BOWEN UNIVERSITY, IWO. OSUN STATE. NIGERIA

COLLEGE OF AGRICULTURE, ENGINEERING, AND SCIENCES

PHYSICS PROGRAMME

FIRST SEMESTER EXAMINATION 2022/2023 SESSION

PHY 201: GENERAL PHYSICS III (3 CREDITS)

DATE: FRIDAY, 10TH FEBRUARY 2023 **TIME: 3.30 P.M – 6.30 P.M**

INSTRUCTION: ATTEMPT ANY FOUR QUESTIONS. ***(EACH QUESTION CARRIES 25 MARKS)***

Use the following constants where applicable.

Planck's constant, h = 6.63 x 10^{-34} J.s, **charge on an electron e = 1.6 x 10^{-19} C,**

1u (atomic mass unit) = 1.66 x 10^{-27} kg, **1 eV = 1.602 x 10^{-19}J,**

rest mass of proton = 1.007276u, **rest mass of electron = 1.008665u**

rest energy equivalent (1u) = 931.494 MeV/u, **mass of electron Me = 9.1 x 10^{-31} kg**

speed of light 'c' = 2.998 x 10^{8} m/s **acceleration due to 'g' = 9.81 ms^{-1}**

QUESTION 1

a. (i) Define a reference frame? **(5 marks)**
(ii) Hence, what is an inertia reference frame? **(5 marks)**

b. Who proposed the special relativity theory and on what two postulates was it predicated upon? **(5 marks)**

c. A 3.0 kg object was lifted from the floor to the top of a table 42 cm above the floor. Calculate the amount by which the mass of the system, which consists the Earth and the object increased due to the increase in the gravitational potential energy PE_G . **(10marks)**

QUESTION 2

a. (i) What do you understand by the term time dilation? **(5 marks)**
(ii) Hence, what is proper time? **(2 marks)**

b. (i) Explain briefly the phenomenon of length contraction. **(6 marks)**
(ii) Define the term 'proper length' **(2 marks)**

c. A space craft moving at 85 percent of the speed of light travels from the Earth to the star 'Anxoma', which is 5.2 years light years away.
Determine how long the trip will take according to;
(i) Earth's clock and
(ii) Spacecraft's clock **(10 marks)**

QUESTION 3

a. (i) Write a short note on photoelectric effect? **(5 marks)**

(ii) Hence, write out the Einstein equation for photoelectric effect defining all the symbols and parameters used in your expression **(2 marks)**

b. (i) Briefly explain what is meant by the resonance of De'Broglie wave **(3 marks)**

(ii) Define 'workfunction' **(5 marks)**

c The workfunction of a metal is 4.17eV. Determine the longest wavelength light that can cause emission from the metal. **(10 marks)**

QUESTION 4

a. (i) What is Compton's effect? **(3½ marks)**

(ii) Write a mathematical expression to represents Compton's effect **(2 marks)**

(Define all the symbols and characters used in your written expression.) **(1½ marks)**

b. (i) Explain the phenomenon of 'blackbody' **(3 marks)**

(ii) What is cavity radiation? **(3 marks)**

(iii) What are bound particles? **(2 marks)**

c. A photon with wavelength of 0.400 nm strikes an electron at rest and rebounds at an angle of 150° to its original direction. Calculate the;

(i) speed and (ii) wavelength after the collision **(10 marks)**

QUESTION 5

a. (i) What do you understand by the term 'Newtonian mechanics'? **(3 marks)**

(ii) List the two major defects of the Newtonian mechanics **(2 marks)**

(iii) Mention some fundamental phenomena they cannot account for in physics **(2 marks)**

b. (i) What is Lorentz transformation? **(4 marks)**

(ii) What is thermionic emission? **(4 marks)**

c. Compute the value of 'γ' for a particle travelling at 0.7 that of light. **(10 marks)**