THE INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY - HCMC

FINAL EXAMINATION – CLASS

Student Name:_____Student ID:_____

Date: JUNE 2021

Duration: 48 hours (13:00 PM 16/06/2021 – 13:00 PM 18/06/2021)

GROUP 1

SUBJECT: **PHYSICS 4**	
Head of Department of Physics: Signature: Full name: Phan Bao Ngoc	Lecturer: Signature: Full name: Do Xuan Hoi

INSTRUCTIONS: $h = 6.63\times10^{-34}\,\text{J.s}$; $c = 3\times10^{8}\,\text{m/s}$; $e = 1.6\times10^{-19}\,\text{C}$

Avogadro number: $N_A = 6.022 \times 10^{23}$ atoms/mole; rest mass of electron: 9.1×10^{-31} kg.

Question 1 (20 pts) The objective lens of a telescope has a focal length of 171 cm. The distance between objective and eyepiece is 180 cm. This telescope is used to observe a star and the final image is at infinity.

a/ Draw the light ray diagram.

b/ Determine the position of the first image of the star and compute the focal length of the eyepiece.

c/ Explain why we do not need to know the size of the star but we can always compute the magnification of such a telescope.

Question 2 (20 pts) The speed of a mosquito of mass 1.6 mg is known to be between 0.50 m/s and 0.51 m/s.

a/ Estimate the uncertainty in its position.

b/ How do you interpret the so small magnitude of the result in question a/?

Q**uestion 3 (20 pts)** Knowing that the energy of an atom is given by: $E_n = -\frac{A}{n^2}$, where *A* is a constant and *n* is an integer. This atom was at first at the level of energy *n*, absorbs two adjacent spectral lines with wavelength 97,5 nm and 102,8 nm and jumps to the levels *n*' and *n*' + 1.

a/ Identify the levels of energy *n* and *n*' concerned in these processes.

b/ Deduce the average value of the constant *A* . What is this atom?

Question 4 (20 pts) An elementary particle has the proper time of 100 ns but in a laboratory, its lives for 357.1 ns.

a/ What is this particle's velocity?

b/ Compare the distance this particle travels in this laboratory and the distance its travels according to a scientist moving with its during this time. What is your observation?

Question 5 (20 pts) The radioactive nucleus $^{232}_{90}Th$ transforms to $^{208}_{82}Pb$ after a series of alpha and beta decays. The half time of $^{232}_{90}Th$ is 1.40×10^{10} years.

a/ Determine the number of alpha and beta decays.

b/ What is the radioactive produced by 1.00 kg of $^{232}_{90}Th$

END OF QUESTION PAPER