UNIVERSITY OF SRI JAYEWARDANEPURA

B.Sc. General/Special Degree Third Year Course Unit Examination –

October, 2017.

PHY 329 1.0 / PHY 373 1.0 – Space Physics - I

Time : One hour

Answer all questions

01. **Show that** the variation of Pressure *P(h)* of an isothermal atmosphere consisting of only one type of gas molecules of mass *m* with the altitude *h* can be expressed as,

$$P(h) = P_0 \, e^{-\frac{h}{H}}$$

assuming *T* and *g* are constants where, $H = \dfrac{kT}{mg}$ and *T* is the temperature and *g* is the acceleration due to gravity.

In the Earth's atmosphere, the major constituents are nitrogen and oxygen having an average molecular mass of 4.8×10^{-26} kg. The Atmospheric Pressure $P_0 = 1.0 \times 10^5$ Nm^{-2} at the ground level.
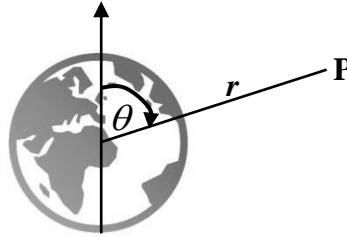
Estimate the Atmospheric Pressure at an altitude of 6.0 km.
You may assume that, g = 10 ms^{-2}, k = 1.38×10^{-23} JK^{-1} and T = 288 K.

02. Explain the importance of **Ozone layer** for maintaining a life form comprehensively on Earth.

Explain how far gases such as "**CFC**" can damage the Ozone layer.

What are the steps that you can take to **protect the Ozone layer** ?

03.

You are given the following mathematical equation for the Earth magnetic field intensity, $H(r,\theta)$ at any point P at a distance r from the center of the Earth and making an angle θ with the vertical, as shown in the figure above.

$$H(\,r,\,\theta\,)=\frac{\mu_o}{4\,\pi}\cdot\frac{M}{r^3}\cdot\left(\,1+3\,\cos^2\theta\,\right)^{\frac{1}{2}}$$

Where, M is the Dipole Moment of the Earth and the other symbols have their usual meanings.

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The intensity of the Earth's Magnetic Field at the equator is *40,000 nT*.

Calculate the Dipole Moment of the Earth.
($\mu_0 = 45\times10^{-7}\,Nm^2wb^{-2}$ and the radius of the Earth is *6.4×10⁶ m*)

Hence, **determine** the Magnetic Field intensity at the poles of the Earth.

04.   What is the importance of the **E - layer** in the ionosphere of the Earth atmosphere for the SW radio communication ?

What is meant by the **multi-reflection** of radio-waves ?

What kind of difficulties you would expect in multi-reflection transmission ?

Write down the relationship between **maximum possible range** (R) of a direct-transmitted radio waves with its **frequency** (f).

What would be the maximum possible ranges for radio waves of frequencies 10 kHz and 100 kHz in direct-transmission ?

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