

Name \_\_\_\_\_

## Cooling and Warming the World: How Heat Pumps and Refrigeration Cycles Work

### Open-Ended Response Answer Key

1. A heat pump works by absorbing heat from one location (either inside or outside) using an evaporator, compressing and pressurizing it with a compressor, releasing the heat in another location using a condenser, and cycling the refrigerant through an expansion valve. In cooling mode, it releases heat outside, while in heating mode, it releases heat inside.
2. Heat pumps have a lower environmental impact compared to traditional heating and cooling methods because they transfer heat rather than generate it, reducing energy consumption and greenhouse gas emissions. Over time, this can lead to cleaner air and a smaller carbon footprint.
3. Advancements in heat pump technology include improved refrigerants, more efficient compressors, and better insulation. These innovations have contributed to higher efficiency, lower energy consumption, and reduced environmental impact.
4. Widespread adoption of heat pumps for heating and cooling could significantly reduce energy consumption and greenhouse gas emissions on a global scale. This transition could lead to a more sustainable energy future and mitigate the impacts of climate change.

