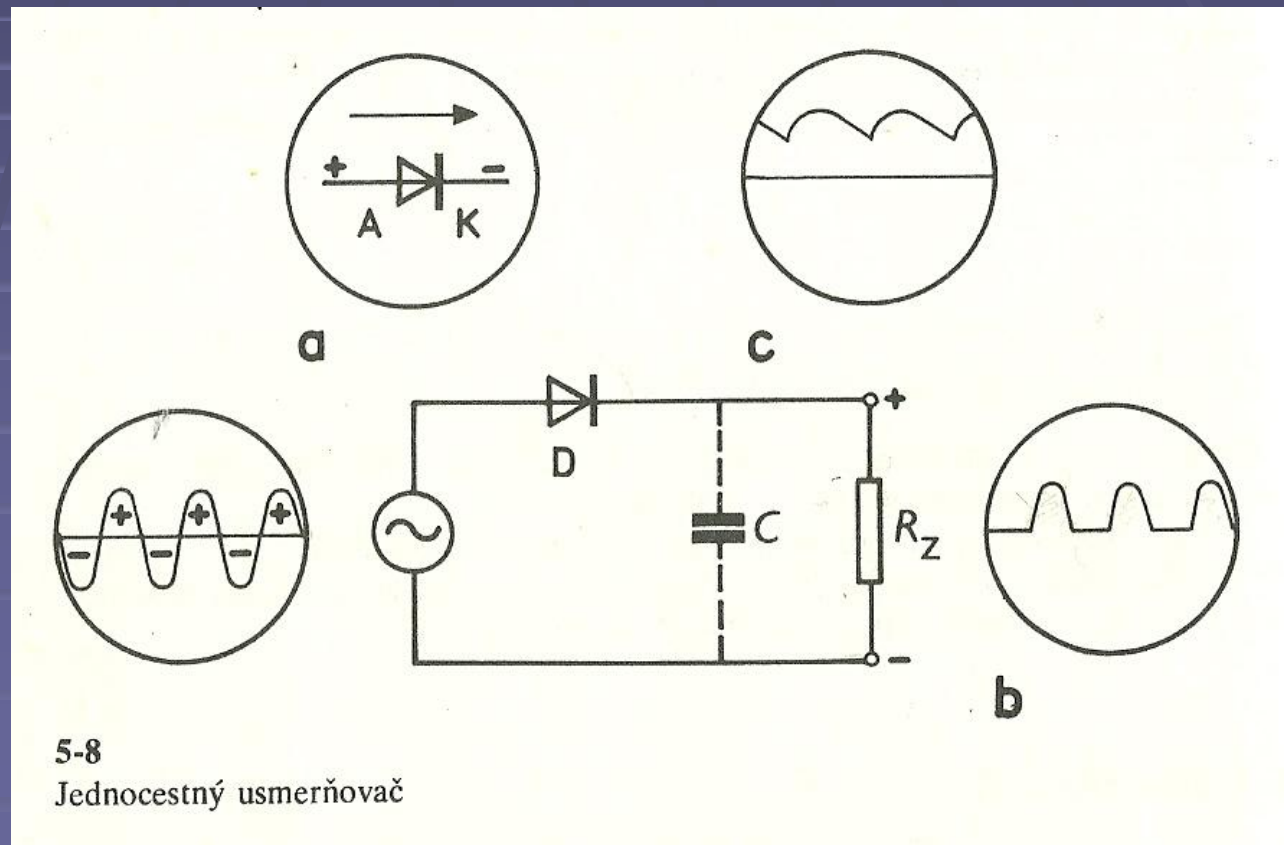


Diode

Semiconductor diode – non ohmic conductor – half-wave rectification

- Its resistance changes per a time (we can not use the Ohm´s law)
- A reverse-biased diode – this way the depletion region widens – no current reverse biased
- A forward-biased diode - this way the depletion region is reduced – current forward biased



Semiconductors

- Pure semiconductors act as insulators when very cold, and conduct only poorly at normal room temperatures.
- Semiconductors can be given greatly improved conducting abilities by doping them with small amounts of substances.
- They can become either n-type or p-type semiconductors depending on substance added.
- N-type material – silicon doped with phosphorus which increases the number of negative electrons which are free to move through the material.
- P-type – silicon with boron which creates gaps or positive holes in the electron structure and electrons are then able to move through the material by jumping from one hole to another.

The p-n junction diode

- A junction is formed between p-type and n-type regions. P-type and n-type material across a narrow layer is called the **depletion layer**.

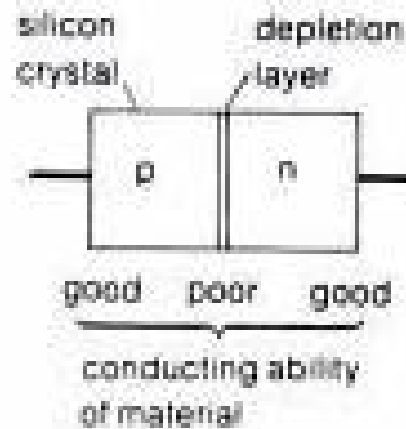


Figure 2a p-n junction diode

If a p.d. is applied across the crystal as in the figure, a current flows. Despite the poor conducting ability of the material in the depletion layer, the layer is so narrow that its resistance is low. The crystal in this case is said to be **forward biased**.

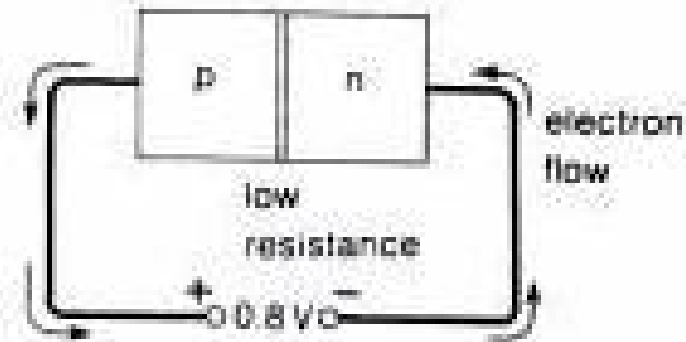
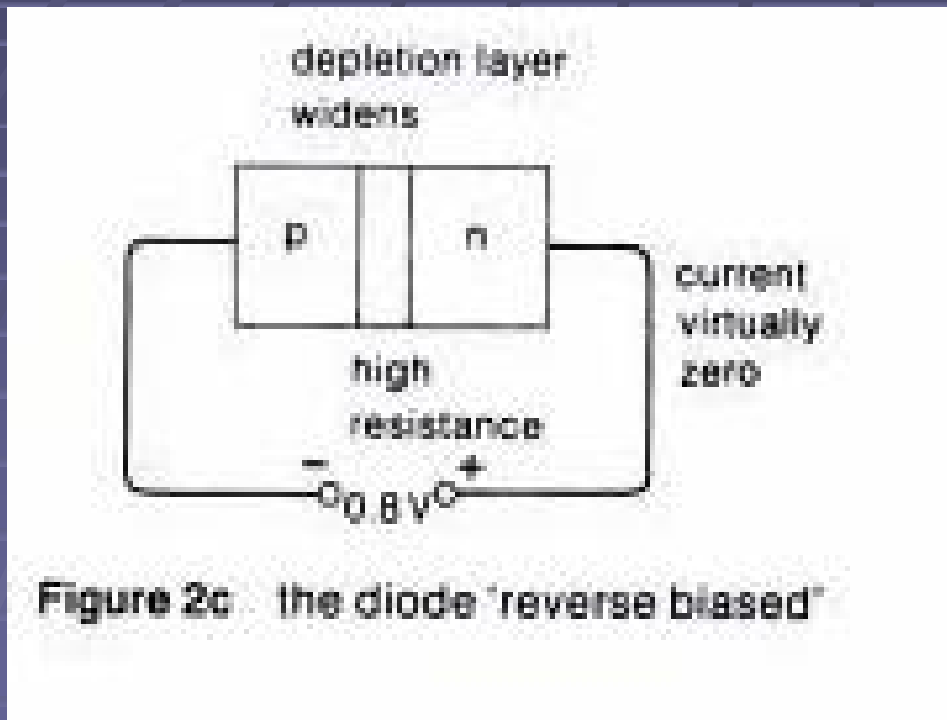


Figure 2b the diode 'forward biased'

If the p.d. is applied in the opposite direction as in the figure, the current through the crystal is virtually zero. This is because electrons and holes are pulled away from the depletion layer, making it much wider and greatly increasing its resistance. The crystal in this case is said to be **reverse biased**.



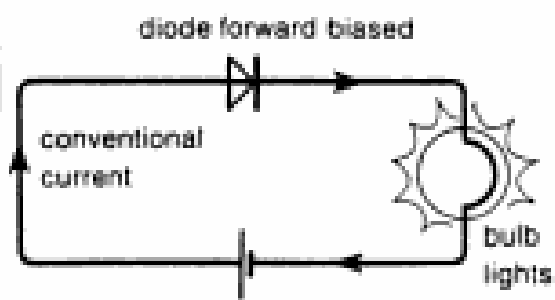


Figure 3a With the diode forward biased, a current flows

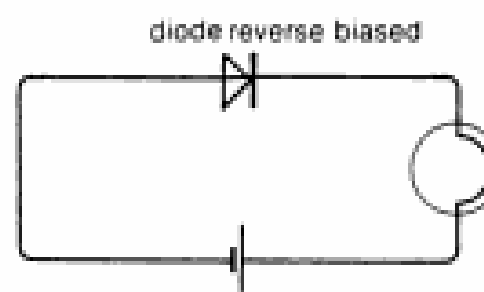


Figure 3b With the diode reverse biased, virtually no current flows

Junction diode: varification if I with V

- Characteristic curve of the diode – the diode does not obey Ohm's law.

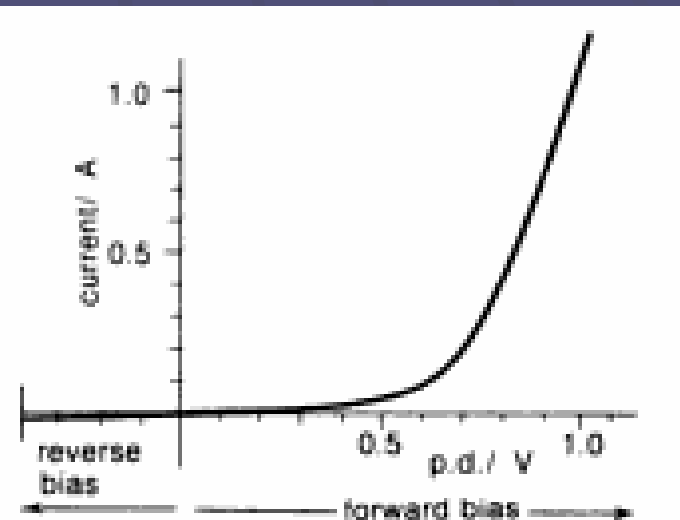
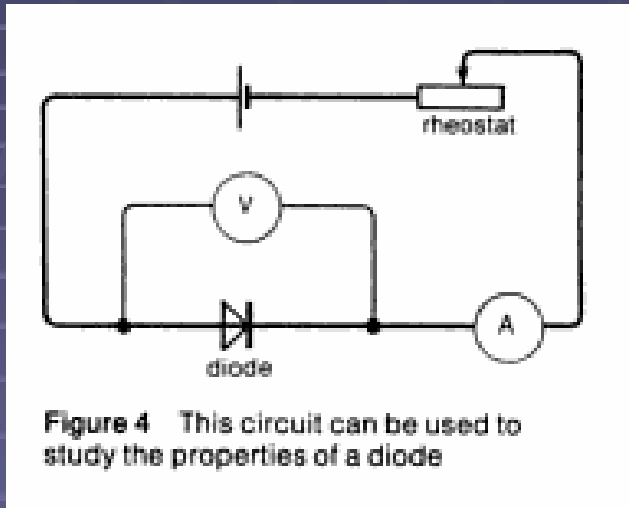
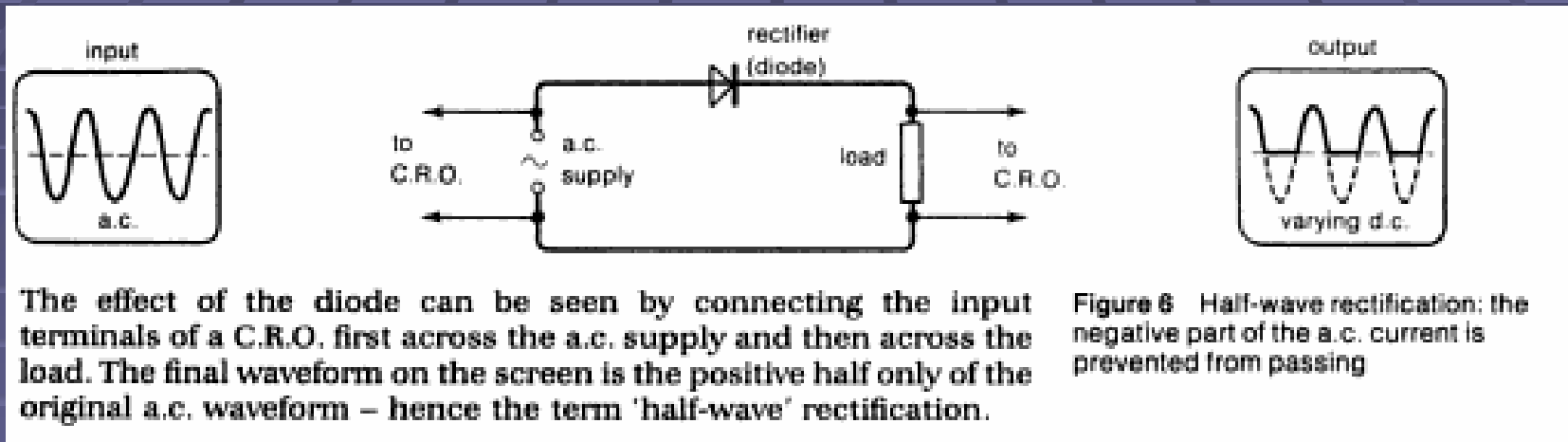


Figure 5 The graph shows that the diode has a low forward resistance (which can vary); and a very high (but not infinite) reverse resistance

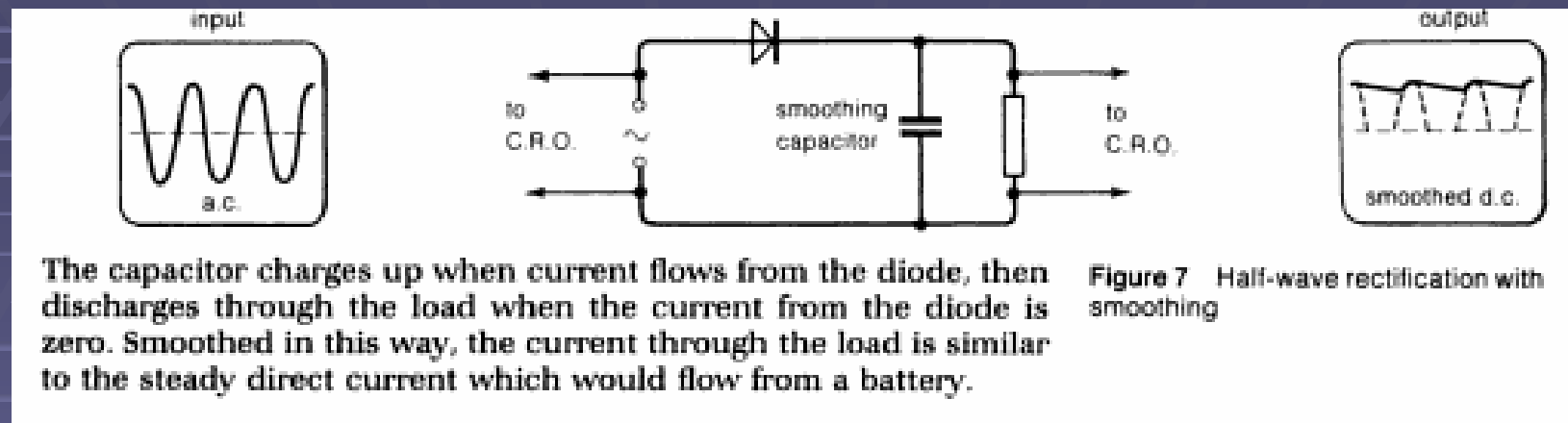
Half-wave rectification



The effect of the diode can be seen by connecting the input terminals of a C.R.O. first across the a.c. supply and then across the load. The final waveform on the screen is the positive half only of the original a.c. waveform – hence the term 'half-wave' rectification.

Figure 6 Half-wave rectification: the negative part of the a.c. current is prevented from passing

Smoothing



Full-wave rectification

- Full-wave rectification using an ingenious arrangement of diodes called a bridge rectifier.

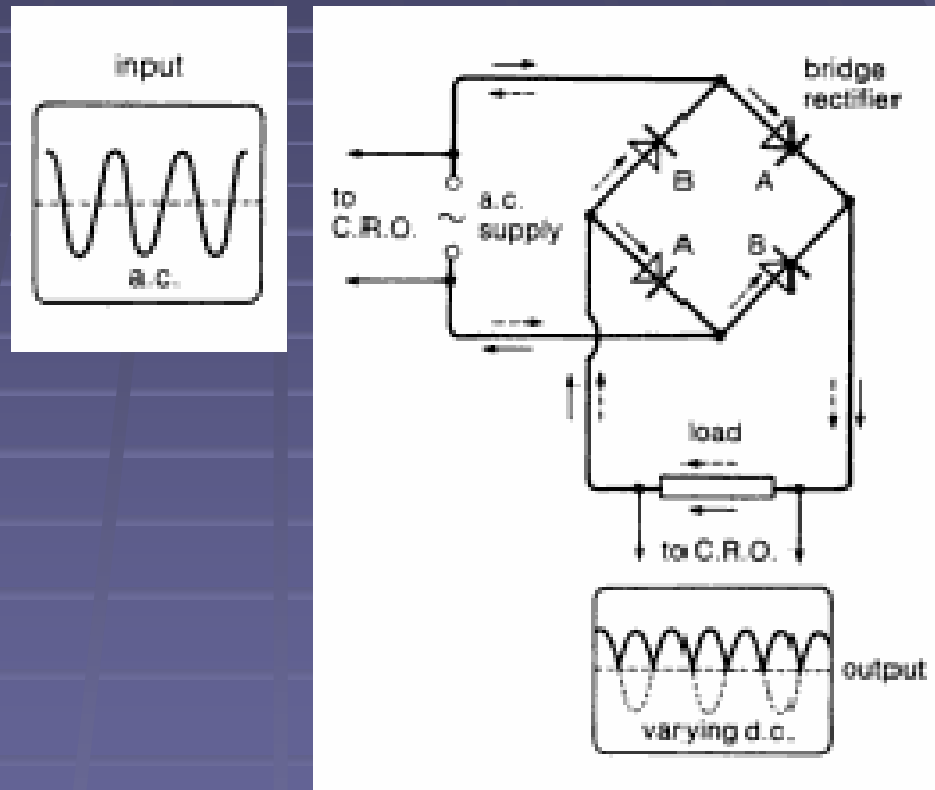


Figure 8 Full-wave rectification. The negative part of each a.c. cycle is reversed.