





## 1st Law-1

Sunday, 17 October, 2021 21:10

Lecturer: Mustafa Al-Zyout, Philadelphia University, Jordan.

-  R. A. Serway and J. W. Jewett, Jr., *Physics for Scientists and Engineers*, 9th Ed., CENGAGE Learning, 2014.
-  J. Walker, D. Halliday and R. Resnick, *Fundamentals of Physics*, 10th ed., WILEY, 2014.
-  H. D. Young and R. A. Freedman, *University Physics with Modern Physics*, 14th ed., PEARSON, 2016.
-  H. A. Radi and J. O. Rasmussen, *Principles of Physics For Scientists and Engineers*, 1st ed., SPRINGER, 2013.

- A gas at a pressure of  $2 \text{ atm}$  is heated and allowed to expand against a frictionless piston at constant pressure. If the volume changed by  $0.5 \text{ m}^3$ . How much work is done by the gas?
- If  $3 \times 10^5 \text{ J}$  of heat enters during the expansion, what is the change in the internal energy of the gas?

## 1st Law-2

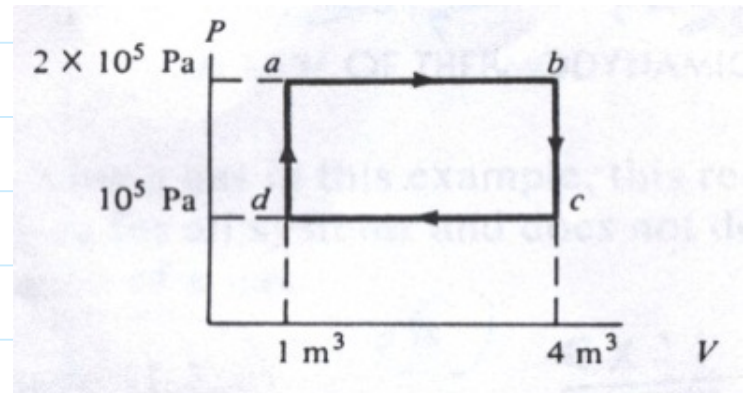
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A gas undergoes a series of pressure and volume changes as shown.





- How much work is done by the gas along the path abc?
- How much work is done by the gas along the path cda?
- How much heat enters the gas during one full cycle?



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Find the entropy changes of the system and of its surroundings for a reversible adiabatic process.

## 2nd Law-2

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- If  $3.33 \times 10^5 J$  of heat is removed from a kilogram of liquid water at  $0^\circ\text{C}$ , it will turn to ice.  
Suppose heat is reversibly withdrawn from  $10^{-2} kg$  of liquid water at  $0^\circ\text{C}$ , until it is entirely converted to an ice cube at the same temperature. What is the entropy change of the water?
- What is the net entropy change of the water and surroundings?

## 2nd Law-3

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Two large objects are isolated from their surroundings. They are at temperatures  $T_1$  and  $T_2$  with  $T_2 > T_1$  and are placed in thermal contact. A small quantity of heat  $Q$  is transferred, leaving their temperatures nearly unchanged. Find the entropy changes.