Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (CBCSS-Reg./Sup./Imp.) Examination, November 2018
(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
5B07 PHY : Thermal Physics

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all**. Very short answer type. **Each** question carries **one** mark.   (4×1=4)

1. Entropy is a measure of

2. The number of coordinates in phase space of a single particle is

3. The T-S diagram of a reversible engine is a triangle. The area of the triangle gives

4. During an adiabatic process _____ is constant.

SECTION – B

Answer **any seven**. Short answer type. **Each** question carries **two** marks.   (7×2=14)

5. What is meant by principle of increase of entropy ?

6. What are extensive and intensive variables ? Give examples.

7. What are the postulates of statistical mechanics ?

8. Derive the first TdS equation.

9. Show that the work done during an isochoric process is always zero.

10. Derive an expression for efficiency from T-S diagram of a Carnot engine.

11. Briefly explain Black body radiation.

12. Show that entropy is a state function.

13. State and explain Zeroth law of thermodynamics.

14. What are thermodynamic potentials ?

SECTION – C

Answer **any four**. Short Essay/Problem type. **Each** question carries **three** marks.

(4×3=12)

15. State and prove Carnot's theorem.

16. A monatomic ideal gas of volume 1 litre at a pressure of 8 atmosphere undergoes adiabatic expansion until the pressure drops to 1 atmosphere. How much work is done ? (1 atmosphere = 10^5 N/m^2)

17. When a refrigerator is switched off, the ice stored in a cold storage melts at the rate of 36 kg/hour when the external temperature is 30°C. Find the minimum output power of the motor of the refrigerator required to prevent the ice from melting. L = 80 cal/g , 1 calorie = 4.2J.

18. Calculate the increase in entropy of 1 kg of ice when it is converted into steam. Specific heat of water 1 kcal kg^{-1}c^{-1}. Latent heat of ice 80 cal/g and Latent heat of steam 540 cal/g.

19. Draw the T-S diagram of an isochoric process. Prove that its slope is T/C_v.

20. Calculate the boiling point of water under a pressure of two atm. It is given that the boiling point of water under a pressure of one atmosphere is 373.2 K. Latent heat of vaporization is 539 cal/g. Specific volume of water is 1 cc and specific volume of steam is 1674 cc.

SECTION – D

Answer **any two**. Long essay type. **Each** question carries **five** marks.

(2×5=10)

21. Derive an expression for work done in a quasi-static process, hence to find the work done in (1) an isothermal process (2) adiabatic process.

22. Deduce thermodynamic potentials and derive Maxwells relations.

23. Describe Carnot's cycle and obtain an expression for the efficiency of an ideal heat engine in terms of temperatures.

24. State and prove Clausius theorem for entropy and write down Clausius mathematical statement of second law.