K17U 1707

Reg. No. : .....

Name : .....

V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination, November 2017
(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
5B07PHY : Thermal Physics

Time : 3 Hours Max. Marks : 40

SECTION – A

Answer **all**. Very short answer type. **Each** question carries **1** mark.

1. Internal energy of a perfect gas depends on _____
2. The efficiency of a heat engine is 100% when the temperature of sink is _____
3. The T-S diagram of a reversible engine is a triangle. The area of the triangle gives _____
4. Photons obey _____ statistics. **(4x1=4)**

SECTION – B

Answer **any seven**. Short answer type. **Each** question carries **two** marks.

5. What are extensive and intensive variables ? Give examples.
6. Derive an expression for workdone during an adiabatic process.
7. State and explain first law of thermodynamics.
8. Explain change of entropy in any reversible cycle.
9. What is Gibbs function ? Give 2 of its properties.
10. Write down Tds equation and explain the symbols.
11. Distinguish between Maxwell Boltzmann, Fermi Dirac and Bose Einstein statistics.
12. Define Fermi energy. Write down an expression for Fermi energy.
13. What is the significance of thermodynamics potentials ?
14. Give any four postulates of kinetic theory of gases. **(7x2=14)**

P.T.O.

SECTION – C

Answer **any four**. Short essay/problem. **Each** question carries **three** marks.

15. At what temperature is the root mean square speed of an atom in an Argon gas cylinder equal to the root mean square speed of a Helium gas atom at –20°c ?
16. 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 = 4.2 J.
17. Calculate the workdone when one litre of a monoatomic perfect gas at N.T.P. is compressed adiabatically to half its volume. $\gamma = 5/3$.
18. A reversible engine converts one fifth of heat which it absorbs at source into work. When the temperature of the sink is reduced by 77°c, its efficiency is doubled. Compute the temperature of the source and sink $\eta = 1/5$.
19. Calculate the change in entropy when 1 litre of water at 27°c is heated to 77°c.
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 vapourisation is 539 cal/g. Specific volume of water is 1 cc and specific volume of steam is 1674 cc. **(4x3=12)**

SECTION – D

Answer **any two**-long essay type-**each** question carries **five** marks.

21. Deduce thermodynamic potentials and derive Maxwells relations.
22. State and prove Clausius theorem for entropy and write down Clausius mathematical statement of second law.
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 Cartnot's theorem. **(2x5=10)**

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