



## CONCEPT: SPONTANEOUS VS NONSPONTANEOUS REACTIONS

- **Spontaneity:** determines whether a reaction/process, under certain conditions, \_\_\_\_\_ or \_\_\_\_\_.
  - **Spontaneous:** a \_\_\_\_\_ process which does not require a constant outside \_\_\_\_\_ source
    - \_\_\_\_\_ formation of products at equilibrium
  - **Nonspontaneous:** an \_\_\_\_\_ process which requires a constant outside energy source
    - Does \_\_\_\_\_ formation of products at equilibrium
- Spontaneity does not determine the speed of a reaction/process

	$\xrightarrow{\text{spontaneous}}$ $\xleftarrow{\text{nonspontaneous}}$		Rate in forward: _____
$6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \xrightarrow{\text{sunlight}} \text{Glucose} + 6 \text{ O}_2$ $\xleftarrow{\text{spontaneous}}$			Rate in forward: _____

**EXAMPLE:** Label each process as spontaneous or nonspontaneous.

- a) a sugar cube dissolved in room temperature water \_\_\_\_\_
- b) mixing of 3 gases in a container \_\_\_\_\_
- c) heat flows from cold object to warm object \_\_\_\_\_
- d) ice cube melts at  $-1.0^\circ\text{C}$  \_\_\_\_\_
- e) ball rolls down a hill \_\_\_\_\_
- f) plant respiration:  $\text{O}_2$  and glucose produce  $\text{CO}_2$  and ATP \_\_\_\_\_