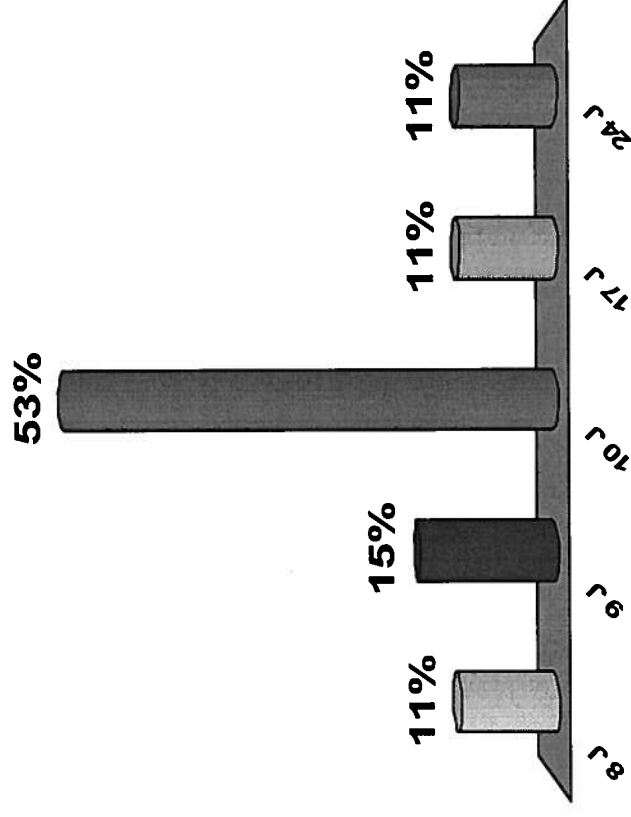


A container of gas initially has an internal energy of 9 J. If 8 J of heat is added while the gas performs 7 J of work on its surroundings, what is the final value of the internal energy?

- 1. 8 J
- 2. 9 J
- ✓ 3. 10 J
- 4. 17 J
- 5. 24 J



The final internal energy is

c) $U_f = 10 \text{ J}$, as follows.

- **1st Law:** $Q^{IN} + W^{IN} = \Delta U_{\text{internal}}$
- Therefore,
- $\Delta U = (+8 - 7) \text{ J} = +1 \text{ J}$ (using $Q^{IN} = 8 \text{ J}$,
and $W^{IN} = - |W^{OUT}| = -7 \text{ J}$)
- So that
- $U_f = U_o + \Delta U = 9 + 1 = 10 \text{ J}$. (c)
- Note that **ejected heat**, like W^{OUT} , is also negative in 1st Law.