

EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE - 2005/2006



SECOND SEMESTER (PROPER/REPEAT)

(MARCH/APRIL 2008)

PH 306 ENVIRONMENTAL PHYSICS

Time: 01 hour.

Answer ALL Questions

Gravitational acceleration $g = 9.8 \text{ m s}^{-2}$

Radius of the Earth $R_E = 6.37 \times 10^6 \text{ m}$

Universal gas constant $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$

Specific heat of water $= 4.18 \times 10^6 \text{ J m}^{-3} \text{ K}^{-1}$

Stefan's constant $= 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$

1. Write the following in order of ascending height: troposphere, mesosphere, stratosphere, tropopause, ionosphere, magnetosphere and stratopause. In what ways does troposphere differ from the stratosphere? Explain why atmospheric pressure decreases with height.

If the tropopause is at a pressure of 150 mb and the stratopause at 1 mb

- Calculate the total mass per unit cross-section of the stratosphere
- How thick would the stratosphere be if it was brought to ground level at standard temperature (273 K) and the pressure (1 atm)

2. Explain the importance of renewable energy and list five renewable energy sources available at present.

A solar collector with a glazed cover has an area of 4 m^2 . The collector itself has an absorption coefficient of 0.9 and no significant emittance. The glass cover has a transmission coefficient of 0.8 and an absorption/emission coefficient of 0.2. The ambient temperature is $-5 \text{ }^\circ\text{C}$ and the convective heat transfer can be neglected. If the solar irradiance on the collector is 750 W m^{-2} ,

Calculate:

- the flow rate of water through the collector if the temperature at the inlet is $18 \text{ }^\circ\text{C}$ and at the outlet is $24 \text{ }^\circ\text{C}$. (The temperature of the glass cover is the mean of these values)
- the energy transfer coefficient of the collector
- the capture efficiency of the collector
- What could be done to improve the performance of the system?