

An R 22 refrigeration cycle (shown on the following page) is used to provide 35 kW of cooling at  $-20^{\circ}\text{C}$ . R 22 leaves the water-cooled condenser  $3^{\circ}\text{C}$  subcooled. The condensing temperature is  $25^{\circ}\text{C}$  and the temperature in the flash tank is  $0^{\circ}\text{C}$ . A portion of the flow from the condenser is cooled in the flash tank to  $10^{\circ}\text{C}$  before going through the expansion valve to the evaporator. The vapour leaves the evaporator  $5^{\circ}\text{C}$  superheated.

Both compressors have an adiabatic efficiency of 88 % and a volumetric efficiency of 73 %.

- Show the cycle on a large p-h diagram, writing in all enthalpy values as they are read off the tables or calculated.
- Calculate the power requirement of each compressor and subsequently the coefficient of performance of the cycle.
- Calculate the displacement rate in liters per second of **only** the low stage compressor.

Consider all pipeflow to be frictionless and adiabatic

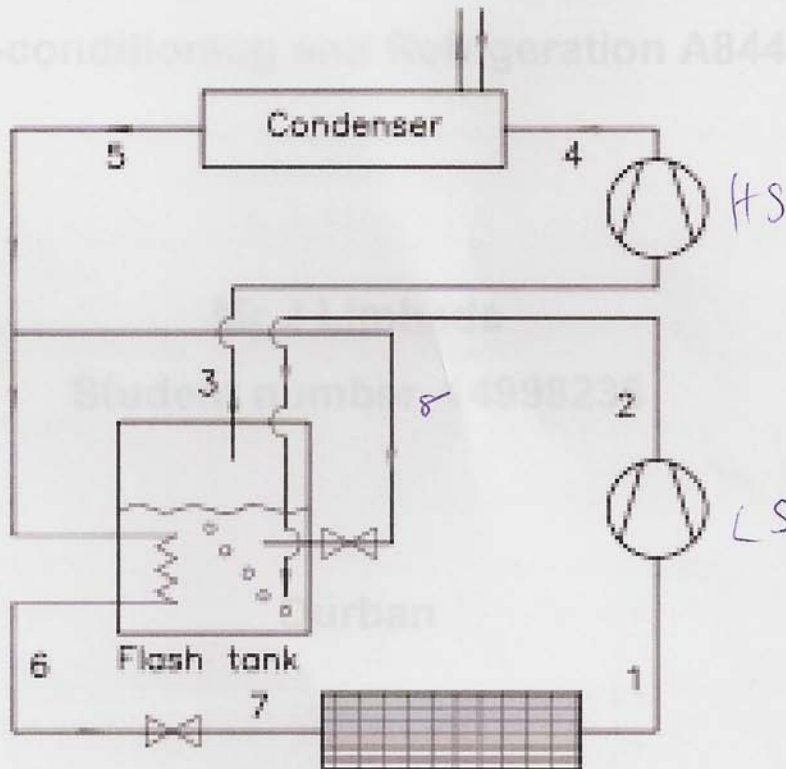


Figure 4 (Question 5)