

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2024
(Second Semester)
Branch – PHYSICS

THERMAL AND STATISTICAL PHYSICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	What is the range of a gas thermometer? a) -150 to 600°C b) -15 to 600°C c) -50 to 600°C d) -0 to 600°C	K1	CO1
	2	Which of the following is a type of temperature measurement device that uses the expansion of a liquid to measure temperature? a) Thermocouple b) Thermistor c) Mercury thermometer d) Both a & b	K2	CO1
2	3	Joule-Thomson effect explains the change in temperature that accompanies expansion of a gas a) without production of work or transfer of heat. b) with production of work or transfer of heat. c) without production of work or with transfer of heat. d) with production of work or without transfer of heat.	K1	CO2
	4	In van der Waal's equation, b is known as a) volume constant b) pressure constant c) volume correction d) pressure correction	K2	CO2
3	5	Rayleigh-Jeans law of Radiation a) applies to smaller wavelengths b) applies to longer wavelengths c) applies to all wavelengths d) does not apply to any wavelength	K1	CO3
	6	Wien's displacement law is expressed by the equation a) $\lambda_m T = \text{Constant}$ b) $\lambda_m \sqrt{T} = \text{Constant}$ c) $\lambda_m T^2 = \text{Constant}$ d) $\lambda_m T^3 = \text{Constant}$	K2	CO3
4	7	Out of the following, the physical quantity, that relates with the first law of thermodynamics is a) Temperature b) Pressure c) Energy d) Volume	K1	CO4
	8	In Carnot cycle, the first step is a) Isothermal expansion b) Isothermal compression c) Adiabatic expansion d) Adiabatic compression	K2	CO4

Cont...

5	9	Which of the following particles is a kind of Bose particle? a) Electrons b) Protons c) Photons d) Neutrons	K1	CO5
	10	The most probable distribution of particles obeying Maxwell – Boltzmann statistics is given by a) $n_i = g_i / (e^{\alpha + \beta \epsilon_i} + 1)$ b) $n_i = g_i / (e^{\alpha + \beta \epsilon_i} - 1)$ c) $n_i = g_i / e^{\alpha + \beta \epsilon_i}$ d) $n_i = g_i / e^{\alpha - \beta \epsilon_i}$	K2	CO5

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Discus the working of the clinical thermometer.	K5	CO3
	(OR)			
	11.b.	Describe the construction and working of thermoelectric thermometer.		
2	12.a	Explain the theory of Porus plug experiment.	K3	CO3
	(OR)			
	12.b.	Outline the properties of liquid helium I and II.		
3	13.a.	Deduce Newton's law of cooling from Stefan's law.	K3	CO3
	(OR)			
	13.b.	Deduce Wien's displacement law for the distribution of energy in black body spectrum.		
4	14.a.	A Carnot engine efficiency 40% and temperature of sink 300 K to increase up to 60% calculate the change in temperature of the source.	K4	CO4
	(OR)			
	14.b.	Calculate the efficiency of a Carnot engine operating between temperatures of 900 K and 300 K.		
5	15.a.	Derive the expression for Fermi – Dirac distribution.	K4	CO4
	(OR)			
	15.b.	Compare M-B, B- E and F- D statistics.		

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Describe the construction and working of platinum resistance thermometer.	K4	CO4
2	17	Derive Van der Waal's equation.	K4	CO4
3	18	Describe Lee's method for determination of the thermal conductivity of bad conductor	K4	CO4
4	19	Obtain Maxwell thermodynamic relations.	K5	CO3
5	20	Obtain the expression for Maxwell Boltzmann distribution law.	K5	CO3

Z-Z-Z END