THE INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY - HCMC
FINAL EXAMINATION – CLASS

Student Name:_____ **Student ID:**_____

Date: JANUARY 2021

Duration: 90 minutes

SUBJECT: PHYSICS 2	
Head of Department of Physics: Signature: Full name: Phan Bao Ngoc	Lecturer: Signature: Full name: Do Xuan Hoi, Phan Hien Vu

INSTRUCTIONS: This is a closed book examination. Use of cell phones, laptops, dictionaries is not allowed.

Boltzmann constant: $k = 1.38 \times 10^{-23}$ J/K, gas constant: $R = 8.31$ J/(mol.K), 1atm = 1.01×10^5 Pa.

Question 1 (20 pts) A cylinder contains 0.1 mol of an ideal **monatomic** gas. Initially the gas is at a pressure of 1.00×10^5 Pa and occupies a volume of 2.50×10^{-3} m^3.

(a) Find the initial temperature of the gas in kelvins. 300.84K

(b) If the gas is allowed to expand to twice the initial volume, find the final temperature (in kelvins) of the gas if the expansion is adiabatic. 189.08K.

Question 2 (20 pts) The pressure of an ideal gas inside a spherical balloon with volume of 0.065 m^3 is 1.25 atm. The average translational kinetic energy of a molecule is 6.11×10^{-21} J.

(a) Find the temperature of the gas inside the balloon. 295.17K

(b) What is the total translational kinetic energy of all the molecules in the balloon? 12325.64J.

Question 3 (20 pts) A volume of air (assumed to be an ideal gas) is first cooled without changing its volume and then expanded without changing its pressure, as shown by the path *abc* in Fig.1.

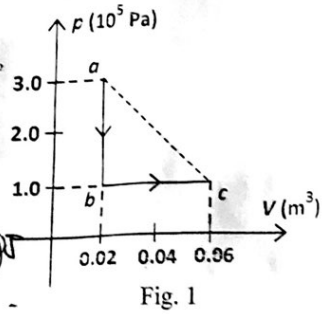

Fig. 1

(a) How does the final temperature (state *c*) of the gas compare with its initial temperature (state *a*)? $T_a = T_c$

(b) How much heat does the air exchange with its surroundings during the process *abc*? Does the air absorb heat or release heat during this process? 4000J

(c) If the air instead expands directly from state *a* to state *c*, how much heat does it exchange with its surroundings? 1093.93J.

Question 4 (20 pts) The means free path of nitrogen molecule at 27°C and 1.0 atm is 4.1×10^{-7} m.

(a) Calculate the diameter of each nitrogen molecule. 1.5×10^{-10} m.

(b) If the average speed of nitrogen molecule is 675 m/s, what is the time taken by the molecule between two successive collisions? 1.21×10^{-9} s

Question 5 (20 pts) An ice cube at −10°C is put into a Thermos flask containing 100 cm^3 of water at 30°C. The final equilibrium temperature of the system is 20°C.

(a) Determine the mass of the ice cube. 0.01kg

(b) How much has the entropy of the cube–water system changed? 1.45J/K.

$c_w = 4190$ J/kg·K, $c_i = 2220$ J/kg·K, $L_f = 3.33 \times 10^5$ J/kg, $\rho_w = 1000$ kg/m^3

END OF QUESTION PAPER

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