

Answers to selected questions

Chapter 21

- Q6** The gravitational force is giving theoretical physicists the most difficulty. General relativity appears to be incompatible with quantum theory and the quark model.
- Q12** No. Only if they have the same luminosity can we associate the brightness with distance. Some stars are intrinsically brighter than others, though, and appear brighter even though they are at greater distances.
- Q18** Adding gallium impurity atoms results in a p-type semiconductor. Gallium is a group III element in the periodic table, so when it replaces a silicon atom in the lattice there is a deficiency of one electron. The lack of an electron, or hole, contributes to the conductivity as if it were a positive charge.
- Q24** No (not yet). The first superconductors had a critical temperature below 10 K. Present high temperature semiconductors have critical temperatures of the order of 100 K. This is a great advance, since liquid nitrogen is relatively cheap and has a boiling point of 77 K. But we are still not to the point of having superconductors operable at room temperature.