

## 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.

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① In a conductor the valence band and the conduction band overlap partially. This allows the valence electrons to easily move when free into the conduction band. This easy movement gives conductors low electrical resistance.

② In an insulator there is a large forbidden gap between the valence band and conduction band. This therefore makes it difficult for electrons in the valence band to gain sufficient energy to move into the conduction band. This gives an insulator high electrical resistance.

③ In a ~~sup~~ semiconductor there is a forbidden gap between the valence band and conduction but however, this gap is small. And under certain conditions electrons can gain sufficient energy to pass over the gap into the conduction band thus lowering the electrical resistance.