

**Avisnashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University) Coimbatore – 641 043
Bachelors Degree Examination - November 2018
SEMESTER-I**

**Class: I B.SC.
Major : Physics**

**MAX.MARKS: 100
Time : 3 Hours**

18BPHC02- Heat and thermodynamics

Part-A

(10 x 1 = 10 MARKS)

Choose the correct answer

1. According to Dulong and Petit's law the average energy of an atom of a solid at temperature T is:
a) $1/2 KT$ b) KT c) $2KT$ d) $3KT$
2. Einstein's theory of specific heat of solids assumes that the atoms of a solid vibrate simple harmonically
a) the longitudinal waves b) like transverse waves
c) all with the same frequency d) in a complex number
3. The temperature of inversion of a gas is
a) a/Rb b) $2a/Rb$ c) $8a/27Rb$ d) $27a/8Rb$
4. Using adiabatic demagnetization, the minimum temperature produced is
a) $1K$ b) $10^{-3}K$ c) $10^{-4}K$ d) $10^{-5}K$
5. The dimensions of the constant b in Van der Waal's equation are that of
a) Volume b) Pressure c) Pressure/Volume d) Volume/Pressure
6. The average velocity of the molecules in a gas in equilibrium is
a) proportional to \sqrt{T} b) proportional to T^2 c) proportional to T d) equal to zero
7. In Carnot cycle the first step is
a) isothermal expansion b) isothermal compression
c) Adiabatic expansion d) Adiabatic compression
8. Transfer of heat from a body at a low temperature to a body at high temperature
a) is impossible b) is possible by keeping both the bodies in contact
c) is possible by doing external work d) none of these
9. Entropy remains constant in
a) adiabatic process b) isothermal process
c) isochoric process d) isolated process
10. Entropy is maximum in which state
a) Solid b) liquid c) gas d) can be any

Part-B**(5X6=30 MARKS)****Answer ALL questions****Each answer should not exceed 400 words or two pages**

- 11 a. Determine C_p by continuous flow electrical method.
(or)
- 11 b. State Dulong and Petit's law and explain the variation of the atomic heat of a substance with temperature.
- 12 a. Describe Nernst vacuum calorimeter and indicate briefly how it may be used to determine the specific heat at low temperatures.
(or)
- 12 b. Write short notes on adiabatic demagnetization.
- 13 a. Write the postulates of kinetic theory of gases.
(or)
- 13 b. Explain the concept of degrees of freedom by taking suitable examples.
- 14 a. Derive an expression for work done during an isothermal process.
(or)
- 14 b. State and prove Carnot's theorem.
- 15 a. Show that during a reversible adiabatic process the entropy of the system remains constant.
(or)
- 15 b. State and explain with example the third law of thermodynamics.

Part-C**(5X12=60 MARKS)****Answer ALL questions****Each answer should not exceed 800 words or four pages**

- 16 a. Define specific heat of a gas at constant volume. Describe the method of determining C_v using ~~Joly's~~ ^{Joule's} differential steam calorimeter.
(or)
- 16 b. Explain the Einstein's theory of specific heat capacity of solids and give the limitations of the theory.
- 17 a. Discuss Newton's law of cooling. How will you determine the specific heat of a liquid by Newton's law of cooling.
(or)
- 17 b. What is Joule-Kelvin effect? Describe the Porous plug experiment and what conclusions have been drawn from it?
- 18 a i) State the law of equipartition of energy. Using the law show that for a gas possessing f degrees of freedom the ratio of two specific heat (γ) is $(1+2/f)$. (6 marks)
ii) Derive an expression for viscosity of gases. (6 marks)
(or)
- 18 b. Derive Vander Waal's equation of state and use it to obtain the expressions for the critical constants in terms of the constants of the Vander Waal's equation.
- 19 a. Describe Carnot's cycle and obtain an expression for the efficiency of reversible Carnot engine with a perfect gas as the working substance.
(or)
- 19 b. Describe with necessary theory the construction and working of an internal combustion engine.
- 20 a. Derive an expression for the change of entropy of a perfect gas.
(or)
- 20 b. Deduce Maxwell's thermodynamic relations.
