Science Virtual Learning

MPI Physics 240
Thermodynamics 16:
Work Done by a Gas, Part 2
May 13, 2020

Lesson: MPI Thermodynamics 15
Work Done by a Gas, Part 2
May 13, 2020

Objective: To be understand how a gas does work when it expands, and how to calculate the work if the temperature is constant or the container is insulated

This video discusses how a gas does work when expanding, and how to calculate it if the temperature remains constant during the expansion, or the container is insulated so there is no heat flow

https://youtu.be/YYfB442tvVE

Video: Work Done by a Gas, Part 2

Example Video:

1. A fish emits an air bubble of volume 1.00 mL at the bottom of a lake, where the pressure is 2.44 atm. As it rises, the pressure decreases, and the bubble expands, but the temperature of the water is constant. At the top, the pressure is 1.00 atm.
a) what is the final volume of the bubble at the top?
b) how much work did it do as it rose?

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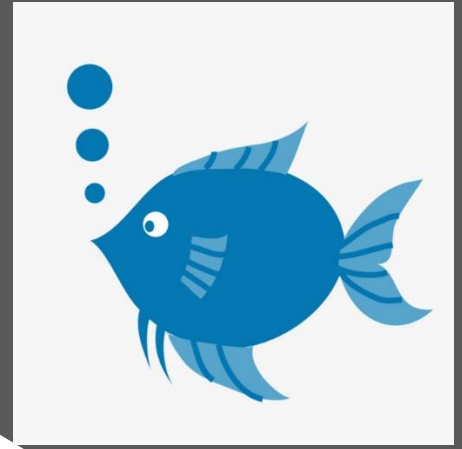
Example 1 from the Video

Example Video: https://youtu.be/0jIK_EHDpUk

During the power stroke of an internal combustion engine,
a piston starts with very hot gas (2500 °C) at a small
volume (0.200 L) and high pressure (68.0 atm), and
expands very rapidly to a volume of 2.00 L and pressure
2.70 atm. The expansion is so rapid that (almost) no heat
can pass through the piston walls.
a) How many moles of gas are in the piston?
b) What is the temperature after the expansion?
c) How much work does the gas do during the expansion?
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Example 2 from the Video

IV   EV

V_c TDC

V_d B

S

BDC

x   TDC
0°

270°   θ   90°

180°
BDC

x-engineer.org
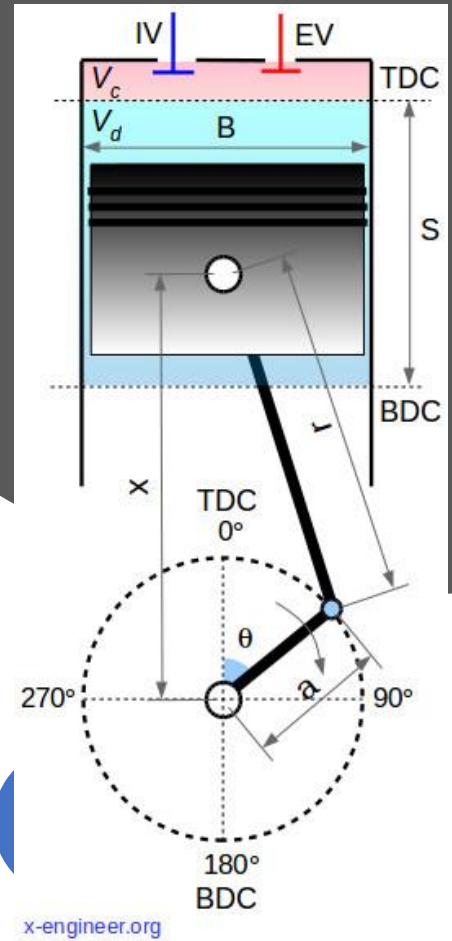
Homework 1

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/D9IwaT6loBs

An enclosed piston contains 0.252 moles of gas at 25.0°C. The piston is pulled outward slowly enough that the temperature of the gas inside always stays equalized with the outside temperature. The piston expands until it is twice its original volume. How much work was done by the gas?

Homework 2

- Try to solve the problems yourself, then watch the solution video:

- https://youtu.be/D9IwaT6loBs

During the compression stroke of an internal combustion engine, a piston starts with a large amount (2.00 L) of cool gas (30.0°C) at low pressure (1.00 atm). The piston then compresses the gas to a volume of 0.200 L and pressure of 25.1 atm.

a) How many moles of gas are in the piston?

b) What is the temperature after the compression?

c) How much (negative) work does the gas do during the compression?

That's it!