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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**University Village, NnamdiAzikiwe 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-2K-4 Stefan – Boltzman Constant, $δ$b

 h = 6.6 x 10 -34 JsPlanck’s Constant, h

 C = 3.0 108 ms-1 Speed of height, c

 KD = 1.38 x 10 -23 JK-1Boltzman Constant, KD

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 Tp = 5796 K where Rp=6.96×108 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 Ωa 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 x 10-7 m. Take the velocity of light as 3 x 108 ms-1ms-1 and Planck’s constant as 6.6 x 10-34Js. (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, Bλ,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)