7 (a) At the triple point of water, the three states of water (ice, water and water vapour) coexist in stable equilibrium. The triple point of water is 273.16 K.

Compare the average kinetic energy of the molecules in ice and water at the triple point of water.

....

....

....

.... [2]

(b) Fig. 7.1 shows an experiment to determine the latent heat of fusion of ice. For setup A, a 12.0 W heater was turned on while for setup B, a control setup, the heater was not turned on. The heaters used in setup A and setup B are identical heaters.

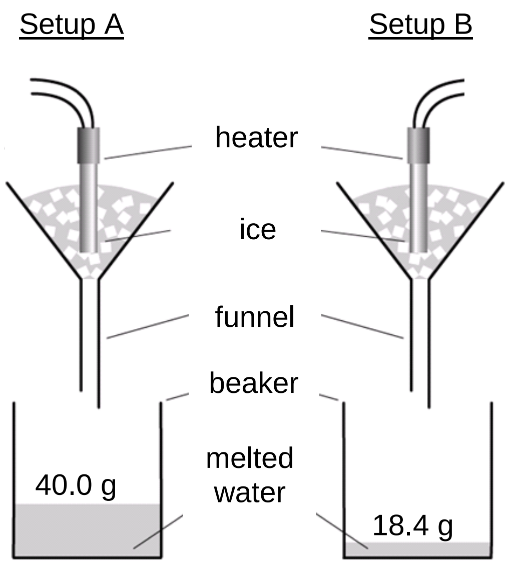

Fig. 7.1

(i) Explain why control setup B is needed.

....

.... [1]

(ii) The ice was allowed to melt for 10 minutes and the mass of the water collected from each funnel is shown in Fig. 7.1. Calculate the specific latent heat of fusion of ice.

specific latent heat of fusion of ice = ... J kg^{-1} [2]

(c) Fig 7.2 shows 2 containers, A and B, connected by a tube of negligible volume with a valve installed. Container A is filled with 0.200 mol of ideal gas while there is a vacuum in container B. The valve is closed.

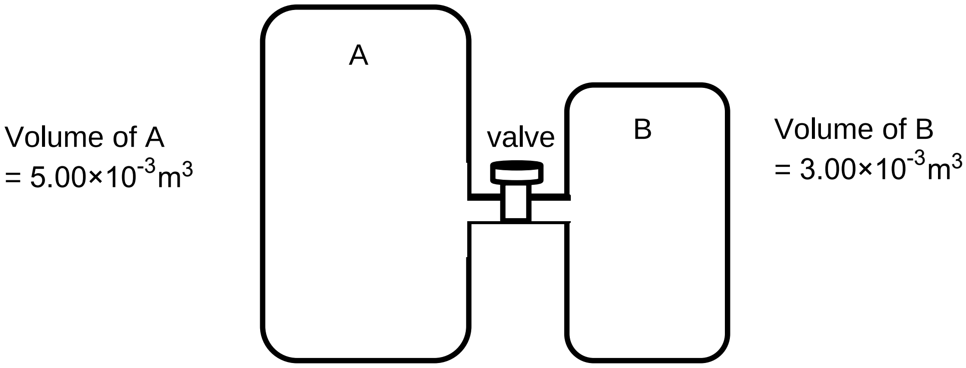

Fig. 7.2

(i) Given that both containers are kept at 27 ℃, calculate the pressure of the ideal gas in container A.

pressure = ... Pa [1]

(ii) Calculate the pressure and the amount of ideal gas in the container B when the valve is opened assuming that the temperature remains constant and the gas reaches an equilibrium state.

pressure = ... Pa

amount of ideal gas = ... mol [2]

(iii) Container B is now heated to 100 ℃ while container A is kept at 27 ℃. Calculate the pressure in container B with the valve remaining open.

pressure = ... Pa [2]

(d) A fixed mass of ideal gas is made to undergo the following processes as shown in Fig. 7.3 below:

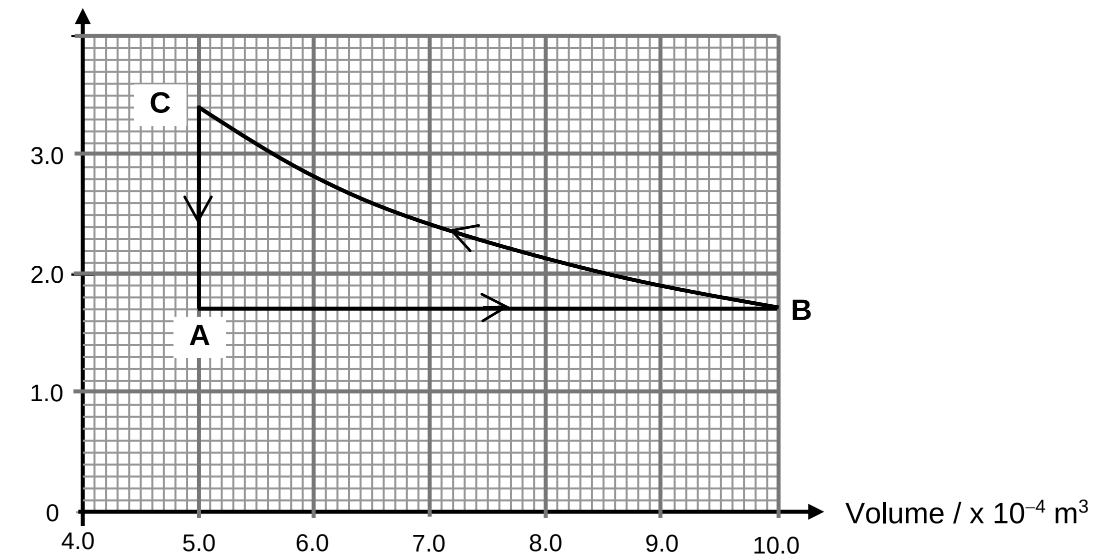

Fig. 7.3

(i) Use the data from Fig. 7.3 to confirm that process BC is isothermal. Show your working clearly.

[3]

(ii) State and explain how you would attempt to ensure experimentally that the process BC is isothermal.

....

....

....

....

.... [2]

(iii) The temperature of the gas at C is 385 K. Calculate the temperature of the gas at A.

temperature at A = ... K [2]

(iv) During the process A to B, 213 J of energy is supplied by heating the gas. Use the First Law of Thermodynamics to calculate the increase in internal energy of the gas for process A to B.

increase in internal energy = ... J [3]

[Total: 20]