ourdiu.com | Shared by Adnan Akib

# Daffodil International University

**Faculty of Science & Information Technology**
**Department of Computer Science & Engineering**
**Final Semester Examination, Fall 2024**
**Course Code: PHY102, Course Title: Physics II**
**Level: 1 Term: 2 Batch: 66**

**Time: 2:00 Hrs.** **Marks: 40**

## Answer ALL Questions

*[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]*

| | | | | |
|---|---|---|---|---|
| 1. | *a)* | Define nuclear binding energy. | 1 | CO1 |
| | *b)* | Identify what occurs during alpha decay in a radioactive atom. | 1 | |
| | *c)* | Distinguish between nuclear fission and fusion reactions. | 2 | |
| | *d)* | Describe Heisenberg's uncertainty principle. | 2 | |
| | *e)* | Outline the Compton effect with a proper diagram. | 2 | |
| | *f)* | Write down the postulates of the theory of relativity. | 2 | |
| 2. | *a)* | Demonstrate why an electron cannot exist within the nucleus. | 3 | CO2 |
| | *b)* | Explain the significant observations from various atomic models that illustrate the structure of the atom. | 4 | |
| | *c)* | State Lorentz transformation and calculate time dilation using Lorentz transformation. | 4 | |
| | *d)* | From radioactive decay law show that $N = N_o e^{-\lambda t}$, where the symbols have their usual meanings. | 4 | |
| 3. | *a)* | Find the mass defect, binding energy and binding energy per nucleon of $^{62}_{28}Ni$ nucleus. Given that, atomic mass of hydrogen = 1.007825u. Mass of a neutron = 1.008665u and atomic mass of nickel = 61.928348u. | 3 | CO3 |
| | *b)* | Calculate the maximum kinetic energy of the electron emitted from a metal surface when light of wavelength 2400Å incident on it. The work function of metal surface is 2.3eV. | 3 | |
| | *c)* | An astronaut, at the age of 30 years, went to investigate the Milky Way by a spaceship moving with a speed of $2.4 \times 10^8$ ms$^{-1}$ and returned after 50 years (according to the calendar of the earth). What will be his age? | 3 | |
| | *d)* | The half-life of a radioactive material is 15 hours. If the initial mass of that material is 4g then after 60 hours how much of that material will remain unchanged? | 3 | |
| | *e)* | Determine the de Broglie wavelength of an electron moving with a velocity of $v = 1.8 \times 10^7$ m/s. | 3 | |