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**Glass – Transport Applications**

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**Acknowledgement**

Mr John Gibson is a highly regarded educator and engineer. John taught Industrial Arts at a number of high schools before taking a position at Sydney Teachers’ College, then University of Sydney. He had an engineering education consultancy and has extensive experiencing working with NESA on Engineering Studies syllabus development and the HSC examination committee. The STEM Industry School Partnerships (SISP) Program asked John for his responses to the iTeachSTEM topic discussion questions. SISP is grateful to John for submitting these example discussion responses.

# Describe the structure of glass.

Glass is a material that predominantly shows no crystalline form in its structure. It is amorphous.

It is weak in tension and very strong in compression.

1. **Explain the process of toughening glass.**

Sheet glass is placed in a furnace and left until it softens, but not molten.

It is drawn out of the furnace and sprayed with cool air on each side.

As glass is predominately an insulator, the effect of the air cools and contracts the outer surface leaving the inner layer soft. As the inner layer cools, it too contracts, causing the outer surfaces to become compressed.

1. **Describe the structure created in a toughened glass.**

If we test the hardened glass by trying to bend it, the compression of an outer surface has to overcome the internal compression before an outer surface comes into tension, where fracture becomes likely.

1. **Describe the structure of laminated glass.**

Two layers of glass, with a flexible transparent polymer layer in between.

1. **Explain the properties of laminated glass.**

Fracture in a glass windscreen can be easily caused if it is not mounted well or, when a stone hits it at speed. When fractured, the glass forms sharp shards which can cause serious personal injury. To prevent this, a flexible polymeric sheet is placed between two layers of glass. A stone or serious jolt can cause the outer surface to fracture, but instead of sharp shards, the cracked glass is supported by the flexible polymer, preventing injury.

1. **Explain the application of laminated glass.**

Laminated glass can be used in any environment where glass is used, and where it is likely to be accidentally broken, such as in vehicle windscreens.