

2 (a) The equation

$$pV = \text{constant} \times T$$

relates the pressure p and volume V of a gas to its kelvin (thermodynamic) temperature T .

State two conditions for the equation to be valid.

1.

.....

2.

..... [2]

- (b) A gas cylinder contains $4.00 \times 10^4 \text{ cm}^3$ of hydrogen at a pressure of $2.50 \times 10^7 \text{ Pa}$ and a temperature of 290 K.

The cylinder is to be used to fill balloons. Each balloon, when filled, contains $7.24 \times 10^3 \text{ cm}^3$ of hydrogen at a pressure of $1.85 \times 10^5 \text{ Pa}$ and a temperature of 290 K.

Calculate, assuming that the hydrogen obeys the equation in (a),

- (i) the total amount of hydrogen in the cylinder,

amount = mol [3]

- (ii) the number of balloons that can be filled from the cylinder.