

Jawaban Tugas Hukum Termodinamika

1. diketahui :  $Q = 1000 \text{ Joule}$   
 $W = -2500 \text{ Joule}$

Jwb :  $U = Q - W$   
 $U = 1000 + 2500 = 3500 \text{ Joule}$

2. diket :  $V = 3 \text{ liter}$   
 $T_1 = 27^\circ \text{C} = 300 \text{ K}$   
 $P = 1 \text{ atm} = 10^5 \text{ N/m}^2$   
 $T_2 = 227^\circ \text{C} = 500 \text{ K}$

Jwb :  $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_2 = \frac{V_1}{T_1} \cdot T_2$$

$$V_2 = \frac{3}{300} \cdot 500$$

$$V_2 = 5 \text{ liter} = 5 \text{ dm}^3 = 5 \times 10^{-3} \text{ m}^3$$

$$W = P \cdot \Delta V$$

$$W = 10^5 \cdot (V_2 - V_1)$$

$$W = 10^5 \cdot (5 \times 10^{-3} - 3 \times 10^{-3})$$

$$W = 10^5 \cdot 2 \times 10^{-3}$$

$$W = \underline{2 \times 10^2 \text{ Joule}}$$

3. diket :  $Q_1 = 2000 \text{ J}$   
 $Q_2 = 1200 \text{ J}$

ditanya :  $\eta = \dots ?$

Konsep :  $\eta = \frac{W}{Q_1}$

$$\eta = 1 - \frac{Q_2}{Q_1}$$

$$\eta = 1 - \frac{T_2}{T_1}$$

$$\text{Jwb: } \eta = 1 - \frac{Q_2}{Q_1}$$

$$\eta = 1 - \frac{1.200}{2000}$$

$$\eta = 1 - 0,6$$

$$\eta = 0,4$$

$$\eta = 40\%$$

4. diketahui :  $n = 3 \text{ mol}$

$$T = 27^\circ\text{C} = 300 \text{ K}$$

$$V_1 = 20 \text{ cm}^3 = 2 \times 10^{-5} \text{ m}^3$$

$$V_2 = 50 \text{ cm}^3 = 5 \times 10^{-5} \text{ m}^3$$

$$R = 8,314 \text{ J/mol K}$$

ditanya :  $W$ ?

$$\text{Jawab : } W = nRT \ln \left( \frac{V_2}{V_1} \right)$$

$$= 3 \times 8,314 \times 300 \times \ln \left( \frac{5 \times 10^{-5}}{2 \times 10^{-5}} \right)$$

$$= 7482,6 \times \ln \frac{5}{2}$$

$$= 6852,94 \text{ J}$$

$$\begin{aligned} 5. \quad T_2 &= T_2 \\ (1-n) T_r &= (1-n) T_1 \\ (1-70\%) T_1 &= (1-50\%) (900) \\ (1-0,7) T_1 &= (1-0,5) (900) \\ 0,3 T_1 &= (0,5) (900) \\ 0,3 T_1 &= 450 \\ T_1 &= \frac{450}{0,3} \\ T_1 &= 1,500 \text{ K} \\ T_1 &= 1227^\circ \text{C} \end{aligned}$$

$$6. \quad \text{diketahui : } T_t = 27^\circ \text{C} = 300 \text{ K} \\ C_p = 6,5$$

ditanya :  $T_r$  ?

$$\text{Jawab : } c_p \frac{T_r}{T_t - T_r}$$

$$6,5 = \frac{T_r}{300 - T_r}$$

$$6,5(300 - T_r) = T_r$$

$$1950 - 6,5 T_r = T_r$$

$$1950 = T_r - 6,5 T_r$$

$$1950 = 7,5 T_r$$

$$T_r = \frac{1950}{7,5}$$

$$= 260 \text{ K}$$

$$= (260 - 273)^\circ \text{C}$$

$$= -13^\circ \text{C}$$