3 **(a)** Define specific heat capacity.

.....

.....

..... [2]

(b) A block of aluminium has a volume of $3.612 \times 10^{-3}\,m^3$ at a temperature of 0 °C.

Aluminium has a density of $2.700 \times 10^{3}\,kg\,m^{-3}$ at 0 °C.
It has a density of $2.620 \times 10^{3}\,kg\,m^{-3}$ at 500 °C.

The block is heated so that its temperature increases from 0 °C to 500 °C at an atmospheric pressure of $1.01 \times 10^{5}\,Pa$.
The increase in internal energy of the block is 4.38 MJ.

(i) Calculate the mass of the block.

mass = ... kg [2]

(ii) Show that the volume of the block at a temperature of 500 °C is $3.722 \times 10^{-3}\,m^3$.

[1]

(iii) Use the information in **(b)(ii)** to determine the magnitude of the work done on the block when its temperature is raised from 0 °C to 500 °C.

work done = ... J [2]

(iv) Explain whether the work done on the block is positive or negative.

.....

.....

..... [2]

(v) Use the first law of thermodynamics to determine, to three significant figures, a value for the specific heat capacity of aluminium. Explain your reasoning. Give a unit with your answer.

specific heat capacity = ... unit ..... [3]

(c) Without further calculation, suggest with a reason how doubling the pressure in **(b)** is likely to affect the answer in **(b)(v)**.

.....

.....

..... [1]

[Total: 13]