

2002 HIGHER SCHOOL CERTIFICATE EXAMINATION
Physics

Section I – Part B (continued)

Marks

Question 24 (8 marks)

In terms of band structures and relative electrical resistance, describe the differences between a conductor, an insulator and a semiconductor. 8

The band structure of a conductor has overlapping valance and conduction bands which allow their free electrons to carry current with ease. An insulator does not have an overlapping of valance/conduction bands and do not have free electrons to allow a current to pass through them. Semiconductors have a small gap between the valance/conduction bands and when doped with a band 3 or 5 element can produce an overlapping valance/conduction band allowing free electrons to pass currents. Semiconductors can be made from isotopes of otherwise insulators. Semiconductors require a catalyst or kickstart to allow current to pass through them, they have a higher resistance than conductors so energy is wasted as heat.