K16U 1725

Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree (CBCSS – 2014 Admn. Regular) Examination, November 2016

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 **1** mark.

1. During an adiabatic process _____ is constant.
2. Electric charge is an _____ parameter.
3. Entropy is a measure of _____
4. Bose-Einstein statistics is applied to particles which are _____ **(4×1=4)**

SECTION – B

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

5. State and explain Zeroth law of thermodynamics.
6. What is a refrigerator and define its coefficient of performance.
7. What is Carnot's theorem ?
8. Derive an expression for efficiency from T-S diagram of a Carnot engine.
9. What are thermodynamic potentials ?
10. What is meant by principle of increase of entropy ?
11. State and explain equipartition theorem.

P.T.O.

12. Briefly explain Black body radiation.

13. What is Helmholtz free energy ?

14. Define root mean square velocity. Write an expression for the root mean square velocity. **(7×2=14)**

SECTION – C

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

15. Deduce the value of γ for monoatomic and diatomic gases.

16. A Carnot's refrigerator takes heat from water at 0°C and rejects it to a room at temperature 27°C. 1 kg of water at 0°C is to be changed into ice at 0°C. How many calories of heat are rejected to the room ? What is the workdone by the refrigerator in this process ? What is the coefficient of performance of the machine ?

17. A monoatomic 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 = $10^5 N/m^2$).

18. 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 sink ? Also calculate the efficiency of the engine.

19. 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 540 cal/g.

20. Calculate the melting point of ice under a pressure of 2 atm. it is given that the melting point ice under 1 atmospheric pressure is 273.16K. Latent heat of fusion of ice is 79.6 cal/g and at the melting point specific volume of ice is 1.0908cc and that of water is 1.0001cc. One atm = 1.013×10^6 dynes/cm^2. **(4×3=12)**

SECTION – D

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

21. Derive Maxwells 4 thermodynamical relations. Use one of them to obtain Clausius-Clapeyron's Latent heat equation.

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

23. Derive an expression for workdone in a quasi-static process, hence to find the workdone in

    1) an isothermal process

    2) adiabatic process

    3) an isobaric process.

24. State postulate of kinetic theory. Hence derive the expression for pressure exerted by ideal gas.

(2×5=10)
