

ConcepTest PowerPoints

Chapter 15

Physics: Principles with Applications, 6th edition

Giancoli

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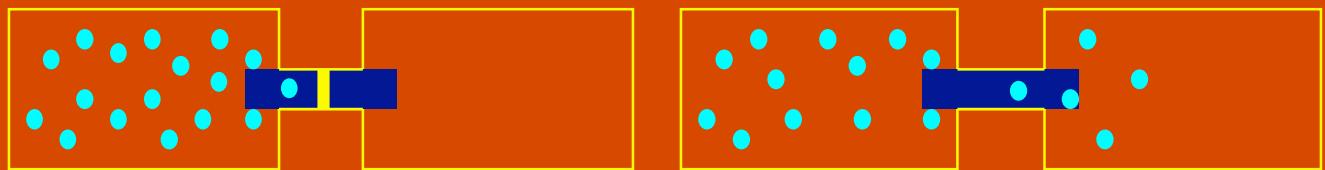
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ConcepTest 15.1

A free expansion occurs when a valve is opened allowing a gas to expand into a bigger container. In such an expansion the temperature of the gas will:

Free Expansion

- 1) increase
- 2) decrease
- 3) stay the same



ConcepTest 15.1

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In such a process:

$W = 0$ there is no object to move,

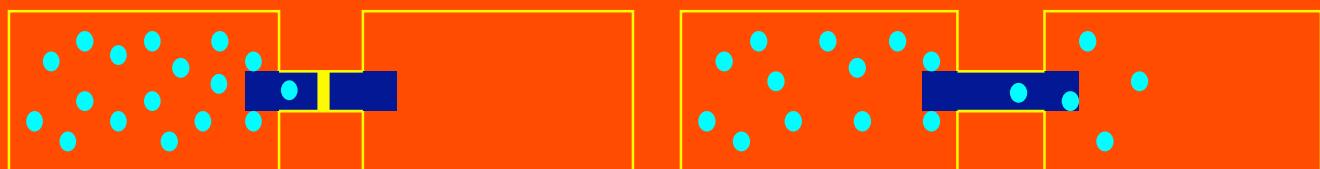
$Q = 0$ there is no heat exchange, therefore

$\Delta U = 0$ by the First Law of Thermodynamics.

Thus, there is no change in the temperature.

Free expansion is an irreversible process --- the gas molecules have virtually no chance of returning to the original state.

Free expansion is neither adiabatic nor isothermal expansion, even though ΔT and Q are zero.

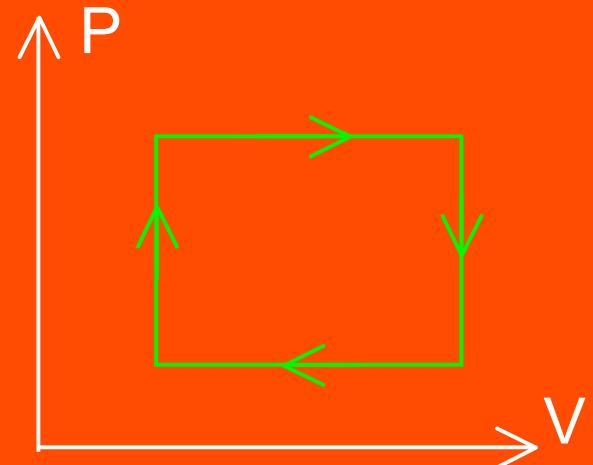


ConcepTest 15.2

Work

In the closed thermodynamic cycle shown in the P-V diagram, the work done by the gas is:

- 1) positive
- 2) zero
- 3) negative



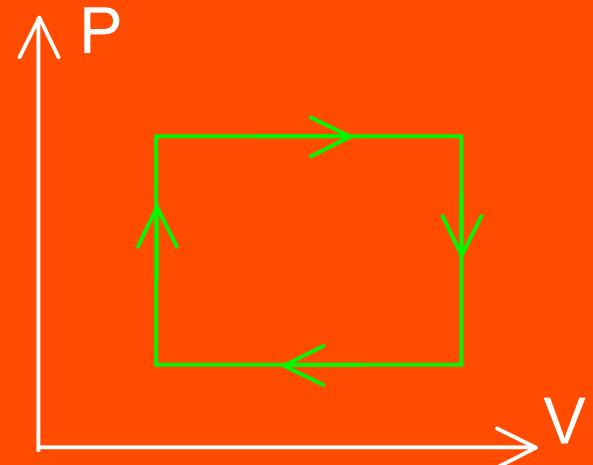
ConcepTest 15.2

Work

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- 2) zero
- 3) negative

The gas expands at a higher pressure and compresses at a lower pressure. In general, clockwise = positive work; counterclockwise = negative work.

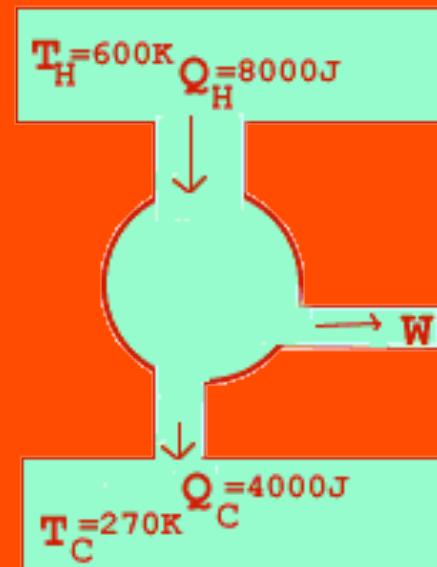


ConcepTest 15.3

Heat Engine

The heat engine below is:

- 1) a reversible (Carnot) heat engine
- 2) an irreversible heat engine
- 3) a hoax
- 4) none of the above



ConcepTest 15.3

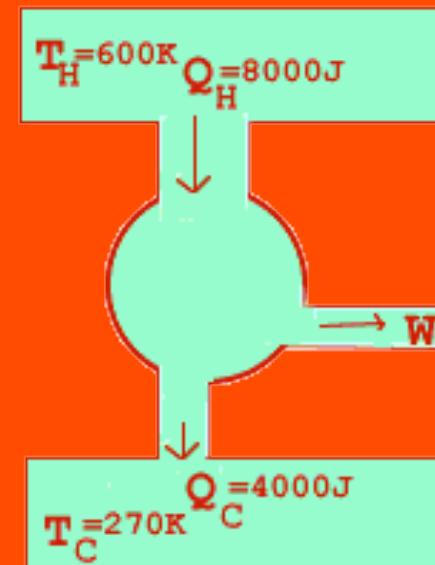
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$$\text{Carnot } e = 1 - T_C/T_H = 1 - 270/600 = 0.55.$$

But by definition $e = 1 - Q_L/Q_H$
 $= 1 - 4000/8000 = 0.5$, smaller
than Carnot e , thus irreversible.



Follow-up: What would you need to change to make it a Carnot engine?