How can we explain the electric conductivity of semiconductors, metals and aqueous solutions?

At this station you can find out which charge carriers are responsible for the electric conductivity of metals, semiconductors and solutions. Besides that you can see which processes take place inside the materials when heat energy is supplied.

1) Work through the following parts of the Flash animation " Stromleitung in Metallen, Lösungen und Halbleitern" (German version):
1. Conductivity of metals: (experiment &) model **1**
2. Conductivity of solutions: (experiment &) model **1**
3. Conductivity of semiconductors: (experiment &) model **3**

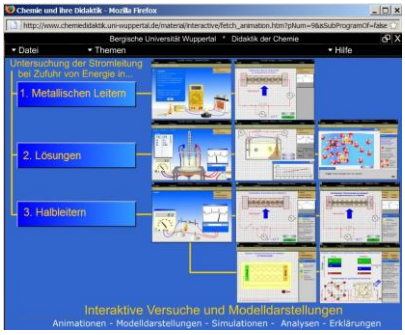
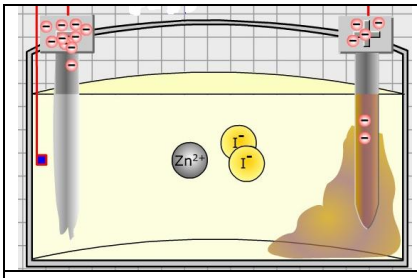
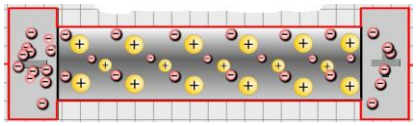
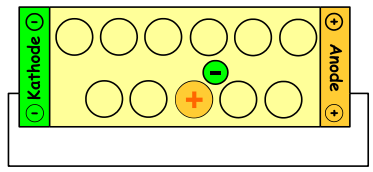


Fig.1 Sitemap of the Flash animation. http://www.chemiedidaktik.uni-wuppertal.de/material/interactive/index.htm

2) Try to understand the conductivity of each of the tested materials. The four guiding questions from the table help you. Look at the animation again and fill in the table.

	metals	solutions	semiconductors
1. Which charge carriers can be seen **a) at room temperature** **b) at higher temperatures?**			
2. Which charge carriers move into which direction?			
3. Does the supply of energy cause any changes concerning the charge carriers?			
4. How does the supply of heat energy affect the electric current and the conductivity?			

3) The following three pictures are taken from the animation. Name the depicted charge carriers and describe which material (semiconductor, solution or metal) is represented. At what point of the animation (e.g. current on or off, heat on or off, at the beginning of the experiment, …) were these pictures taken?

4) Right or wrong? Correct the wrong statements!

☐ The free electrons in metals move faster when the metal is heated.
☐ In metals the positively charged atom trunks swing stronger if the metal is heated.
☐ Semiconductors are only conductive if energy is supplied.
☐ The charge carriers in solutions are electrons and holes.
☐ Semiconductors and solutions undergo chemical change if a voltage is applied.
☐ Electrons always move towards the positive pole.
☐ Electrons are responsible for the electric conductivity of solutions, metals and semiconductors.

5) Compare semiconductors with metals and with solutions and name similarities and differences.

Words: *conductivity:* Leitfähigkeit; *charge carrier:* Ladungsträger; *concerning:* betreffend; *to affect:* beeinflussen; atom trunk: Atomrumpf, hole: Elektronendefizit / Loch;