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 an 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 an isothermal compression where $w_{sys} = 5500\ J$. 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*)

By 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!