

- 2 (a) The first law of thermodynamics may be expressed as

$$\Delta U = (+q) + (+w)$$

where ΔU is the increase in internal energy of the system.

State the meaning of:

$+q$

.....

$+w$

.....

[2]

- (b) The variation with pressure p of the volume V of a fixed mass of an ideal gas is shown in Fig. 2.1.

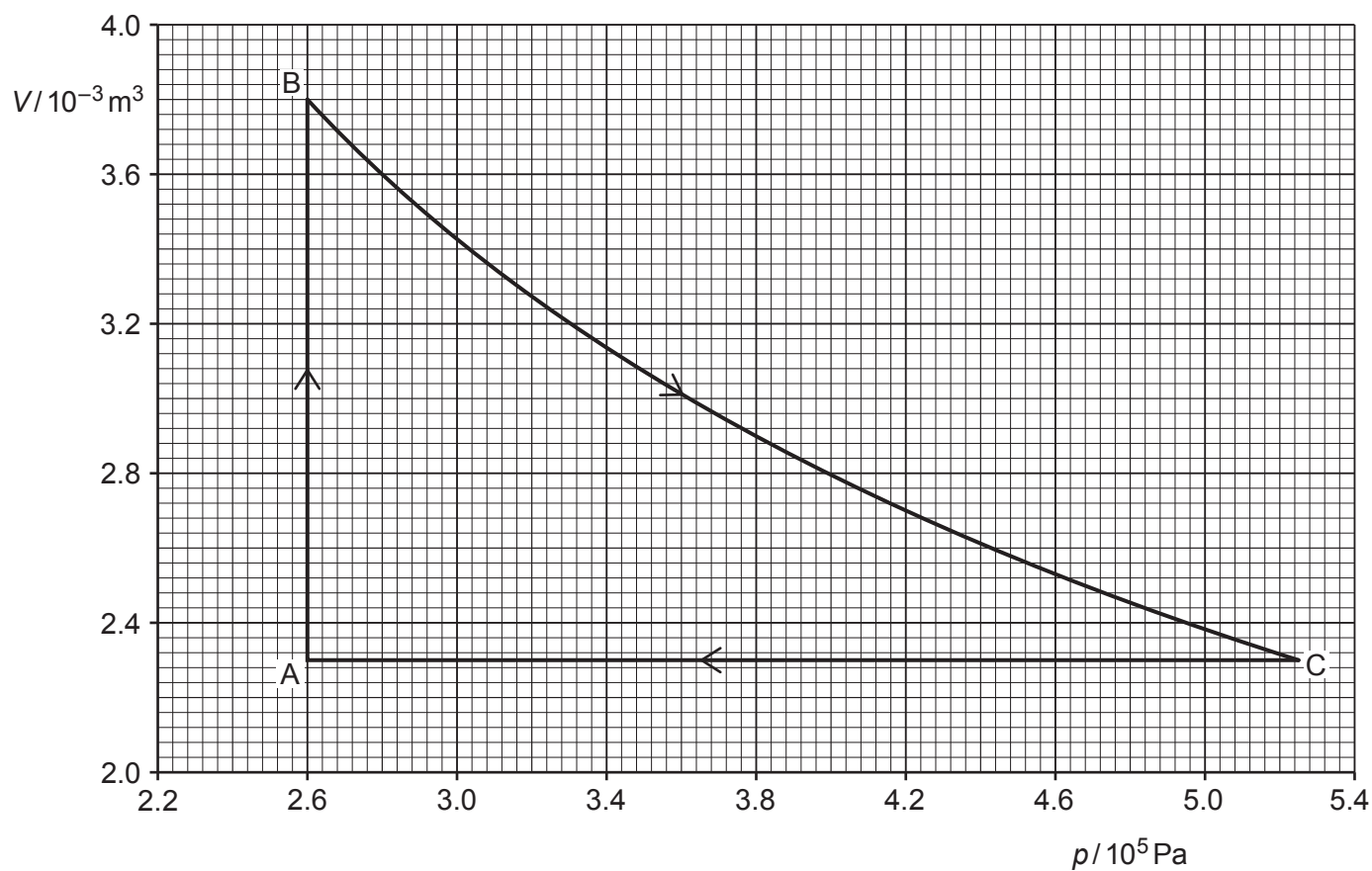


Fig. 2.1

The gas undergoes a cycle of changes A to B to C to A.

During the change A to B, the volume of the gas increases from $2.3 \times 10^{-3} \text{ m}^3$ to $3.8 \times 10^{-3} \text{ m}^3$.

(i) Show that the magnitude of the work done during the change A to B is 390 J.

[1]

(ii) State and explain the total change, if any, in the internal energy of the gas during one complete cycle.

.....

.....

..... [2]

(c) During the change A to B, 1370 J of thermal energy is transferred to the gas.

During the change B to C, no thermal energy enters or leaves the gas. The work done on the gas during this change is 550 J.

Use these data and the information in (b) to complete Table 2.1.

Table 2.1

change	q/J	w/J	$\Delta U/\text{J}$
A to B
B to C
C to A

[4]