

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2011-12 & thereafter)

SUBJECT CODE: 11PH/MC/TS24

B.Sc. DEGREE EXAMINATION APRIL 2015
BRANCH III - PHYSICS
SECOND SEMESTER

REG. No. _____

COURSE : MAJOR – CORE
PAPER : THERMAL PHYSICS AND STATISTICAL MECHANICS
TIME : 30 MINS. MAX. MARKS: 30

SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I CHOOSE THE CORRECT ANSWER:

1. Stefan-Boltzmann law is _____.
a. $E=\sigma T$ b. $E=\sigma T^2$ c. $E=\sigma T^3$ d. $E=\sigma T^4$
2. _____ law holds well in the region of longer wavelengths.
a. Planck's b. Rayleigh-Jeans c. Stefan's d. Wien's
3. Wien's displacement law _____ is equal to constant.
a. σT^4 b. $\lambda_m T$ c. σT d. λ_m/T
4. Thermodynamics is concerned with the relation of _____ to mechanical work.
a. heat b. pressure c. entropy d. enthalpy
5. First law of thermodynamics represents _____.
a. $dQ=dU-dW$ b. $dU=dW+dQ$ c. $dW=dU+dQ$ d. $dQ=dU+dW$
6. Coefficient of performance of a refrigerator is _____.
a. $(Q_2-Q_1)/Q_2$ b. $Q_2/(Q_1-Q_2)$ c. $(Q_1-Q_2)/Q_1$ d. $Q_1/(Q_1-Q_2)$
7. Unit of entropy is _____.
a. J/S b. J/N c. J/K d. J/Kg
8. The unattainability principle is called _____ of the thermodynamics.
a. zeroth law b. first law c. second law d. third law

9. The entropy remains constant during an _____ process.
 a. adiabatic b. isothermal c. isochoric d. isobaric
10. Entropy is a measure of the _____ of the molecules of the system.
 a. order b. disorder c. number d. volume
11. The temperature of inversion of helium is _____.
 a. -80°C b. -160°C c. -240°C d. -320°C
12. Helium II is called _____.
 a. fluid b. superfluid c. biofluid d. chemicalfluid
13. The value of mean square speed from distribution law is _____.
 a. 1kT/m b. 2kT/m c. 3kT/m d. 4kT/m
14. Phase space is called as _____.
 a. ϕ space b. μ space c. Ω space d. η space
15. The classical statistics is
 a. Maxwell-Boltzmann b. Bose-Einstein
 c. Fermi-Dirac d. Maxwell-Einstein

II **FILL IN THE BLANKS:**

16. Wien's law holds well in the region of _____ wavelengths.
17. All practical engines have efficiency _____ than the Carnot's engine.
18. The entropy is _____ in the gaseous state than in the liquid state.
19. Adiabatic demagnetization is also called as _____ effect.
20. Bose-Einstein and Fermi-Dirac statistics are _____ statistics.

III **STATE WHETHER TRUE OR FALSE:**

21. Black bodies absorb less radiant energy than bodies of lighter colors.
22. The zeroth law of thermodynamics deals with the thermal equilibrium.
23. Entropy of the system decreases in all irreversible processes.
24. Helium II forms a thin film on all solid surfaces is called rolling film.
25. The maximum number of molecules which possesses this velocity is called most probable velocity.

IV ANSWER BRIEFLY:

26. Define mean free path.

27. Mention any two thermodynamic coordinates of the system.

28. Define heat engine.

29. Define Joule-Thomson effect.

30. Define phase space.



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TIME : 2 ½ HOURS **MAX. MARKS: 70**

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

1. Deduce the expression for mean free path.
2. State and explain Clausius and Kelvin statement of second law of thermodynamics.
3. Calculate the efficiency of the Carnot's engine working between the temperatures 227°C and 15°C.
4. Calculate the change in entropy when 10 grams of ice at 0°C is converted into water at the same temperature. (latent heat of ice is 80 cal/gm)
5. Show that $C_p - C_v = R$ by using Maxwell's thermodynamics relation.
6. Derive first and second TdS equations.
7. At what temperature a black body will radiate thermal energy at the rate of 1 watt per square cm.

SECTION – C

ANSWER ANY THREE QUESTIONS: (3 x 15 = 45)

8. Deduce the expression for the coefficient of viscosity of the gases.
9. Derive the relation between isothermal and adiabatic elasticity.
10. Explain the change in entropy in a reversible and an irreversible process.
11. Deduce Clausius-Clapeyron's latent heat equation.
12. Compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

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