For Examiner's Use

3 **(a)** State the *first law of thermodynamics*.

……..

……

……..

…… [2]

(b) Use the first law of thermodynamics to calculate the gain in internal energy when 5.0 kg of water at 100 °C is transformed into 5.0 kg of steam at 100 °C at a constant pressure of 1.01×10^5 Pa.

density of steam = 0.598 kg m^{-3}
density of water = 1000 kg m^{-3}
specific latent heat of vaporisation of water = 2.26×10^6 J kg^{-1}

gain in internal energy = …… J [4]

For Examiner's Use

(c) A fixed mass of ideal gas undergoes a cycle of changes as shown in Fig. 3.1. No thermal energy was transferred during the processes from A to B and C to D.

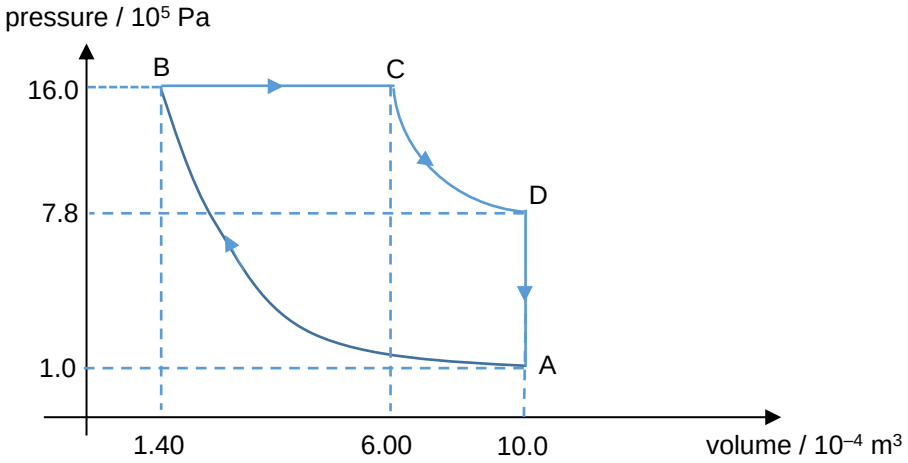

Fig 3.1

(i) State and explain whether the gas is at a higher temperature at C or D.

……

……

……

…… [2]

(ii) Fig. 3.2 shows the energy changes during one complete cycle. Complete the table.

Section of cycle	heat supplied to gas / J	work done on gas / J	increase in internal energy of gas / J
A to B			300
B to C		−740	1840
C to D			
D to A	−1700		

Fig. 3.2

[4]

[Total: 12]