



EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE - 2002/2003

(MARCH/APRIL 2004)

REPEAT

PH 306 ENVIRONMENTAL PHYSICS

Time: 01 hour.

Answer ALL Questions

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1. Explain briefly how the ozone layer prevents the harmful UV radiation reaching the Earth's surface. Name minimum of three man-made chemicals that contributes mostly to the destruction of ozone in the stratosphere and explain the mechanism of destruction.

The Beer-Lambert law is given by

$$I_t = I_o \exp(-\sigma N x),$$

where

$I_t$  - transmitted flux light at a set wavelength,

$I_o$  - incident light flux,

$N$  - concentration of the target gas,

$x$  - path length of the radiation through the gas and

$\sigma$  - photo-absorption cross-section.

Calculate the percentage increase in 260 nm UV radiation reaching the Earth's surface at the South Pole when the ozone hole is 50% of the normal concentration  $3.2 \times 10^{16} \text{ m}^{-3}$ . Assume that the photo-absorption cross-section for 260 nm UV light is  $10^{-21} \text{ m}^2$  and that the stratosphere is 40 km deep.

2. (a) Distinguish thermal conductivity ( $k$ ) and thermal transmittance ( $U$ ) in the use of Built Environment.

The outside wall of a building consists of two layers of brick each 10 cm in thick with a thermal conductivity  $0.54 \text{ Wm}^{-1}\text{K}^{-1}$ . The two layers are separated to provide an airspace 5 cm in thick and having a thermal resistance of  $0.180 \text{ m}^2\text{KW}^{-1}$ . Assuming thermal resistances of inner and outermost surfaces as  $0.123$  and  $0.055 \text{ m}^2\text{KW}^{-1}$  respectively,

- (i) calculate thermal transmittance ( $U$ ) for the wall and
  - (ii) what would the thermal transmittance ( $U$ ) of the wall be if the cavity was filled with polyurethane foam of thermal conductivity  $0.026 \text{ Wm}^{-1}\text{K}^{-1}$ ?
- (b) What do you understand by the term "renewable energy"? Name minimum of four renewable sources available at present and describe one of these sources in detail, for its usage as energy provider for future world energy demand.