The circuit on the left is to be used as an inverter. For the transistor, $\mu C V T = 200 \Omega - 6$, $V_T = 1V$.

(6) What are $V_{OH}$ and $V_{OL}$?

- When $V_H = 0V$, $M_1$ is off, so $V_{OH} = 5V$.

- When $V_H = 5V$, assume $M_1$ is in Sat.

$$I_O = \frac{\mu C V T (V_{OH} - V_T) ^2}{2L} = 1 \times 10^{-4} (4) ^2 = 1.6 \text{ mA}$$

$$V_{Oh} = 5V - 62.5 \times 1.6 \times 10^{-3} = 4.9V$$

Check Sat. assumption: $V_{Oh} > V_{gs} - V_T$

$\geq 4.9V > 2.4V$

$\therefore M_1$ is in Sat. and $V_{Oh} = 4.9V$.

(6) What is the power consumption of the circuit for a 1 MHz, 50% duty cycle input?

$$P = I_O \cdot V_{DD} \cdot 0.5 = 1.6 \text{ mA} \cdot 5V \cdot 0.5 = 4 \text{ mW}$$

- Doesn't depend on frequency.

(6) Is this a good inverter?

- No, output logic levels are not sufficient to drive the input of the following gate. (Assuming an identical inverter).