



K20U 1545

Reg. No. :

Name :

V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination,
November 2020

(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
5B07PHY : Thermal Physics

Time : 3 Hours

Max. Marks : 40

Instruction : Write answers in English only.

SECTION – A

Very short answer type. **All** questions to be answered. **Each** question carries **1** mark.

1. Which is an extensive coordinate ?
a) Volume b) Temperature c) Pressure d) None
2. The change in entropy in a reversible cycle is _____
3. During an adiabatic process _____ is constant.
4. At absolute zero all states up to _____ energy level are occupied. **(4×1=4)**

SECTION – B

Short answer type. **7** questions to be answered. **Each** question carries **2** marks.

5. State the third law of thermodynamics.
6. What is a refrigerator and define its coefficient of performance ?
7. Draw the T-S diagram for the Carnot cycle.
8. What is meant by principle of increase of entropy ?
9. Is it possible to obtain 100% efficiency for a heat engine ? Give reason.
10. What are extensive and intensive variables ? Give examples.
11. What do you mean by an indicator diagram ? Explain it.
12. Derive the first TdS equation.
13. What are the postulates of statistical mechanics ?
14. Distinguish between bosons and fermions. **(7×2=14)**

P.T.O.



SECTION – C

Short essay/problem type. 4 questions to be answered. **Each** question carries 3 marks.

15. A Carnot engine takes 200 calories of heat from a source at temperature 400K and rejects 150 calories of heat to sink. What is the temperature of the sink ? Also calculate the efficiency of the engine.
16. A monatomic ideal gas of volume 1 litre at a pressure of 8 atmos. undergoes adiabatic expansion until the pressure drops to 1 atmosphere. How much work is done ? (1 atmos = 10^5 N/m²).
17. Calculate the increase in entropy of 1kg of ice when it is converted into steam. Specific heat of water 1Kcal kg⁻¹ c⁻¹. Latent heat of ice 80 cal/g and Latent heat of steam 540cal/g.
18. When a refrigerator is switched off, the ice stored in a cold storage melts at the rate of 36kg/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.
19. 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 373.2K. Latent heat of vaporization is 539cal/g. Specific volume of water is 1cc and specific volume of steam is 1674cc.
20. Radiation from Big Bang has been Dopler shifted to longer wavelength by the expansion of universe and today has a spectrum corresponding to that of a black body at 2.7 K. Find the wavelength at which the energy density of this radiation is maximum. In what region of this spectrum is this radiation ? (4×3=12)

SECTION – D

Long essay type. Answer **any 2**. **Each** question carries 5 marks.

21. Derive Maxwells 4 thermodynamical relations. Use one of them to obtain Clausius-Clapeyron's Latent heat equation.
22. Obtain the expression for entropy of a perfect gas in terms of Pressure, Volume and Specific Heats.
23. State and prove Carnot's theorem.
24. Explain the Diesel cycle and the working of a Diesel engine. Derive an expression for its efficiency. (2×5=10)