STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2015-16 & thereafter)

SUBJECT CODE: 15PH/MC/TS24

B.Sc. DEGREE EXAMINATION APRIL 2017
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 ON THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I CHOOSE THE CORRECT ANSWER:

1. Heat energy received by the earth from the sun is due to
   a) Convection b) Radiation c) Reflection of light d) Transmission of light

2. Emissivity of perfectly black body is
   a) 1 b) 2 c) 5 d) 0

3. Which of the following is most rapid process
   a) Conduction b) Convection c) Radiation d) None of these

4. According to Wien's Law
   a) λmT = Constant b) $\frac{\lambda m}{T}$ = Constant c) $\frac{T}{\lambda m}$ = Constant d) $T + \lambda m$ = Constant

5. Unit of Stefan's Constant is given by
   a) W/mK^2 b) W/m^2K^2 c) W^2/m^2K^4 d) W/mK

6. Which of the following variable controls the physical properties of a perfect gas.
   a) Pressure b) Temperature c) Volume d) all of the above

7. The unit of temperature is S.I units is
   a) Centigrade b) Celsius c) Fahrenheit d) Kelvin

8. General Gas Equation is
   a) PV= nRT b) PV = mRT c) PV= KiRT d) Cp_Cv = Wj

9. The value of n = 1 in the polytrophic process indicates it to be
   a) Reversible Process b) Isothermal Process
   c) Adiabatic Process d) Irreversible Process

10. Change of entropy is zero under a
    a) Isothermal b) Isochoric Process c) Isobaric Process d) None of these

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11. Increase of entropy is
    a) Good b) Nither Good (or) bad c) Bad d) None of these

12. Which set of conditions represents the easiest way to liquify a gas?
    a) Low Temperature and high pressure b) High Temperature and Low pressure
    c) Low Temperature and Low pressure d) High Temperature and high pressure

13. The Gibb's function G is Thermodynamics is defined as G = H – TS. In an Isothermal, Isobaric, reversible process, G
    a) Remains Constant but not zero b) Varies linearly
    c) Varies non linearly d) is zero

14. According to Maxwell's law of distribution of velocities of molecules the most probable velocity is
    a) Generate than the mean velocity b) Equal to the mean velocity
    c) Equal to roof mean square velocity d) Less than the roof mean square velocity

15. In a canonical ensemble a system A of fixed volume is in contact with a large reservoir B
    a) A can exchange only energy with B
    b) A can exchange only particles with B
    c) A can exchange neither energy nor particles with B
    d) A can exchange both energy and particles with B

II FILL IN THE BLANKS:

16. Heat transfer that occurs in the absence of a medium across space is called _____.
17. In an Isothermal process _____remains constant.
18. Process in which volume remains constant _____ process.
19. When a liquid boils is an _____ in entropy.
20. Entropy is a _____Function.

III STATE WHETHER TRUE OR FALSE:

21. The second law of Thermodynamics would backup this statement: Heat can be completely changed in to work.
22. Whenever energy transforms the total amount of energy remains constant.
23. Heat will never if itself flow from a cold object to a hot object.
24. Thermodynamic is the transformation of heat in to work.
25. The quantity E – TS is known as the Helmholtz free energy.

IV ANSWER BRIEFLY:

26. Define black body radiation.

27. What are thermo dynamic Co -ordinates?

28. Define Heat Engines.

29. Write any one Maxwell's relations.

30. Give the Clausius Clapeyron Equation.

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SECTION – B

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

1. Explain about Wien's Law.

2. Explain about liquefaction of gases and give the uses of helium.

3. A Metal ball 3 cm in radius is heated in a furnace to 5000C. If its emissivity is 0.5, at what rate does it radiate energy?

4. The motor in a refrigerator has a power output of 210 W. The freezing compartment is at -3.0ºC and the outside air is at 26ºC. Assuming that the efficiency is 85%of the ideal, calculate the amount of heat that can be extracted from the freezing compartment in 15 min.

5. A mixture of 1.78kg of water and 262 of ice at 0^0c is, in a reversible process, brought to a final equilibrium state where the water/ice ratio, by mass 1:1 at 0^0c.(a)Calculate the Entropy change of the system during this process.

6. Apparatus that liquefies helium is in a laboratory at 296 K. The helium in the apparatus is at 4.0 K. If 150 mJ of heat is transferred from the helium, find the minimum amount of heat delivered to the laboratory.

7. A Refrigerator does 153 J of work to transfer 568 J of heat from its cold compartment.
   (a) Calculate the refrigerator's coefficient of performance,
   (b) How much heat is exhausted to the kitchen?

SECTION – C

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

8. Derive Stefan-Boltzmann Law.
9. Explain Thermodynamic process.
10. Derive the expression connecting first and second law of thermodynamics.
11. Explain about Maxwell's relationships.
12. Explain clapeyron-clausius equation and also give its derivation.