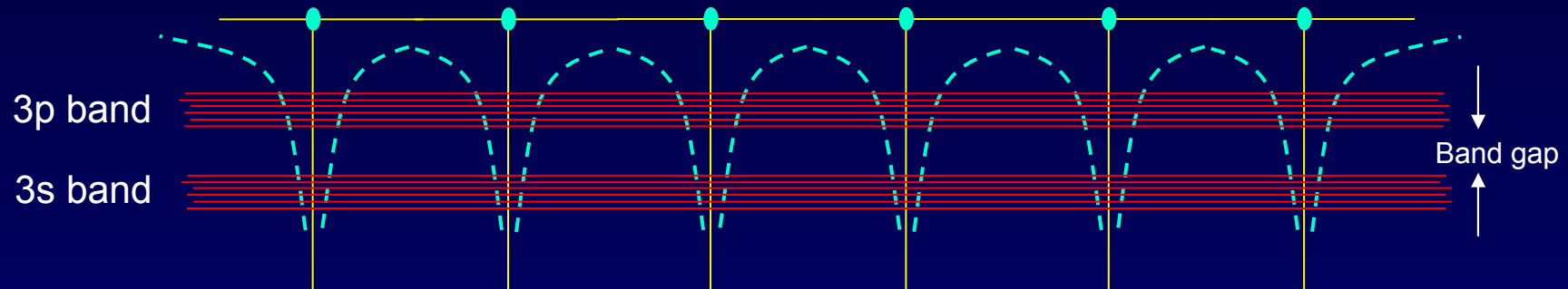


Solution



Consider a crystalline solid in which each atom contributes some electrons to the 3s band. Which situation can produce a conductor.

- a. Each atom contributes one 3s electron.
- b. Each atom contributes two 3s electrons.
- c. Each atom contributes three 3s electrons.

For N atoms, the band can hold $2N$ electrons (spin up and spin down). So:

- a) gives us a half-filled band (conductor).
- b) gives a full band (insulator).
- c) is not possible. An atom can only have two 3s electrons.