10 **(a)** **(i)** Clearly distinguish between temperature and heat.

.....

.....

..... [2]

(ii) Explain why a piece of metal at room temperature feels cool to the touch while a piece of wood at room temperature does not.

.....

.....

..... [2]

(b) A student carries out an experiment to determine the specific latent heat of vaporisation of a liquid.

Some liquid in a beaker is heated electrically as shown in Fig. 10.1.

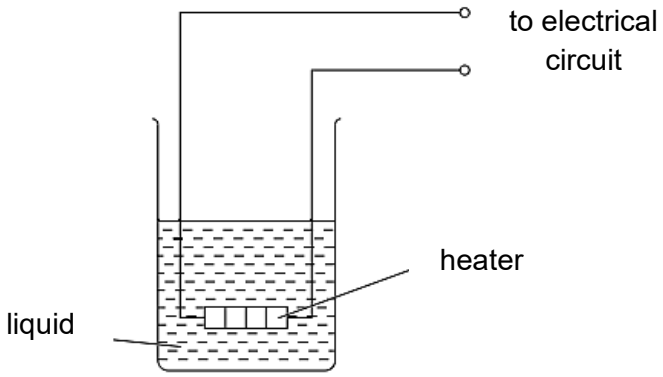

Fig. 10.1

Energy is supplied at a constant rate to the heater. When the liquid is boiling at a constant rate, the mass of liquid evaporated in 5.0 minutes is measured.
The power of the heater is then changed and the procedure is repeated.
Data for the two power ratings are given in Fig. 10.2.

power of heater / W	mass evaporated in 5.0 minutes / g
50.0	6.5

70.0	13.6

Fig. 10.2

(i) Suggest

1. how it may be checked that the liquid is boiling at a constant rate,

.....

..... [1]

2. why the rate of evaporation is determined for two different power ratings.

.....

..... [1]

(ii) Calculate the specific latent heat of vaporisation of the liquid.

specific latent heat of vaporisation = ... $J\ g^{-1}$ [3]

(c) **(i)** State what is meant by an *ideal gas*.

.....

..... [1]

(ii) State what is meant by the *internal energy* of an ideal gas.

.....

..... [1]

(iii) Two thermally insulated vessels are connected by a narrow tube fitted with a valve that is initially closed. One vessel, of volume $16.8 \times 10^3\,\text{cm}^3$, contains an ideal gas at a temperature of 300 K and a pressure of $1.75 \times 10^5\,\text{Pa}$. The other vessel, of volume $22.4 \times 10^3\,\text{cm}^3$, contains the same ideal gas at a temperature of 450 K and a pressure of $2.25 \times 10^5\,\text{Pa}$.

When the valve is opened, the gases in the two vessels mix, and the temperature and pressure become uniform throughout.

1. Show that the final temperature of the gases is 380 K.

[2]

2. Determine the final pressure of the gases.

pressure = ... Pa [2]

(d) A fixed mass of an ideal gas undergoes a cycle PQRP of changes as shown in Fig. 10.3.

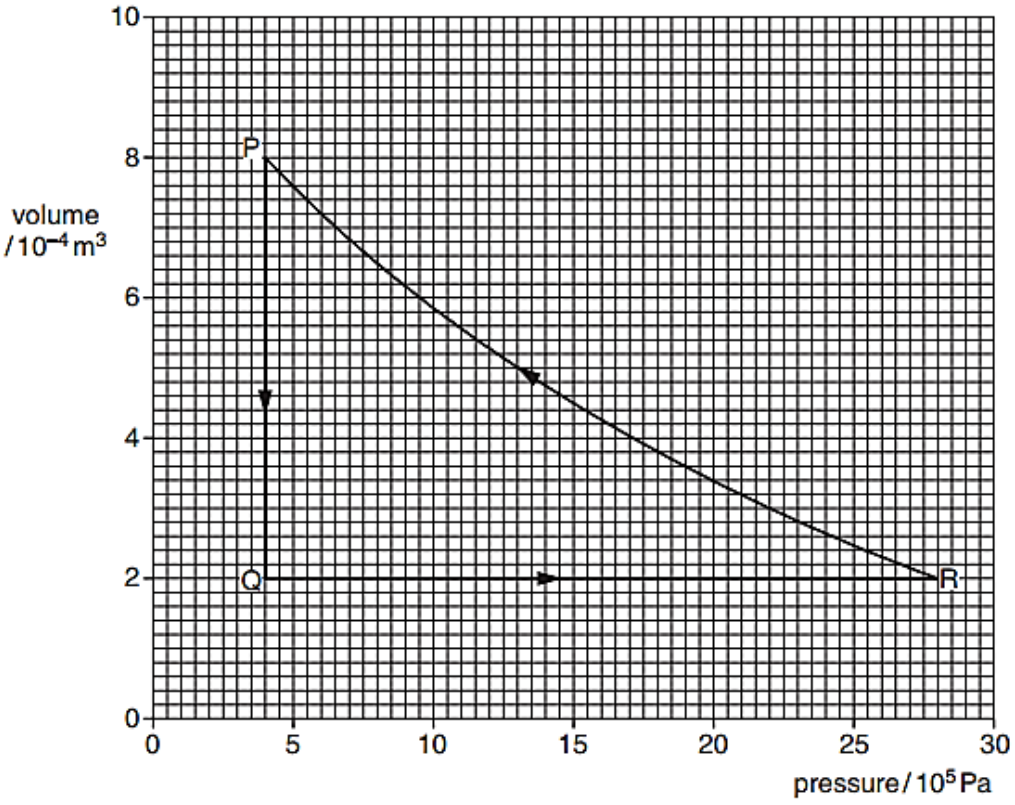

Fig. 10.3

(i) State the change in internal energy of the gas during one complete cycle PQRP.

change in internal energy = ... J [1]

(ii) Calculate the work done on the gas during the change from P to Q.

work done = ... J [2]

(iii) Some energy changes during the cycle PQRP are shown in Fig. 10.4.

change	work done on gas / J	heating supplied to gas / J	increase in internal energy / J
P → Q	.....	− 600	.....
Q → R	0	720	.....
R → P	.....	480	.....

Fig. 10.4

Complete Fig. 10.4 to show all of the energy changes. [2]