• Introduction
  – Sound itself is not a pollutant, but when it interferes with tasks, when it distracts, annoys or disturbs, or when it causes losses in hearing or alters physiology in negative way then it becomes unwanted sound, or noise.

The Physics of Sounds

• Sound is a form of energy that is produced by the vibration of objects which compress and expand air, water or solids to produce waves.

• Frequency and Amplitude (Fig. 10-22, 23)

Fig. 10-22

Fig. 10-23

The Physics of Sounds

• Soft sounds have a low amplitude while loudness is characterized by large amplitudes.

• This amplitude intensity or loudness is measured in decibels (dB)[Fig. 10-24].

Fig. 10-24
Physiology of Sound and Health

Effects

• Sounds enters the ear and the tympanic membrane vibrates.
  – The tympanic membrane is connected to a series of three very small bones in the middle ear known as the malleus, incus, and stapes which transmit the vibration to the oval window of small-shaped structure called the cochlea (Fig. 10-25).

Fig. 10-25

Physiology of Sound and Health

Effects

• Excessive sound pressure (loud noises) can destroy the delicate hairs in the spiral organ.
• Hearing loss is known as permanent or temporary threshold shift (PTS or TTS).

Regulation of Noise

• The regulation of sound requires that it be measured according to a standard.
• Department of Labor with a permissible exposure limit of 90dBA for an eight hour day, 40 hour work week.

Radiation

• Introduction
  – Atoms are the basic units of elements and consist of a small dense center called a nucleus surrounded by a cloud of negatively charged electrons (Fig. 10-27).

Radiation

• When a radioisotope decomposes, it releases energy in the form of electromagnetic radiation (g or x-rays), and energy of motion from particles (a or b) [Fig. 10-27].
Radiation

- An atom which is missing one or more electrons is referred to as an ion, and energetic radiation capable of doing this is called ionizing radiation.

Radiation Exposure

- Every individual comes into contact with ionizing radiation from three general types of sources:
  - (1) naturally occurring (cosmic rays, minerals);
  - (2) naturally occurring but enhanced by human actions; and
  - (3) human generated (fallout).

Health Impacts of Ionizing Radiation

- Dose
  - High vs. low
- Dose rate
  - Time span for a certain exposure may be more important than total dose.

Health Impacts of Ionizing Radiation

- Radiation Induced Mutations
- Birth Defects
- Radiation-Induced Cancer

Radiation and Nuclear Power Generation

- Nuclear power production involves a number of steps, referred to as the nuclear fuel cycle.
  - Mining the Uranium
  - Processing
  - Converting
  - Enriching
Ultraviolet Radiation

• Wavelengths of the electromagnetic spectrum ranging between 40-400 nanometers in length are categorized as ultraviolet (UV) light.

Ultraviolet Radiation

• Injury to the hereditary material of cells is the reason for the lethal or mutational effects which excess UV exposure can provoke in living organisms.

Ultraviolet Radiation

• Three major types of skin cancer account for over 700,000 new cases of the disease diagnosed in the U.S. each year.
  – Basal cell carcinoma
  – Squamous cell carcinoma
  – Malignant Melanoma

Ultraviolet Radiation

• Some Beneficial Effects
  – Needed to produce Vitamin D
  – Germicidal properties
  – Treat bacterial skin diseases