1. A geyser heats water flowing at the rate of 3.0 liters per minute from 27 °C to 77 °C. If the geyser operates on a gas burner, what is the rate of consumption of the fuel if its heat of combustion is 4.0×10^4 J/g?

Sol. Rate of flow of water is = 3.0 liter/min.
Initial temperature of water is = T_1 = 27°C
Final temperature of water is = T_2 = 77°C
∴ increase in temperature of water is given by = $\Delta T = T_2 - T_1 = 77 - 27 = 50°C$
Specific heat for water = c = 4.2 J g^{-1} $°C^{-1}$
Mass of water = m = 3.0 liter/min = 3000 g/min}
By using
$\Delta Q = mc\Delta T$
$= 3000 \times 4.2 \times 50$
$= 6.3 \times 10^5 J/\text{min}$
Heat of combustion of water = 4×10^4J/g
∴ Rate of consumption is given by $= \frac{6.3 \times 10^5}{4 \times 10^4}$ = 15.75 g/min