2 A fixed mass of an ideal gas has a volume V and a pressure p.

The gas undergoes a cycle of changes, X to Y to Z to X, as shown in Fig. 2.1.

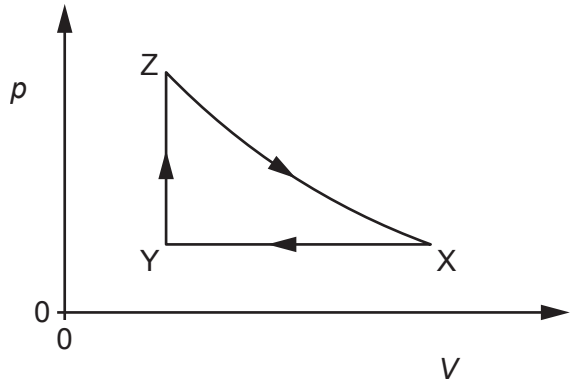

Fig. 2.1

Table 2.1 shows data for p, V and temperature T for the gas at points X, Y and Z.

Table 2.1

	$p / 10^5$ Pa	$V / 10^{-3}$ m^3	T/K
X	1.5	4.2	540
Y			230
Z	5.1		782

(a) State the change in internal energy ΔU for one complete cycle, XYZX.

ΔU = ... J [1]

(b) Calculate the amount n of gas.

n = ... mol [2]

(c) Complete Table 2.1.
Use the space below for any working.

[2]

(d) **(i)** The first law of thermodynamics for a system may be represented by the equation

$$\Delta U = q + W.$$

State, with reference to the system, what is meant by:

ΔU: .....

q: .....

W: .....
[3]

(ii) Explain how the first law of thermodynamics applies to the change Z to X.

.....

.....

.....

..... [2]

[Total: 10]