# Exam 2019

A Carnot engine operated between two heat baths with temperatures of 300 °C and 500 °C. The work done by the engine was 3 kJ.

(a) How much heat was extracted from the hotter bath? (2)

(b) How much heat was transferred into the cooler bath? (2)

(c) What is the efficiency of the engine? (2)

a) $300^{\circ}C \rightarrow 4$

$Q_1 = Q_2 - W$

$= 5J3 - 3 \times 10^3 = 2J3 \ J$

b) $Q_1 - Q_2 = -W$

$= -300 \ J$

c) $\eta = 1 - \frac{|Q_2|}{Q_1}$

$$= 1 - \frac{533}{233}$$

$$\simeq 0.4 \text{ish}$$

a) $\frac{Q_1}{Q_2} = \frac{T_1}{T_2}$

$Q_1 = W + Q_2 = W + \frac{Q_1 T_2}{T_1}$

$Q_1 \left(1 - \frac{T_2}{T_2}\right) = W$

$Q_1 = 11.5954 J$

recommend to draw system in the exam

b) $Q_2 = Q_1 - W = 8.5554 J$

c) $\eta = \frac{\text{work out}}{\text{heat in}}$

$= \frac{W_{out}}{Q_1} = 25.9\%$