

وزارة التعليم العالي والبحث العلمي
جامعة الموصل
كلية العلوم البيئية
قسم تقانات البيئة

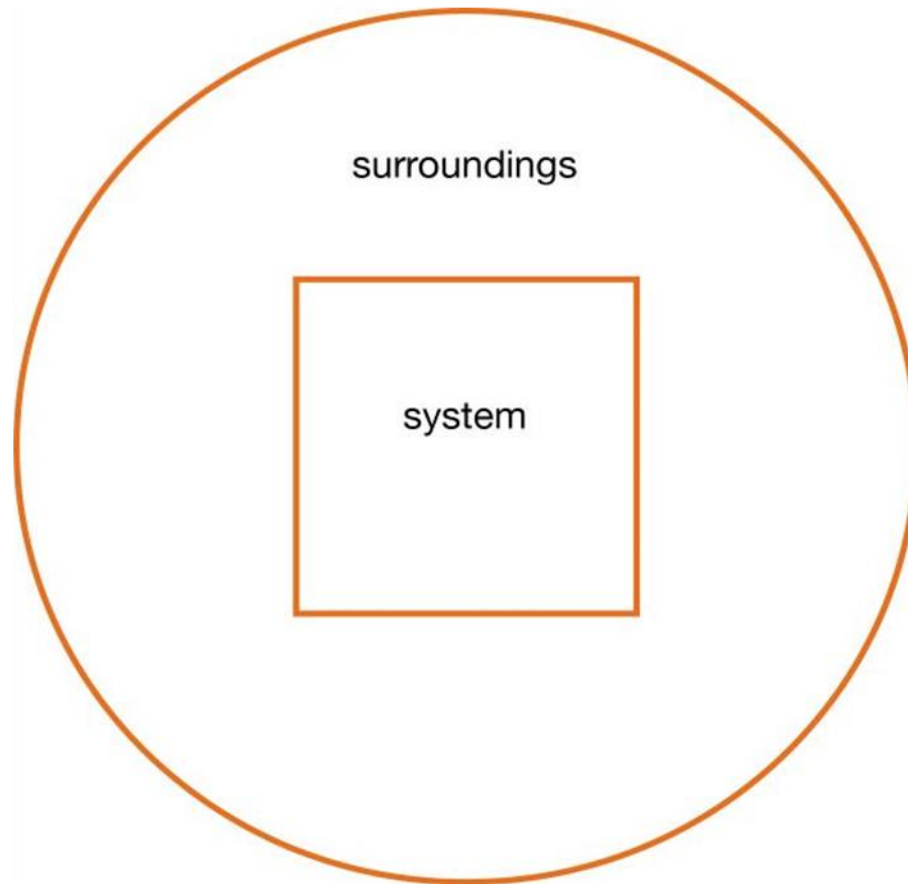
Thermodynamics

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Thermodynamic Concepts

- **Thermodynamic system:** النظام الديناميكي
able to exchange heat with its surroundings
- **State variables:** متغيرات الحالة p, V, T, \dots
describe the thermodynamic system
- **Thermodynamic process:** العمليات الديناميكية الحرارية
changes the state (p, V, T, \dots) of the system

System and surroundings



Thermodynamic Process

Heat Q :

الحرارة

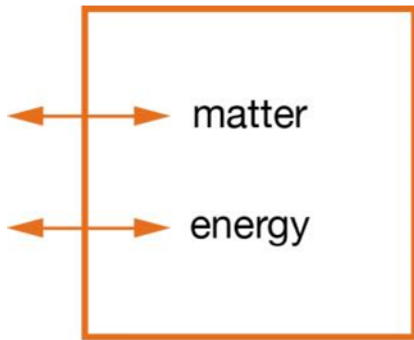
can leave or enter system

Work W :

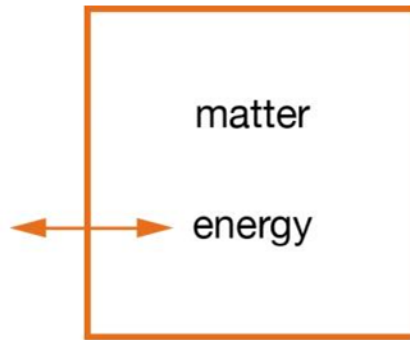
الشغل

- system can do work on its surroundings
- Surroundings can do work on the system

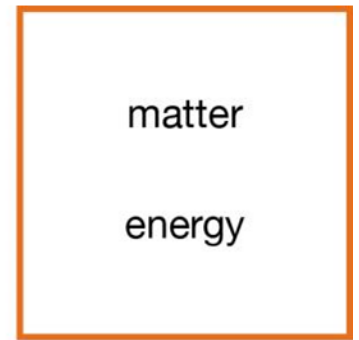
Different types of system



open system



closed system



isolated system

thermodynamic

system:

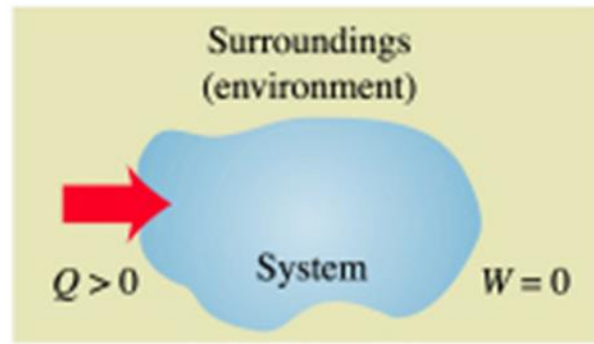
can exchange
heat with its
surroundings

state of system:
(p , V , T , ...)

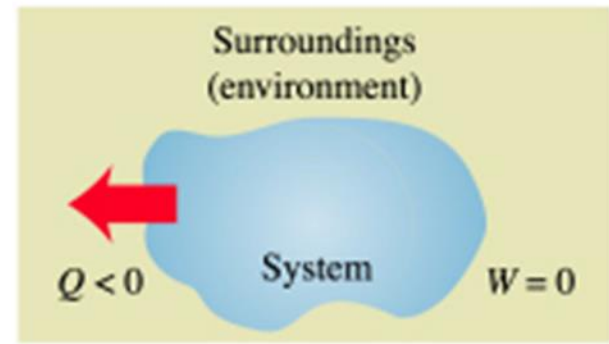
thermodynamic

process:

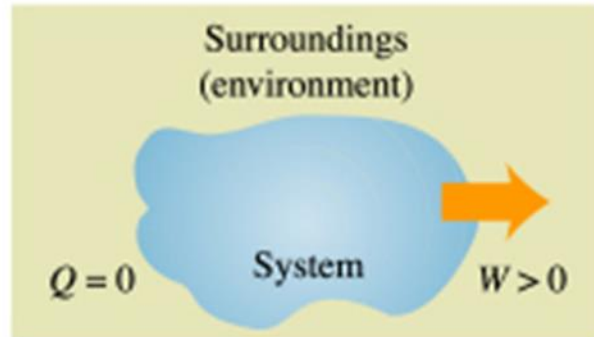
changes state
of the system



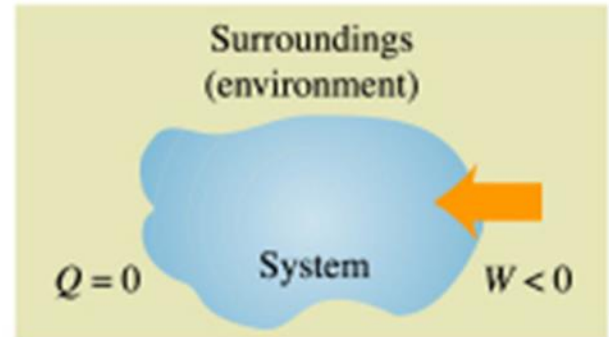
(a)



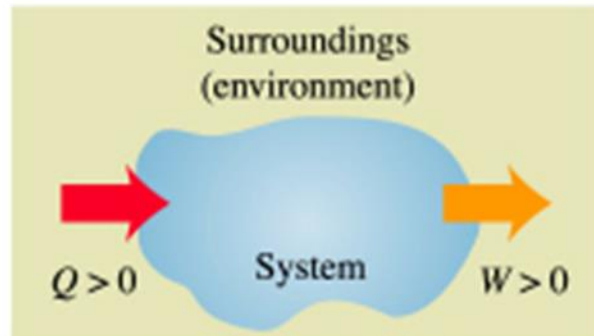
(b)



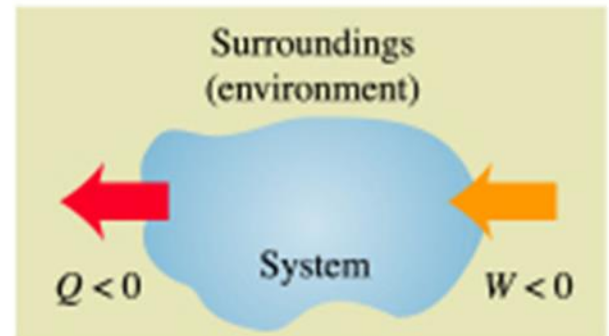
(c)



(d)



(e)

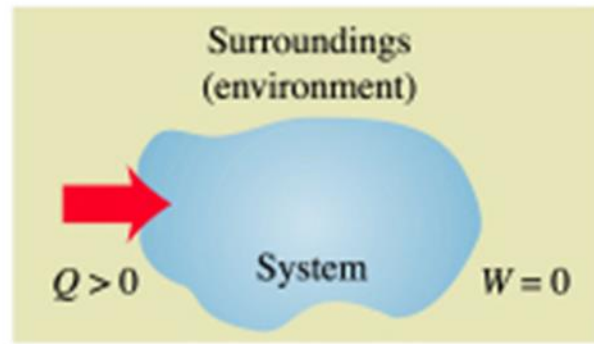


(f)

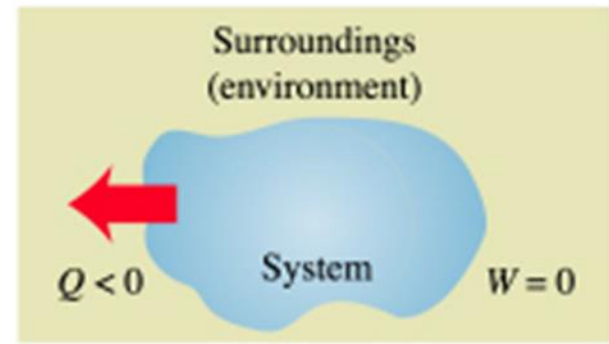
**thermodynamic
process:**
changes state
of the system

**We'll focus on
the roles of:**

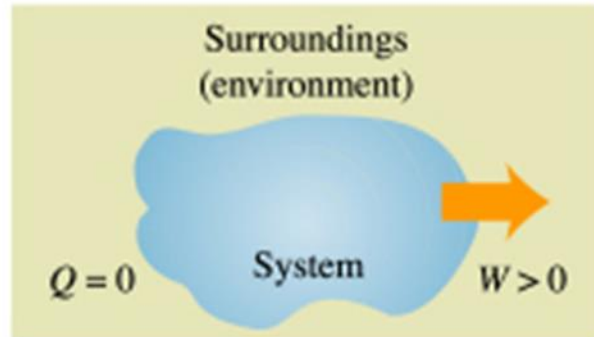
- Heat Q
- Work W



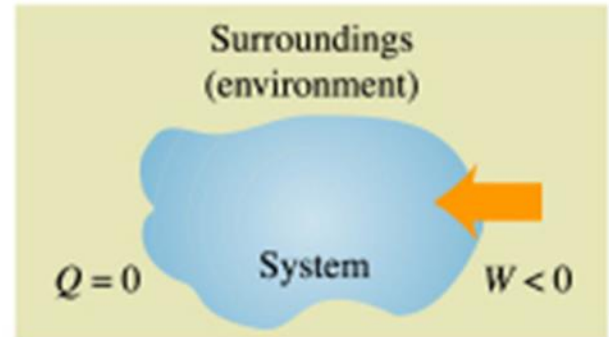
(a)



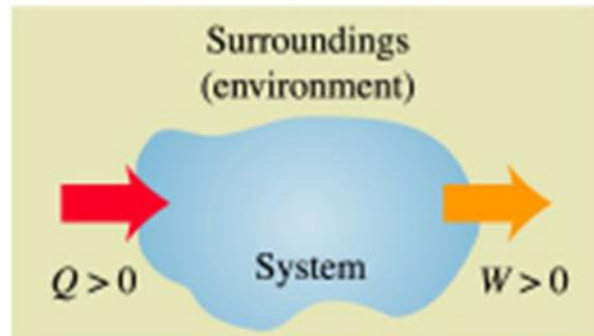
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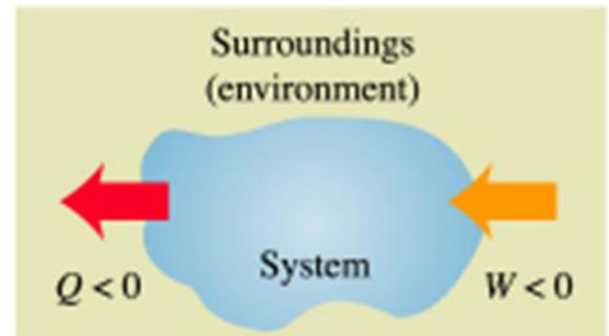
(c)



(d)



(e)



(f)