D.) impossible to tell.
Several cubes of ice are added to a warm drink. After a few minutes the ice is almost gone and the temperature of the drink is

⭐️ lower than before the ice was added to it.

B.) higher than before the ice was added to it.

C.) the same as that of the ice.

D.) impossible to tell.

The heat flows from the higher temperature drink causing its temperature to lower.
Measuring Temperature

- Temperature is measured using a thermometer
- All thermometers have 2 fixed points
  - Ex: 0ºC and 100ºC (freezing and boiling points of water are measured and marked)
  - The interval between is divided into 100 equal parts
Temperature

- Kelvin (K) is the SI unit for temperature
- $K = ^{\circ}C + 273$
- $0 \, K$ is absolute zero (total absence of movement)

Ten years of research and you’re the only ABSOLUTE ZERO we’ve ever gotten!
Temperature Conversion Practice

- $500 \, ^\circ C = 773 \, K$
- $273 \, K = 0 \, ^\circ C$ \text{ Freezing/Melting pt of Water}
- $298 \, K = 25 \, ^\circ C$ \text{ Room Temperature}
- $100 \, ^\circ C = 373 \, K$ \text{ Boiling Point of Water}
- $0 \, K = -273 \, ^\circ C$ \text{ Absolute Zero}
- $0 \, ^\circ C = 273 \, K$
- $-50 \, ^\circ C = 223 \, K$
Which Kelvin temperature is equal to -73°C?

A.) 100 K  
B.) 173 K  
C.) 200 K  
D.) 346 K
Which Kelvin temperature is equal to -73°C?

\[ K = -73 + 273 \]

A.) 100 K
B.) 173 K
C.) 200 K
D.) 346 K
Which Celsius temperature is equivalent to 300 K?

A.) 0 °C
B.) 27 °C
C.) 300 °C
D.) 573 °C
Which Celsius temperature is equivalent to 300 K?

\[300K = X + 273\]

A.) 0 °C
B.) 27 °C
C.) 300 °C
D.) 573 °C