7 **(a)** **(i)** Define the *specific latent heat* of a body.

……

……………………………………………………………………………………………………….[1]

(ii) Hence, explain why the specific latent heat of vaporisation is greater than the specific latent heat of fusion.

……

……

……………………………………………………………………………………………………….[2]

(iii) A cup contains 250 g of water at a temperature of 85°C. A student placed five ice cubes, at – 7.0 °C, of mass 5.0 g each, into the water.

The following information is given:

latent heat of fusion of ice = 334 000 J kg^{-1}

specific heat capacity of ice = 2100 J kg^{-1} K^{-1}

specific heat capacity of water = 4200 J kg^{-1} K^{-1}

1. Calculate the final temperature of the water when all the ice has melted.

final temperature = ………………….. °C [3]

2. State two assumptions that you have made in your calculations.

……

……

………………………………………………………………………………………………………[2]

(b) **(i)** State the *first law of thermodynamics*.

……

……

………………………………………………………………………………………………………[2]

(ii) 2.0 moles of an ideal gas is subjected to various changes of pressure *p*, volume *V* and temperature *T* through a cycle ABCDA. The states A, B, C, and D of the gas are shown in Fig. 7.1.

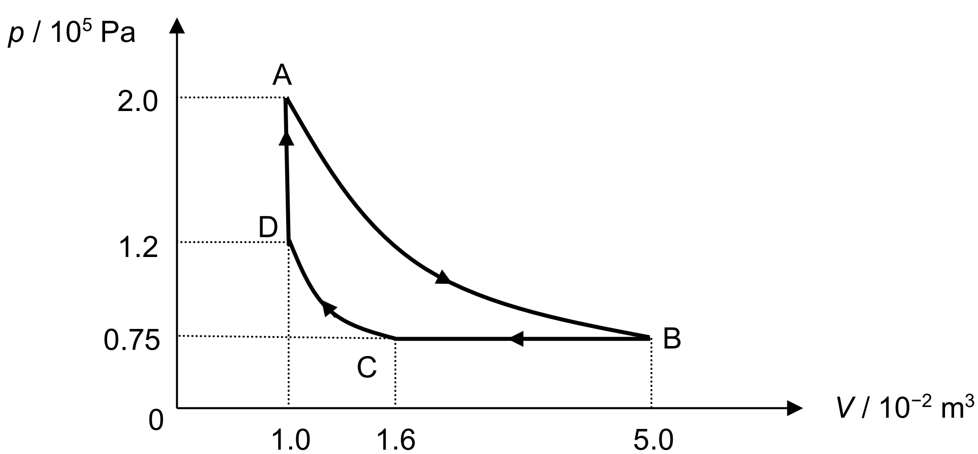

Fig. 7.1

1. Calculate the work done on gas from state B to C.

work done = ………………….. kJ [2]

2. Complete the table in Fig. 7.2, using your answer in **(b) (ii) 1**. [4]

You can make use of the spaces in the following page for your rough workings.

Change in state	Process	Work done on gas / kJ	Heat supplied to gas / kJ	Increase in internal energy of gas / kJ
A to B	Adiabatic		0	
B to C	Isobaric		– 4.83	
C to D	Isothermal	0.43		
D to A	Isovolumetric		7.44	

Fig. 7.2

Space provided to do rough workings.

3. Determine the net work done on the gas of the cycle ABCDA.

net work done = ………………….. kJ [2]

4. Hence, calculate the efficiency ε of this cycle where ε is defined as

$$\varepsilon = \frac{\text{net work done by gas}}{\text{heat supplied to gas in process D to A}} \times 100\%.$$

ε = …………………..% [2]

[Total: 20]