NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Nnamdi Azikiwe Expressway, Plot 91, Cadastral Zone, Jabi, Abuja
FACULTY OF SCIENCES

Department of Pure and Applied Science

JANUARY 2018 EXAMINATION QUESTION

COURSE CODE: PHY455

COURSE TITLE: Lower Atmospheric Physics

COURSE UNIT: 3 units

ANSWER QUESTIONS ONE AND ANY FOUR OTHER QUESTIONS

Using the following constant when necessary

δ_b = 5.67 x 10^{-6} $Wm^{-2}K^{-4}$ Stefan – Boltzman Constant, δ_b

h = 6.6 x 10^{-34} Js Planck's Constant, h

C = 3.0 10^8 ms^{-1} Speed of height, c

K_D = 1.38 x 10^{-23} JK^{-1} Boltzman Constant, K_D

Question 1

Using mainly thermal considerations, describe the layers of the atmosphere from sea level to a height of about 150km. (22 MARKS)

Question 2

a) Explain the formation of Solar wind. (7.5 marks)

b) Using mainly thermal considerations, describe the layers of the atmosphere from sea level to a height of about 150km. (4.5 marks)

Question 3

a) For a photosphere temperature of T_p = 5796 K where R_p=6.96×10^8 m is the radius of the Sun,from its center to the photosphere, compute the irradiance, or luminosity emitted per unit area in W m^{-2}. (6 marks)

b) Show that the solid angle Ω_a around the centre of a sphere is 4π steradians. (6 marks)

Question 4

a) Calculate the energy in joules of ultraviolet light of wavelength 3×10^{-7} m. Take the velocity of light as 3×10^{8} $ms^{-1}ms^{-1}$ and Planck's constant as 6.6×10^{-34} Js. (5 marks)

b) Calculate the radiance and irradiance from the Planck function at T = 273 K and wavelength, λ =0.4 µm. (7marks)

Question 5

a) What is a black body? Give at least two examples. (3 marks)

b) Find the energy emitted per photon, the frequency, and the wave number of a λ =0.5-µm and λ =10-µm wavelength of energy. (9 marks)

Question 6

a) Write an equation relating the spectral irradiance emission, F_λ at the surface of a black body and radiant intensity or radiance, $B_{\lambda,T}$. (3 marks)

b) State Pauli's exclusion principle. (2 marks)

c) According to Weissk of and Wigner, the fact that the life-time of an electron is finite implies that a probability distribution law holds. State the probability distribution law mathematically. (7marks)