2 In a particular combustion engine, a fixed amount of ideal gas undergoes a cycle of four stages as shown in Fig. 2.1.

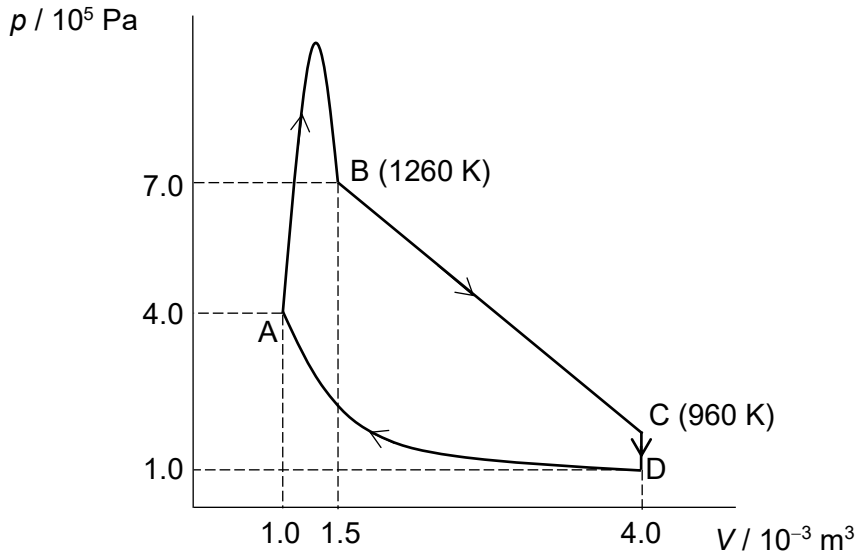

Fig. 2.1

Some values for the pressure p and volume V of the gas at the various states are labelled in the figure.

The four stages of the cycle are:

A → B: the gas gains 2625 J of heat through an explosion and the pressure rises rapidly before decreasing to 7.0×10^5 Pa at state B

B → C: the gas expands to state C

C → D: the gas cools to state D at constant volume

D → A: the gas is compressed at constant temperature to state A.

(a) The temperatures of the gas at states B and C are 1260 K and 960 K respectively.

(i) Determine the pressure of the gas at state C.

pressure = ... Pa [2]

(ii) Hence, determine the magnitude of the work done by the gas in the stage B → C.

work done = ... J [2]

(b) The stage D → A is compression at constant temperature.

State **two** conditions under which the process in the engine is carried out such that it may be considered to be a constant temperature process.

1. .....

.....

2. .....

..... [2]

(c) Some energy changes during one cycle of the engine are shown in Fig. 2.2.

Complete Fig. 2.2.

stage	work done on gas / J	heat supplied to gas / J	increase in internal energy / J
A → B	−1000	2625	
B → C		500	

C → D			
D → A		–555	

Fig. 2.2

[3]

(d) In Fig. 2.1, the stage A → B is represented by a curve.

Explain why it may not be appropriate to represent the process with a curve on the graph.

.....

..... [1]