Question 1: Semiconductors

For an NPN transistor, sketch the collector current as a function of base current (assume base voltage is above emitter voltage).
Question 2: Asynchronous Serial Communication

In brief, describe how a receiver knows when data is valid on the data line.

Data is valid during some period indicated by the state of a clock. However, since there is no common clock, the two sides must rely on their own internal clocks. Before data can be exchanged, the two clocks must be synchronized. This is accomplished by the transmitter first sending some agreed upon pattern of bits (in RS232-C, this is a single start bit). Based on the transition from one bit to the next (different bit values), the receiver can infer the phase of the transmitter clock.

List two low-level mechanisms employed in asynchronous serial communication for verifying the validity of the incoming data.

1. We can include a parity bit in the data frame.

2. The stop bits tell the receiver when the frame should end.