

Quiz 2.1 – Internal energy

Name: _____

Ideal Gas Heat Capacities

○ Give the constant volume heat capacities (in the low temperature limit) for perfect gases with the following geometries:

1. Monoatomic
2. Linear Diatomic
3. Non-linear Polyatomic

○ Describe qualitatively what would happen to these heat capacities in the high temperature limit and why

○ Explain why we must designate constant pressure or constant volume for heat capacities

○ Predict qualitatively how C_V might compare to C_p for a gas at a given temperature

Work

One mole of gas at 34°C undergoes a reversible isothermal expansion in two stages:

1. From 5.0 L to 7.5 L
 2. From 7.5 L to 10.0 L
- Find the work (w_{sys}) at each stage
 - Explain why the work done is not equal, even though the volume changes are the same
 - The gas then undergoes a reversible isothermal compression where $w_{sys} = 5500\text{ J}$. What is the final volume?

Heat

- 10.0 g of He gas at 20.0°C are heated by 315 J at constant volume. What is the final temperature of the gas?
- 10.0 g of N_2 gas at 20.0°C are heated by 315 J at constant volume. What is the final temperature of the gas?
- Find the heat (q_{sys}) required to cool 10.0 g of methane gas by 5°C at constant volume

Птичка (A Little Bird)

Ву Александр Сергеевич Пушкин (Alexander Sergeyevich Pushkin)

В чужбине свято наблюдаю
Родной обычай старины:
На волю птичку выпускаю
При светлом празднике весны.

Я стал доступен утешенью;
За что на бога мне роптать,
Когда хоть одному творенью
Я мог свободу даровать!

In alien lands I keep the body
Of ancient native rites and things:
I gladly free a little birdie
At celebration of the spring.

I'm now free for consolation,
And thankful to almighty Lord:
At least, to one of his creations
I've given freedom in this world!