1. Why is Si in the diamond structure an insulator? Why is molten Si a metal? Explain using molecular orbital and energy band diagrams.

2. Which elements would you choose to $n$-dope Si, and which would you choose to $p$-dope Si. Is La a good $n$-dopant? Is F a good $p$-dopant?

3. A cylindrical piece of copper has a diameter of 1 cm and a length of 5 cm. Its resistivity is $\rho$. This piece of copper is now extended so that it is 10 cm long. How does the resistance change, assuming that $\rho$ does not. Do you expect $\rho$ to change? Why?

4. Describe how the carrier concentration in semiconductors with different doping levels changes with temperature and explain the different regions in the plot.

5. Explain the principle of a MOSFET.