

A. 35

t. 3-17)

MAAKAASU

$$H_m = 46 \text{ MJ/kg}$$

$$m = 12 \text{ kg}$$

a)

$$H_m = \frac{Q_m}{m}$$

missä Q = vapautuva lämpö H = lämpöarvo.

$$\text{eli } Q_m = H_m m$$

$$= 46 \text{ MJ/kg} \cdot 12 \text{ kg} = 552 \text{ MJ}$$

TURVE

$$H_T = 11 \text{ MJ/kg}$$

$$m = 12 \text{ kg}$$

$$Q_T = H_T m$$

$$= 11 \text{ MJ/kg} \cdot 12 \text{ kg} = 132 \text{ MJ}$$

Maakaasusta saadaan energiaa 420 MJ enemmän
eli n. 4,2-kertainen määrä turpeen verrattuna.

b)

$$H = 19 \text{ MJ/kg} \quad \text{ja} \quad m = 9.5 \text{ kg}$$

$$Q = H m$$

$$= 19 \text{ MJ/kg} \cdot 9.5 \text{ kg} = 180.5 \text{ MJ}$$

$$\approx \underline{\underline{180 \text{ MJ}}}$$

18 a) $Q = 48 \text{ kWh} = 48 \cdot 3,6 \text{ MJ} = 172,8 \text{ MJ}$
 $H = 18 \text{ MJ/kg}$

Koska $H = \frac{Q}{m}$ on $m = \frac{Q}{H}$

$$m = \frac{172,8 \text{ MJ}}{18 \text{ MJ/kg}} = \underline{\underline{9,6 \text{ kg}}}$$

b) $Q_{\text{tuotto}} = 172,8 \text{ MJ}$ $Q_{\text{otto}} = ??$

$$\eta = 0,80$$

$$\eta = \frac{Q_{\text{tuotto}}}{Q_{\text{otto}}} \quad \text{mistä} \quad Q_{\text{otto}} = \frac{Q_{\text{tuotto}}}{\eta}$$

$$\text{eli} \quad Q_{\text{otto}} = \frac{172,8 \text{ MJ}}{0,80} = 216 \text{ MJ}$$

Puuta tarvitaan ... $m = \frac{Q_{\text{tuotto}}}{H}$

$$= \frac{216 \text{ MJ}}{18 \text{ MJ/kg}} = \underline{\underline{12 \text{ kg}}}$$

19 a)

$$P_{\text{tuotto}} = 565 \text{ MW}$$

$$\eta = 44\%$$

$$H = 31 \text{ MJ/kg}$$

$$E_{\text{tuotto}} = P \cdot t$$

$$= 565 \cdot 10^6 \text{ W} \cdot 24 \cdot 60 \cdot 60 \text{ s} = 4,8816 \cdot 10^{13} \text{ J}$$

$$= 4,8816 \cdot 10^7 \cdot 10^6 \text{ J}$$

$$= 4,8816 \cdot 10^7 \text{ MJ}$$

$$E_{\text{otto}} = ??$$

koska

$$\eta = \frac{E_{\text{tuotto}}}{E_{\text{otto}}}$$

$$\text{on } E_{\text{otto}} = \frac{E_{\text{tuotto}}}{\eta}$$

$$E_{\text{otto}} = \frac{4,8816 \cdot 10^7 \text{ MJ}}{0,44} = 110945454,5 \text{ MJ}$$

$$\text{massa } m = \frac{Q}{H} = \frac{E_{\text{otto}}}{H}$$

$$= 3578885,63 \text{ kg} \approx 3600 \text{ tonnia}$$

$$b) \frac{3578,9}{40} = 89,47... \approx \underline{\underline{90}}$$

$$c) \frac{565 \text{ MW}}{3,5 \text{ MW}} = 161,4... \approx \underline{\underline{160}}$$