UNIVERSITY OF SRI JAYEWARDANEPURA - FACULTY OF APPLIED SCIENCES

B. Sc. General/Special Degree Third Year Second Semester Course Unit Examination – **May/June, 2022**

DEPARTMENT OF PHYSICS

PHY 310 1.0 / PHY 329 1.0 / PHY 373 1.0 – Space Physics

Time : One hour; No of Questions : 02; No of Pages : 02 & Total marks : 100

Answer all questions

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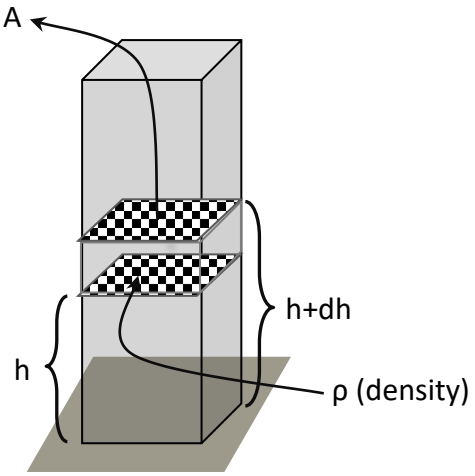
01. **(a)**



Show that the pressure difference dP, between the top and the bottom surfaces of a vertical air column of height dh in the above figure is given by,

$$dP = -N\,\overline{m}\,g\,dh\,.$$

Where, N is the molecular number density, $\overline{m}$ is the mean molecular mass and g is the acceleration due to gravity.

Hence, **show that** the molecular number density, N of the Earth's atmosphere varies as a function of height h as given below;

$$N(h) = N(0)\cdot e^{-h/H} \;;\; H = \frac{k\,T}{\overline{m}\;g}$$

(Symbols have their usual meanings).

(b) In the Earth's atmosphere, the major constituents are Nitrogen and Oxygen having average molecular mass of 4.8×10^{-26} kg. The total number density $N(0) = 2.54\times10^{19}$ cm^{-3} at the ground.

Estimate the molecular number density at an altitude of 6.0 km and 8.4 km.

[You may assume that, g = 10 ms^{-2}, k = 1.38×10^{-23} JK^{-1} and T = 288 K]

(50 Marks)

02. **(*a*)** A sudden large increase in the number of Sunspots is observed to have an approximate cycle of several years.

What is,

(i) Rudolf Wolf's idea,

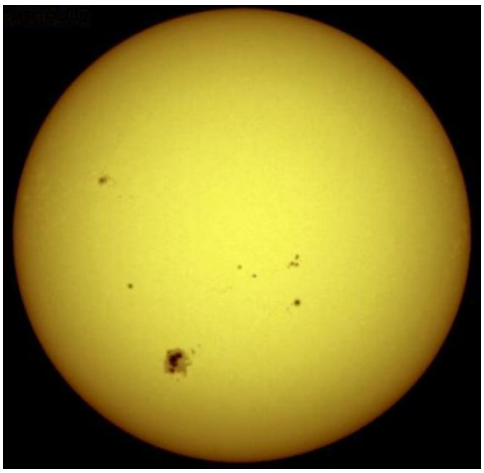
(ii) George Ellery Hale's idea,

about the above solar cycles ?

(*b*) **(i)** What is "Sunspots" ?

(ii) Explain why they get their characteristic appearance ?

(iii) Discuss how you would determine the sunspots number, if the number of individual sunspots as well as number of sunspot groups visible on the Sun are known.



(iv) It is observed that, the number of individual sunspots is 04 and the number of sunspot groups is 03 as shown in the figure above. Calculate the corresponding sunspots number, if the calibration factor for the whole system is 1.6.

(*c*) **(i)** Explain the importance of Ozone layer of the Earth for maintaining a life form comprehensively on the Earth.

(ii) Explain how far the gases such as "CFC" and "BFC" can damage the Ozone layer.

(iii) What are the steps that you can take to protect the Ozone layer ?

(50 Marks)

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