



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

B.Sc. (General) Degree
Second Year – Semester II Examination – Oct./Nov. 2015

PHY 2101- THERMODYNAMICS AND RADIATION

Answer **Two** Questions Only

Time allowed: Two hours

Universal gas constant (R) = 8.314 J K⁻¹ mol⁻¹

The use of a non-programmable electronic calculator is permitted.

1)

- a) Prove that the work done on the system of a fixed gas mass is given by $-PdV$ for a small volume change dV , where “ P ” is the pressure and “ V ” is the volume.
- b) Prove that the work done on a system consisting of ideal gas in an isothermal and quasi-static expansion is given by; (a) $W = nRT \ln(V_1/V_2)$ and (b) $W = nRT \ln(P_2/P_1)$. The symbols have their usual meanings.
- c) One mole of an ideal gas is initially confined to a container. The gas is then heated quasi-statically and isothermally until the pressure is tripled. What is the total work done on the environment by the system?

contd.,

2)

a) Write down the "First law of thermodynamics".

i) Prove that, a) $C_p - C_v = P \left(\frac{\partial V}{\partial T} \right)_p$ for real gases and

b) $C_p - C_v = R$ for an ideal gas.

b) Describe the operation of the Carnot ideal gas heat engine step by step with help of relevant diagrams.

3) Write down the "Second law of thermodynamics".

a) Write down the *Clausius Statement* of the Second Law of thermodynamics.

b) Write down the *Kelvin-Planck Statement* of the Second Law of thermodynamics.

c) Briefly explain,

i) Seebeck effect

ii) Peltier Effect and

iii) Thompson Effect.