

$$T_K = T_C + 273$$

An ideal engine's operating temperatures are 210°C and 45°C. In one cycle the engine's work output is 250 J . How much heat is output in one cycle?

SOLUTION

The efficiency of the engine is

$$e_{th} = 1 - \frac{T_L}{T_H} = 1 - \frac{45 + 273}{210 + 273} = 0.34$$

From the definition of efficiency:

$$e = \frac{W}{Q_H} \longrightarrow Q_H = \frac{W}{e} = \frac{250\text{J}}{.34} = 735 \text{ J}$$

Use the first to compute Q_L :

$$Q_L = Q_H - W = 735 \text{ J} - 250 \text{ J} = \boxed{485 \text{ J}}$$