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

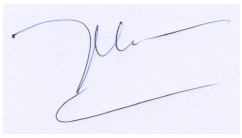
FINAL EXAMINATION – CLASS

Student Name:_____Student ID:_____

Date: JUNE 2021

Duration: 48 hours (8:00 AM 21/06/2021 – 8:00 AM 23/06/2021)

GROUP 1

SUBJECT: **PHYSICS 2**	
Head of Department of Physics: Signature: Full name: Phan Bao Ngoc	Lecturer: Phan Hiền Vũ Signature: 

Question 1. (20 pts) A sample of an ideal gas is taken through cycle ABCA shown in the **Fig. 1**. At point A, $T_A = 300$ K.

a/ Determine the temperature at B.

b/ Assume the BC process is isothermal, compute the work done by the gas on path BC.

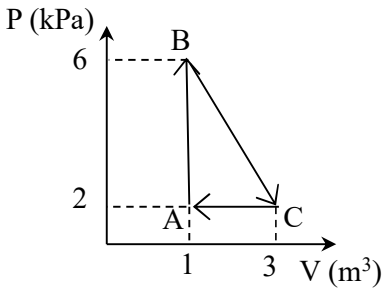


Fig. 1

Question 2 (20 pts) The mean free path of molecules of a 5 g oxygen gas in a container is 760 Angstroms. Assume the diameter of oxygen is 3.55 Angstroms.

a/ Determine the volume of the container.

b/ If the total translational kinetic energy of the oxygen gas is 1.95 kJ, calculate the mean time between collisions.

Question 3 (20 pts) The total kinetic energy of a 0.1 mole nitrogen gas in a 500 cm^3 container is 2.5 kJ.

a/ Compute the temperature and pressure inside the container.

b/ Determine the rms speed of the nitrogen molecules.

Question 4 (20 pts) A 100 g ice cube at -15^0C is dropped into 200 g of water at 30^0C in a thermally insulated container.

a/ What is the final temperature at thermal equilibrium?

b/ How much has the entropy of the ice cube–water system changed? Explain the physical meaning of your result.

Question 5 (20 pts) A sample of a monatomic ideal gas in a cylinder is taken through a reversible cycle. The gas initially at 10 L and 300 K is heated at constant volume to 600 K. Then, it is expanded isothermally to the initial pressure. Finally, it is compressed to its initial state. During the cycle, the net energy providing to the gas as heat is 7.2 kJ.

a/ How many moles of the gas are there in the cylinder?

b/ What is the net work done by the gas?

END OF QUESTION PAPER

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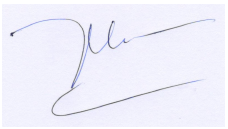
GROUP 2

SUBJECT: **PHYSICS 2**	
Head of Department of Physics: Signature: Full name: Phan Bao Ngoc	Lecturer: Phan Hiền Vũ Signature: 

Question 1. (20 pts) An ideal gas in a cylinder at the initial state of $V_i = 4\ m^3$, $p_i = 2.5\ kPa$, and $T_i = 400\ K$ is compressed at constant pressure to $V_f = 1\ m^3$.

a/ Compute the number of moles of the gas.

b/ Determine the energy released from the gas as heat.

Question 2 (20 pts) A 1 g nitrogen gas is in a 2 L container and the translational kinetic energy of each molecule of the gas is 2.75×10^{-20} J. Assume the diameter of nitrogen is 3.64 Angstroms.

a/ Calculate the mean free path of the gas.

b/ Find the frequency of collisions.

Question 3 (20 pts) The average speed of molecules of a 0.1 mole nitrogen gas in a container is 5×10^3 m/s.

a/ Determine the total translational kinetic energy of the gas.

b/ Compute the energy as heat providing to the gas so that the average speed of its molecules increases to double.

Question 4 (20 pts) An ice cube at -10^0C is dropped into 200 cm^3 of water at 20^0C in a thermally insulated container. When the ice cube–water system reaches equilibrium, the final temperature is 0^0C and water increases a volume of 44 cm^3.

a/ Determine the mass of the ice cube?

b/ Calculate the entropy change of the system? Explain the physical meaning of your result.

Question 5 (20 pts) Fig 1 shows a reversible cycle through which a 1 mole sample of a diatomic ideal gas is taken. At the point a, $T_a = 400$ K. At the point b, $T_b = 600$ K. Process bc is an isothermal expansion.

a/ What is the net energy providing the gas as heat?

b/ What is the net work done by the gas?

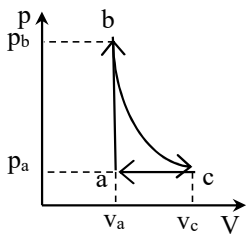


Fig. 1

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GROUP 3

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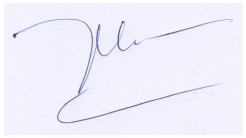
Head of Department of Physics: Signature: Full name: Phan Bao Ngoc	Lecturer: Phan Hiền Vũ Signature: 

Question 1. (20 pts) An ideal gas in a cylinder at the initial state of $V_i = 1\ m^3$, $p_i = 2.5$ kPa, and $T_i = 200$ K is compressed at constant volume to $p_f = 7.5$ kPa.

a/ Compute the number of moles of the gas.

b/ Determine the energy transferred to the gas as heat.

Question 2 (20 pts) Suppose a 2.5 g oxygen gas is in a 4 L container. Assume the diameter of oxygen is 3.55 Angstroms.

a/ Calculate the mean free path of the molecules.

b/ If the total translational kinetic energy of the oxygen gas is 0.98 kJ, compute the pressure of the gas.

Question 3 (20 pts) The translational kinetic energy of each molecule of an 0.1 mole nitrogen gas in a 500 cm^3 container is 2.75×10^{-20} J.

a/ Determine the temperature inside the container.

b/ Calculate the pressure in the container.

Question 4 (20 pts) A 50 g ice cube at -20^0C is dropped into a thermally insulated container containing water at 10^0C. The final temperature is 5^0C at thermal equilibrium.

a/ Determine the initial volume of water?

b/ Calculate the entropy change of the system? Explain the physical meaning of your result.

Question 5 (20 pts) Fig 1 shows a reversible cycle through which a 1 mole sample of a polyatomic ideal gas is taken. At the point a, $T_a = 500$ K. At the point b, $T_b = 800$ K. Process bc is an adiabatic expansion.

a/ What is the net energy transferred the gas as heat?

b/ What is the net work done by the gas?

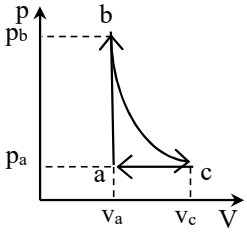


Fig. 1

END OF QUESTION PAPER