

- 1 (a) State what is meant by the *internal energy* of an *ideal gas*.

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..... [2]

- (b) A fixed mass of an ideal monatomic gas has a volume of $2.0 \times 10^{-2} \text{ m}^3$ at a pressure $1.0 \times 10^5 \text{ Pa}$.

- (i) To determine the specific heat capacity of the gas at constant volume, the gas is heated so that its pressure increases to $1.5 \times 10^5 \text{ Pa}$ without any change in volume.

1. Show that the heat supplied to the gas is 1500 J.

[1]

2. Determine the increase in temperature of the gas if the average translational kinetic energy of a gas molecule is $6.2 \times 10^{-21} \text{ J}$ just before the gas is heated.

increase in temperature = °C [3]

- (ii) To determine the specific heat capacity of the gas at constant pressure, the gas is heated from its initial state without any change in pressure.

State the first law of thermodynamics and use it to explain why the specific heat capacity of the ideal gas determined at constant volume is different to the specific heat capacity when determined at constant pressure.

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