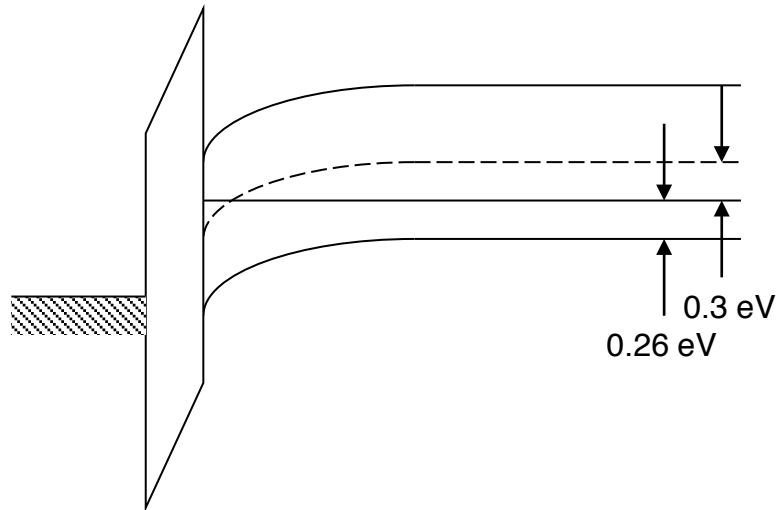


5. An MOS capacitor is biased at the threshold of inversion, as shown in the band diagram below. You may assume that no inversion layer charge is present, and that the structure is “ideal” as defined in class. (The sketch is not drawn exactly to scale. Do not attempt to answer the questions below by “measuring” the diagram.)



- A. What is the surface potential? **ABET-5 Question**  
(5 pts.)
- B. What is the substrate doping? (10 pts.)
- C. What is the width of the depleted region in the semiconductor? (10 pts.)
6. A silicon p-type MOS capacitor is maintained in the dark at room temperature. The substrate doping is  $1 \times 10^{17} \text{ cm}^{-3}$  and the oxide thickness is 20 nm. Assuming the sample is “ideal” (as discussed in class and in the text), calculate the threshold voltage.
- ABET-5 Question**  
(10 pts.)