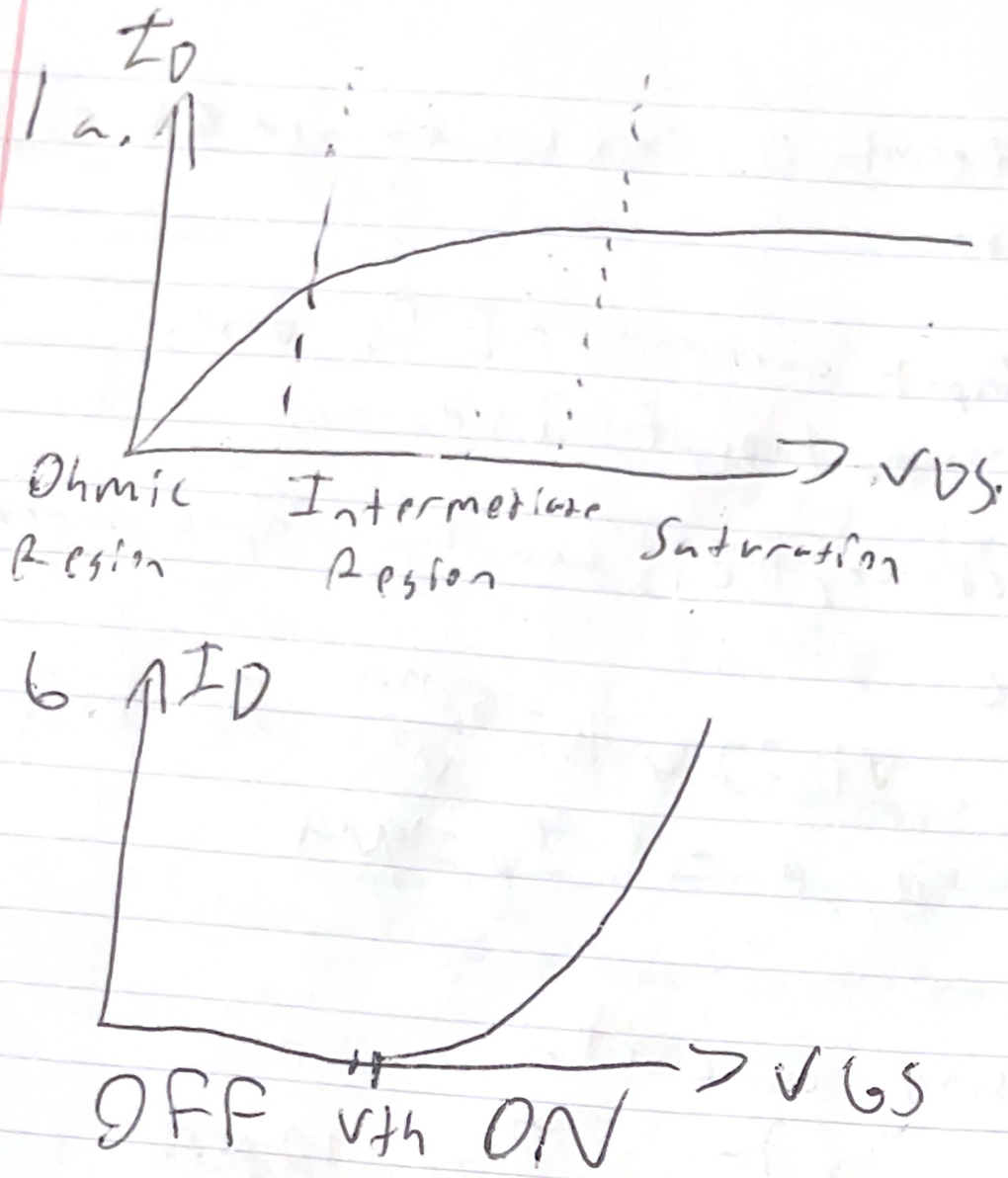


Ic $I_S = I_D$

Id The FET "turns on" allowing current through.

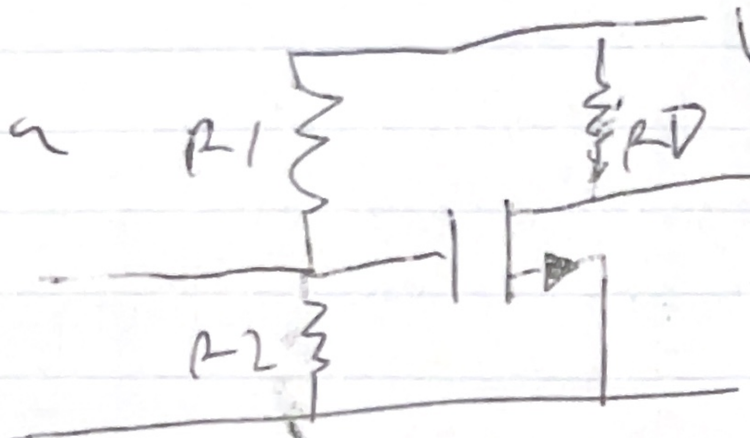
2a Essentially zero.

2b The input power of a FET is $V_{gate} * I_{gate}$. However, BJTs consume more power since I_S for FETs is essentially 0.

2c It takes less energy to run FETs, saving power is good.

2.d Both have three terminals; can be turned ON or OFF, and can amplify signals.

2.e BJTs require an input current, FETs dont.
BJTs have high power consumption, FETs dont.
BJTs have low input impedence, FETs have high input impedence.

3.a 

$V_{th}=2V$ $K=\frac{5mA}{V^2}$ $I_D=4mA$ $V_{CC}=10$

$R_1, R_2 = ?$ $I_{R_1}=10\mu A$

This is a FET biasing circuit.

$4mA = \frac{1}{2} \cdot 5mA \left(\frac{R_2}{R_1+R_2} \cdot 10 - 2\right)^2$ $I_{R_1}=10\mu A$

No input current so I_{R_1} and I_{R_2} must equal $10\mu A$

$10V = I_{R_1} \cdot R_1 + I_{R_2} \cdot R_2$ $10 = 10\mu A(R_1+R_2)$

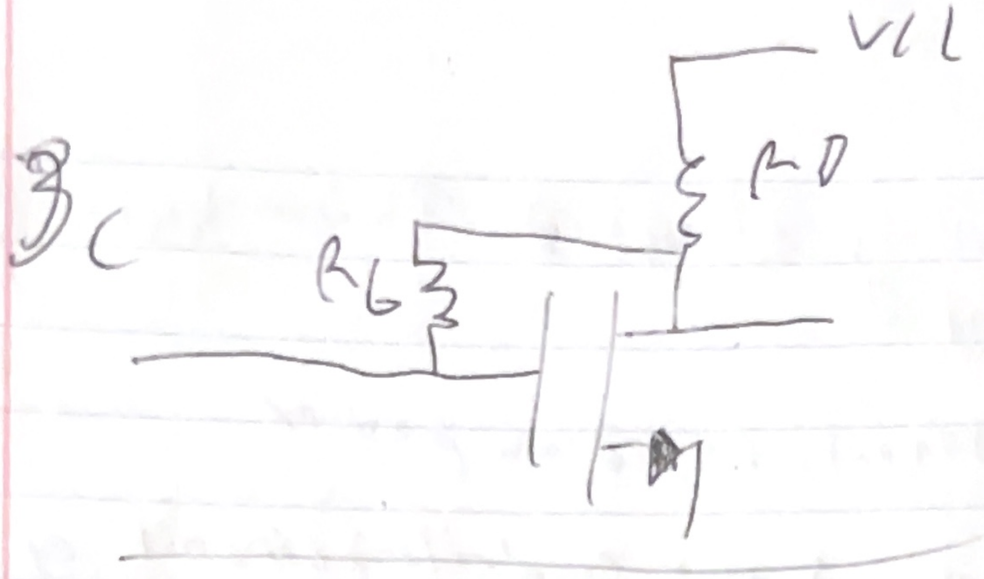
$R_1+R_2=1000000$ $\frac{R_2}{R_1+R_2} = 0.325$

$R_1 = 325k$
$R_2 = 675k$

3.b $V_{DS} = V_{CC} - I_D R_D$ $V_{DS} = 10 - R_D \cdot 4mA$

$\frac{V_{CC}}{2}$ roughly Q point so $V_{DS} = \frac{V_{CC}}{2}$

$5 = 10 - R_D \cdot 4mA$ $R_D = 1250\Omega$



$V_{th} = 2V$ $V_{CC} = 10$

$K = 5 mA/V^2$

$I_D = 4mA$

$R_D, R_G = ?$

this is also a FET biasing circuit.

$V_{GS} = V_{CL} - I_D R_D$ $I_D = \frac{1}{2} K (V_{GS} - V_{th})^2$

$V_{GS} = V_{DS}$ No voltage drop over R_G. Also no current through R_G. $R_G = ?$

$I_D = \frac{1}{2} K (V_{GS}^2 - V_{GS} V_{th} + V_{th})$

$$\frac{V_{GS} - V_{CC}}{-I_D} = R_D$$

$$\frac{V_{GS} - V_{CC}}{-\frac{1}{2} K (V_{GS}^2 - V_{GS} V_{th} + V_{th}^2)} = R_D$$

$V_{GS} = V_{CL} - I_D R_D$

$$\frac{V_{CL} - I_D R_D - V_{CL}}{-\frac{1}{2} K ((V_{CL} - I_D R_D)^2 - (V_{CL} - I_D R_D) V_{th} + V_{th})^2} = R_D$$

$R_L = R_D = P$

3d R_2 and R_1 acts as a voltage divider, dividing a variable amount of voltage reach the FET based on their resistances.

3e V_{GS} and V_{DS} are equal which allows for easier calculations to be done.

4a False. Gate current is almost 0. This makes the input power very small, but not 0

4b True. Other components can draw power

4c. False $I_S = I_D$ due to the controlled circuit of a FET.