Key Stage 5
What is a semiconductor?

Student worksheet

I-V graphs

The digital age is built with electrical components called semiconductors. These are very important in electrical devices as their electrical properties can be changed. Silicon is the most popular material for a semiconductor, hence the naming of “Silicon Valley” where most of the world prominent technology companies operate in, in California.

Your task

1. Below is a graph of a wire, do you know what the axes should be?
2. What components are shown on the other four graphs?

This is only Key Stage 4 recap, so you will need to explain your reasoning here.

http://www.oxfordsparks.ox.ac.uk/content/soluble-semiconductors-revolution-printing-21st-century
Band theory

The *band theory* of conduction describes conductors as having two bands in which electrons can exist: valence band and conduction band. Electrons must be in one or the other.

Your task

1. Which has a larger band gap: a semiconductor or a conductor?
2. Why will temperature increase the number of electrons in the band gap of a semiconductor?
3. What technique alters the size of band gap in a semiconductor?
4. Why must an insulator have a large band gap?

*Bonus question:* What happens to the lattice ions when a conductor is cooled?

Semiconductors

Semiconductors are very important in electrical components, as their electrical properties can be changed.

Silicon is the most popular material for a semiconductor, hence the naming of “Silicon Valley” where most of the world prominent technology companies operate in, in California.

In the early years after the discovery of the LASER, many critics described it as a “solution in search of problem”, meaning they could not imagine a use of the LASER and that it was pointless. Is soluble semiconductors the same? Graphene, however, won its discoverers the Nobel Prize in physics in 2010 and is a type of semiconductor that has a zero band gap.

Your task

The research group at Oxford looks into creating a different kind of semiconductor called a soluble semiconductors.

1. Working in pairs, judge the research and create a short speech to persuade others of your opinion.