This print-out should have 12 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts. Work submitted after this time, but before the DUE DATE on top of this page, will be accepted but not graded.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

Expanding Gas 03

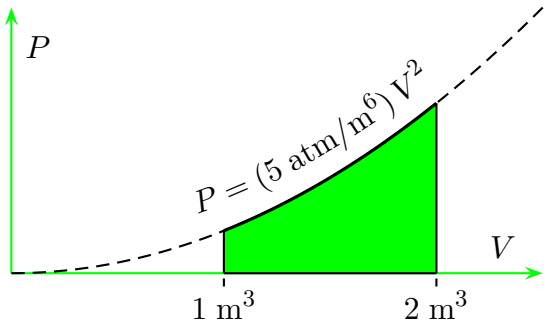
20:11, calculus, numeric, > 1 min, normal.

001

A sample of ideal gas is expanded to twice its original volume of 1 m^3 in a quasi-static process for which

$$P = \alpha V^2$$

with $\alpha = 5$ atm/m^6, $V_a = 1$ m^3 and $V_b = 2$ m^3, as shown in the figure.



How much work was done by the expanding gas? Answer in units of J.

Internal Energy Change 07

20:12, trigonometry, numeric, > 1 min, normal.

002

Given: latent heat of vaporization of water $= 2.26 \times 10^6$ J/kg.

2 cm^3 of water is boiled at atmospheric pressure to become 3342 cm^3 of steam, also at atmospheric pressure.

Calculate the work done by the gas during this process. Answer in units of J.

003

Find the amount of heat added to the water to accomplish this process. Answer in units of J.

004

Find the change in internal energy. Answer in units of J.

Isothermal compression

20:10, calculus, numeric, > 1 min, normal.

005

Given: $R = 8.31451$ J/K · mol.

Two moles of helium gas initially at 300 K and 0.4 atm are compressed isothermally to 1.2 atm.

Find the final volume of the gas. Assume the helium to behave as an ideal gas. Answer in units of m^3.

006

Find the work done by the gas. Answer in units of kJ.

007

Find the thermal energy transferred. Answer in units of kJ.

Internal Energy Change 05

20:12, trigonometry, numeric, > 1 min, normal.

008

An ideal gas initially at 300 K undergoes an isobaric expansion at 2.5 kPa.

If the volume increases from 1 m^3 to 3 m^3 and 12.5 kJ of thermal energy is transferred to the gas, find the change in its internal energy. Answer in units of kJ.

009

Find the final temperature of the gas. Answer in units of K.

Isothermal and Isobaric Work

20:12, calculus, numeric, > 1 min, normal.

010

One mole of an ideal gas is heated at constant pressure so that its temperature increases by a factor of 3. Then the gas is heated at constant temperature so that its volume increases by a factor of 3.

Find the ratio of the work done during the isothermal process to that done during the isobaric process.

Isothermal Expansion

20:09, trigonometry, numeric, > 1 min, normal.

011

One mole of an ideal gas does 3000 J of work on the surroundings as it expands isothermally to a final pressure of 1 atm and volume of 25 L.

Determine the initial volume.($R = 8.31451\ \mathrm{J/K \cdot mol}$.) Answer in units of L.

012

Determine the temperature of the gas. Answer in units of K.