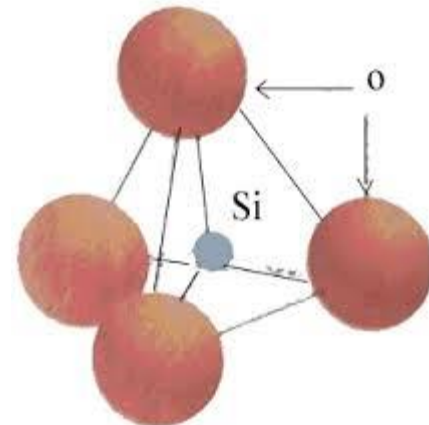
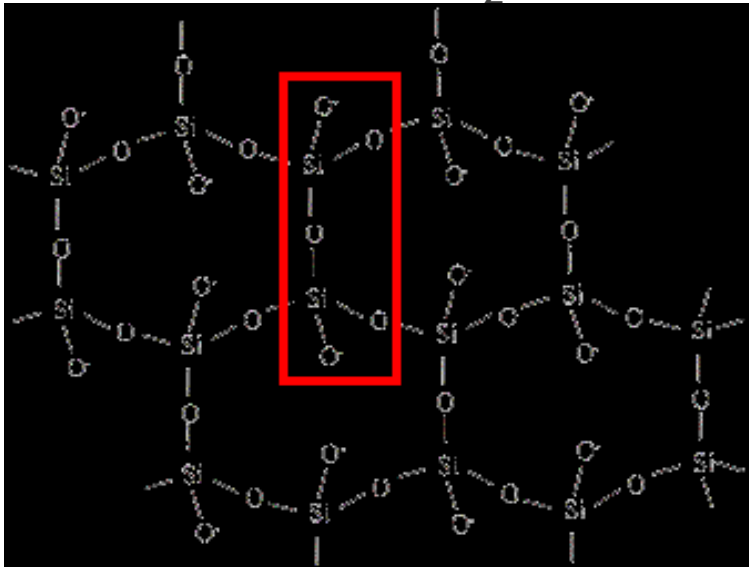
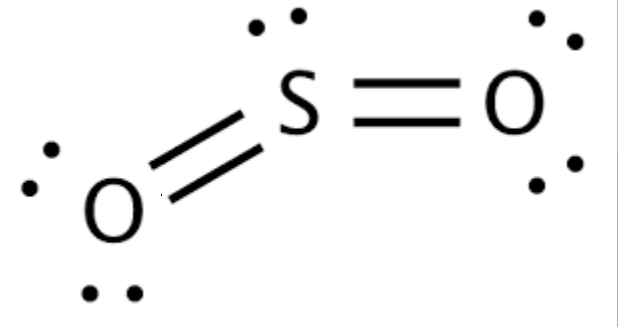


Glass

Types and Analysis

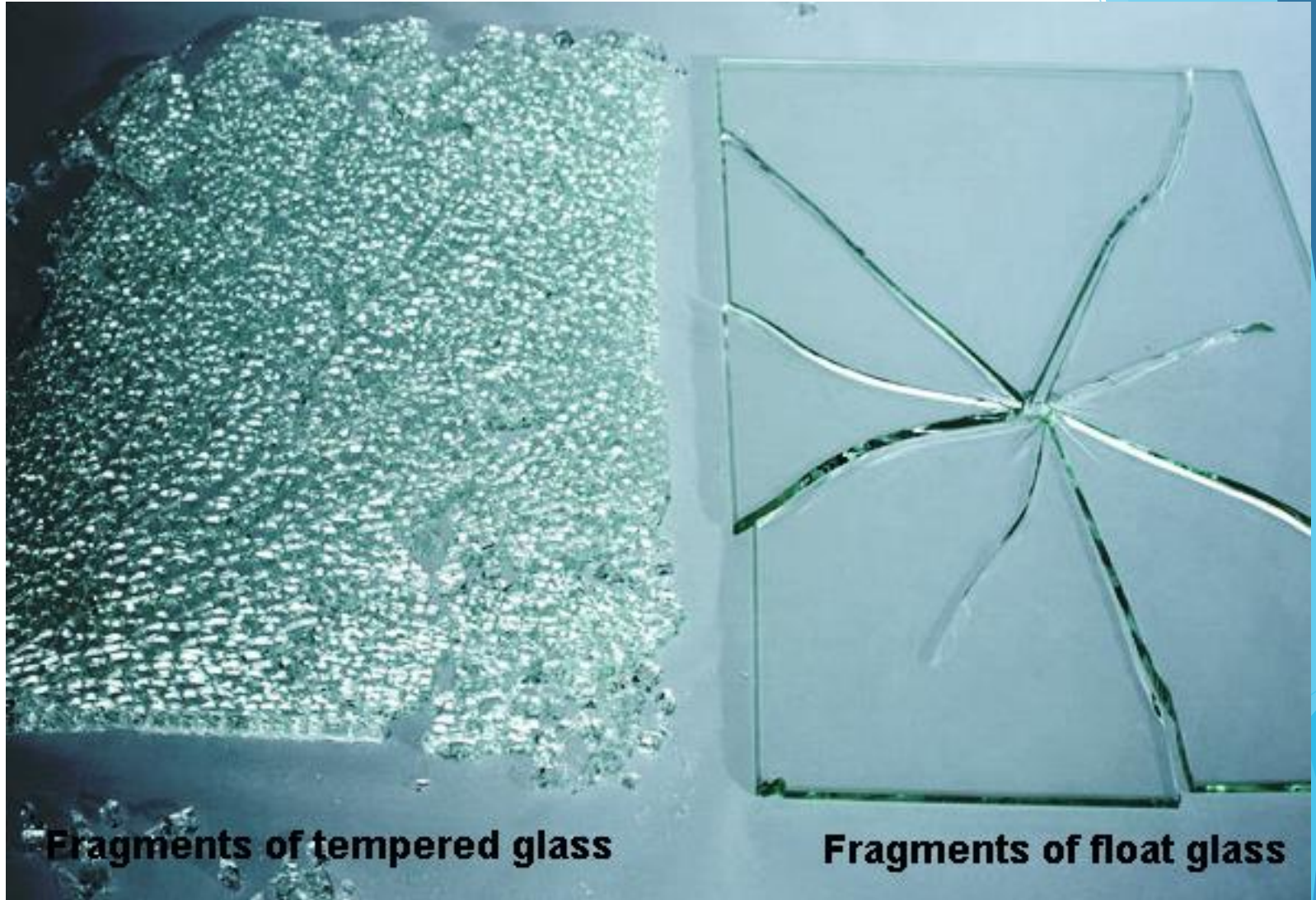
Basic Components

- ▶ SiO_2 (sand), glass however is really SiO_4 .
- ▶ Intermolecular forces cause the silicon atoms (pos) to be attracted to the an oxygen atom (neg) on 2 other SiO_2 molecules



Some Common Glass Types

- ▶ Soda-lime, also called Float glass.
 - ▶ Windows, picture frames, flat glass objects
 - ▶ Has Na_2CO_3 and CaO (Sodium Carbonate and Calcium Oxide)
- ▶ Tempered
 - ▶ Safety glass, auto glass, shower doors, and plate glass windows in stores
 - ▶ Same chemical make up as Soda Lime, but top layer is cooled first causing internal stress.



Fragments of tempered glass

Fragments of float glass

Types Cont'd

- ▶ Borosilicate glass
 - ▶ Lab glassware, kitchen items (Pyrex)
 - ▶ Silicon Dioxide with Boron
- ▶ Tinted glass
 - ▶ Has colorants that reduce glare/ heat penetration for decorative use
 - ▶ Silicon Dioxide with additives/ colorants
- ▶ Leaded glass (Crystal)
 - ▶ Wine Glasses, fine dining, figurines, decorative windows
 - ▶ Silicon Dioxide with lead oxide



Glass as Forensic Evidence

- ▶ Glass is important for forensics
 - ▶ It is found at a lot of crime scenes
 - ▶ It can be accidentally carried away easily
 - ▶ It is stable, it does not decay
 - ▶ Contributes to pool of evidence (Class evidence)
- ▶ Important to collect proper known samples so incidental glass can be eliminated

Class Characteristics of Glass

- ▶ Physical appearance (Size, shape, thickness)
- ▶ Color
- ▶ Density
- ▶ RI Refractive Index

Density

- ▶ Density is a measure of Mass/Volume
- ▶ We will do a lab in which you will find the density of different kinds of glasses. You will be responsible for knowing and understanding how that works.

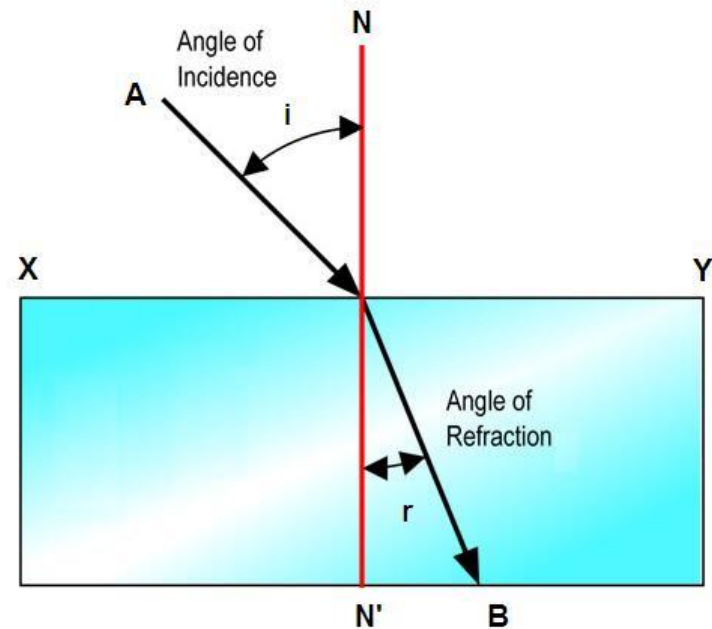
Refractive Index

- ▶ Refractive Index (RI) is the ratio of the velocity of light in a vacuum to its velocity in a medium
- ▶ If RI is the same, the two substances disappear in one another
- ▶ If light does not have to change the speed it travels, in passing from one substance to another, then you can not tell where one stops & the other begins.

Refractive Index

► Equation:

$$RI = \frac{c}{v_{medium}}$$



Individual Characteristics of Glass

▶ Fracturing!!

- ▶ Random stress patterns and breaks are unique
- ▶ Looking at fracture patterns can tell us:
 - ▶ Sequence of the fractures (order of events)
 - ▶ Direction of the force that caused break (entry and exit)

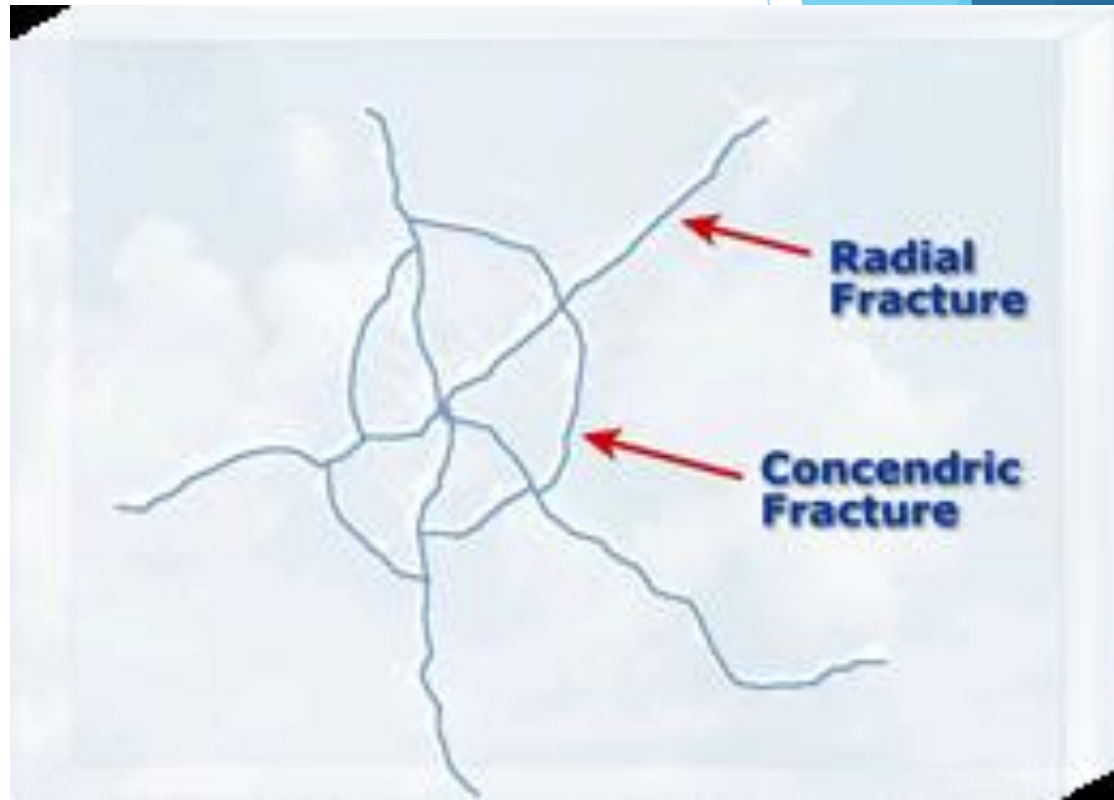
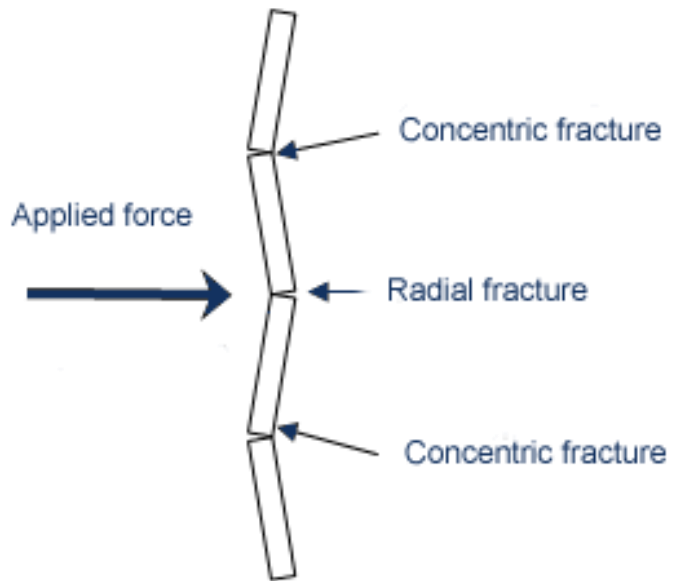
First Shot

- ▶ When 1st fracture, occurs there is an unlimited area to fracture
- ▶ Any further fractures are limited by the boundaries of the 1st fracture. Some of these lines stop at the lines from the first fracture



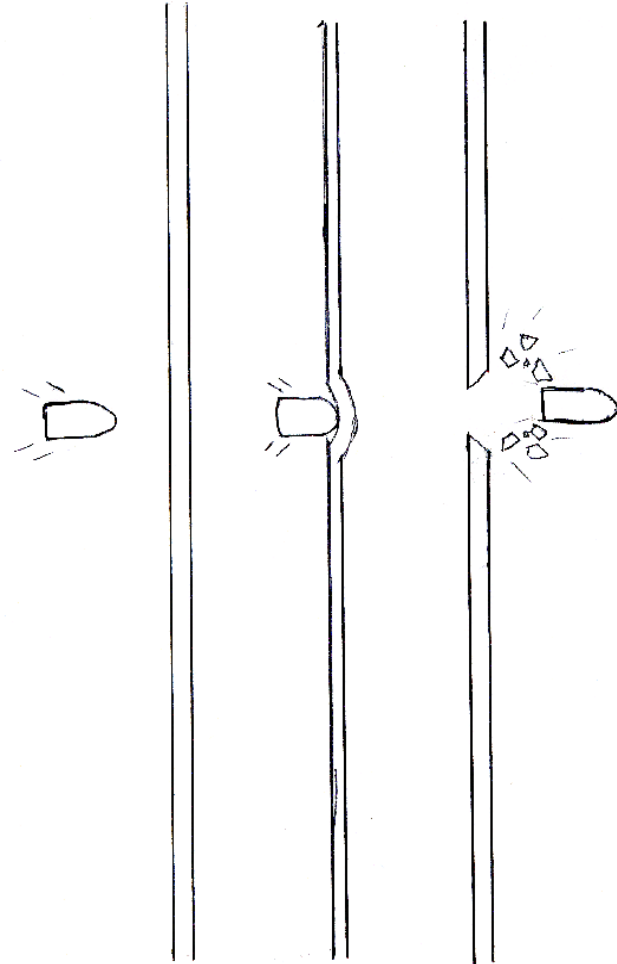
Radial and Concentric Fractures

- ▶ Radial fracture lines occur first extending outward from the break point, produced when the opposite side of impact fails first
- ▶ Concentric fracture lines from a circle around the break point and are produced by the side of impact failing first



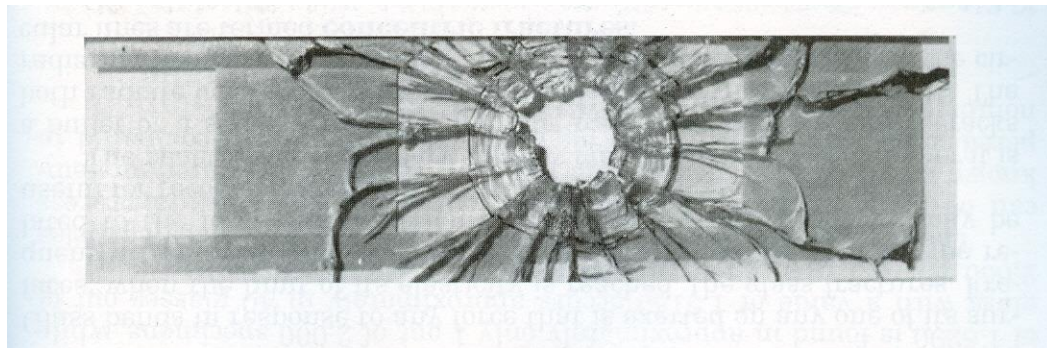
Enter/exit

- ▶ When pressure is applied to the surface of the glass (a bullet), the glass stretches at first.
- ▶ When the limits of its ability to stretch is reached, pieces of the glass are forced out of the opposite side of the glass.



Entrance?

- ▶ Side with smooth, narrower opening is entrance
- ▶ Side with rougher, wider opening is exit



Individual Characteristic

- ▶ If a piece of glass fits into a puzzle of glass, then that piece of glass had to come from the glass that it fits into.
- ▶ Extremely small chance that a random piece could fit in the puzzle.