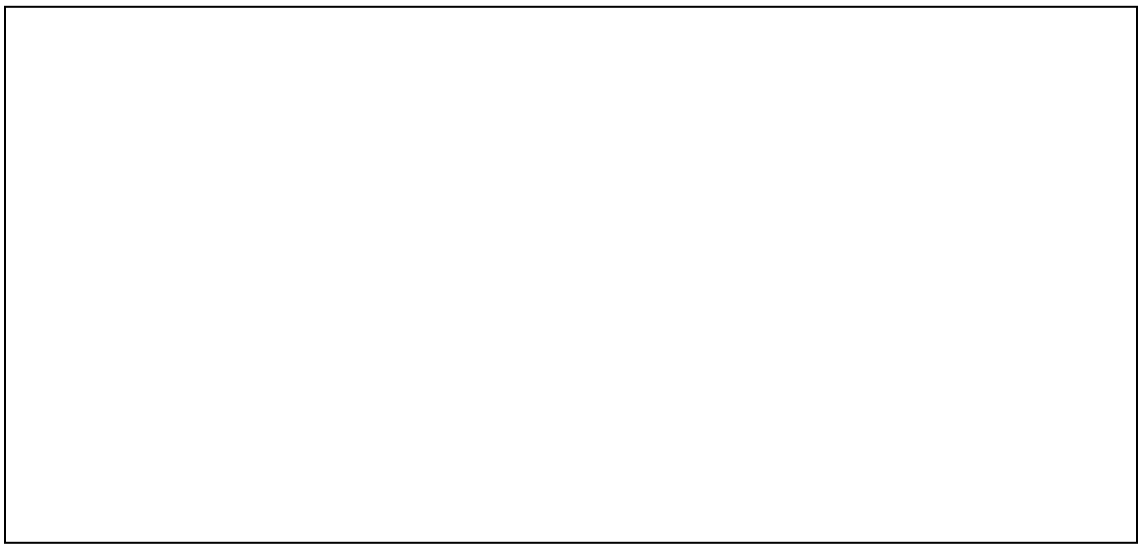
SPH3U

Mechanical Resonance

NATURAL FREQUENCY

All objects have a natural frequency at which they tend to vibrate. This frequency depends on the material the object is made of, the shape, and many other factors. Pendulums have natural frequencies which are dependent on the length of the string used to support the mass. Buildings, rocks, crystals, bones, steel pipes, pencils, elastic bands, etc. all have natural frequencies at which they will vibrate if they are induced.

RESONANCE



e.g. The human body has resonant frequencies. The entire body has a natural frequency of approximately 6 Hz. The head has a natural frequency of between 13 Hz and 20 Hz. The eyes between 35 Hz and 75 Hz. If the body is exposed to intense vibrations at or near these frequencies severe tissue damage can occur. For this reason car and road design specialists make an effort to reduce all mechanical vibrations on the human body.

Other Examples:

- "Rocking" a car out of a snow drift
- Pushing a person periodically on a swing set
- "Tuning" a radio
- Using a bow to vibrate a string a tuning fork or metal rod
- Wind blowing over a power line or bridge.
- Crystals (pizo-electric)

Mechanical resonance must be considered when you are designing anything that has some freedom of movement and will have some physical contact with a vibration source.