3 **(a)** **(i)** State what is meant by the *internal energy* of a system.

....

....

....

....[2]

(ii) Explain why, for an ideal gas, the change in internal energy is directly proportional to the change in thermodynamic temperature of the gas.

....

....

....

....

....[3]

(b) A cylinder of volume $1.8 \times 10^4 \, cm^3$ contains helium gas at pressure $6.4 \times 10^6 \, Pa$ and temperature 25 °C.
Helium gas may be considered to be an ideal gas consisting of single atoms.

Calculate the number of helium atoms in the cylinder.

number = ...[3]

[Total: 8]