

**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 2**

**SUBJECT: PHYSICS 4**

Head of Department of Physics:

Signature:

Full name: Phan Bao Ngoc

Lecturer:

Signature

:



Full name: Do Xuan Hoi

**INSTRUCTIONS:**  $h = 6.63 \times 10^{-34} \text{ J.s}$ ;  $c = 3 \times 10^8 \text{ m/s}$ ;  $e = 1.6 \times 10^{-19} \text{ C}$

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

**Question 1 (20 pts)** A fixed candle in front of a lens gives its image on a screen 30 cm to the lens's right. When you move the lens 4 cm to the right, the screen must be moved 4 cm to the left in order to have the image on it.

a/ This lens is converging or diverging? Explain your answer.

b/ Find the focal length of the lens.

**Question 2 (20 pts)**

a/ Find the de Broglie wavelength of a smoke particle of mass  $10^{-9} \text{ g}$  moving at 1 cm/s and of an electron with a kinetic energy of 1 eV.

b/ Explain why we can detect the wave property of this electron but not this smoke particle.

**Question 3 (20 pts)** Consider a hydrogen atom in the  $n$  state with the energy level  $E_n = -\frac{13.6}{n^2} \text{ eV}$ .

a/ Find the range of the electromagnetic spectrum where all the lines of Balmer series lie in.

b/ Explain why this series was discovered before any other series.

**Question 4 (20 pts)** A spaceship and an elementary particle fly to the Earth's atmosphere at a speed of 40,000 km/h and  $0.75c$  respectively.

a/ Find the distance of travel of the spaceship after 37.5 min.

b/ Find the distance of travel of the particle after the spaceship has travelled 37.5 min.

Explain the difference between two results.

**Question 5 (20 pts)** The nucleus  ${}_{90}^{232}\text{Th}$ , having half life about 14 billion years, decays alpha and beta minus to  ${}_{82}^{208}\text{Pb}$ .

a/ Find the number of helium nuclei and the number of electrons emitted during this decay chain.

b/ People found in a rock 3.65 g of  ${}_{90}^{232}\text{Th}$  and 0.75 g of  ${}_{82}^{208}\text{Pb}$ . Knowing that all of the Pb was produced in the decay of Th, find the age of the rock.

**END OF QUESTION PAPER**