

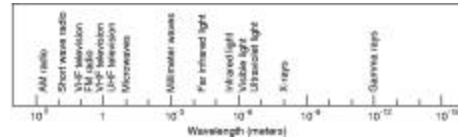
Question:

An incandescent light bulb contains some gas along with the filament. How would removing this gas affect the bulbs energy efficiency?

- Make it more efficient
- Make it less efficient
- No change

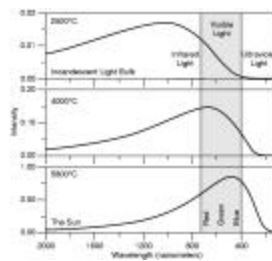
Thermal Radiation

- All materials contain electric charges
- Thermal energy makes these charges accelerate
- Accelerating charges emit electromagnetic waves
- Materials emit electromagnetic waves



Black Body Spectrum

- The spectrum of electromagnetic waves from a black body depends only on its temperature



Incandescent Bulb

- Tungsten filament
- Electrical connections
- Glass envelope
- Nitrogen/Argon/Krypton gas

Operation Issues (Part 1)

- Filament heating and light temperature
- Filament reactivity
- Filament sublimation
- Non-reactive gas added to limit sublimation

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Operation Issues (Part 2)

- Protective gas convection
- Non-light heat losses

Halogen Bulb

- Bromine/Iodine/Oxygen gas
- Small, high temperature glass envelope
- Filament recycling process

Three-Way Bulb

- Two separate filaments
 - One low-power filament
 - One high-power filament
- Three light levels
 - Low-power filament only
 - High-power filament only
 - Both filaments together

Specialized bulbs

- Clear vs. Soft white bulbs
- Long life (high voltage) bulbs
- Rough service bulbs
- Energy-saver bulbs
- Krypton bulbs
- Heat bulbs
- Photoflood bulbs