Phys102 (Sec # ~~41~~) Quiz # 5 (Ch.20)

Name: Key ID #

1- A 3.50-mole sample of an ideal monatomic gas was initially at a temperature of $27^{\circ}C$. The gas is compressed isobarically to half of its original volume, what is the change of entropy of the gas?

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$$\Delta S = nR \ln \frac{V_f}{V_i} + n C_v \ln \frac{T_f}{T_i}$$

$$\Delta S = (3.5)(8.31) \ln \frac{1}{2} + 3.5 \left(\frac{3}{2} \times 8.31\right) \ln \frac{150}{300}$$

$$= \boxed{-50.4 \ \frac{J}{K}}$$

$T_i = 27 + 273 = 300 \ K$

$T_f = ?$

$$\frac{T_i}{V_i} = \frac{T_f}{V_f}$$

$$\frac{300}{V_i} = \frac{T_f}{\frac{1}{2}V_i} \Rightarrow T_f = 150 \ K$$

2- A car engine delivers 8000 J of work per cycle. If its efficiency is 25%, find the energy lost by the engine per cycle.

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$$\varepsilon = \frac{|W|}{|Q_H|} \Rightarrow 0.25 = \frac{8000}{|Q_H|}$$

$$|Q_H| = \frac{8000}{0.25} = 32 \ kJ$$

$$|Q_L| = |Q_H| - W = 32\,000 - 8000 = \boxed{24 \ kJ}$$