M 9932

Reg. No. : ....

Name : ....

**V Semester B.Sc. Degree (CCSS-Reg./Supple./Imp.)
Examination, November 2015
Core Course in Physics
5B07 PHY : THERMAL PHYSICS
(2011 and Earlier Admission)**

Time : 3 Hours   Max. Weightage : 30

SECTION – A

Each bunch of **four** questions carries a weight of **1**.

Choose the **correct** answer from the given list of **4** alternatives.

1. i) Of the following which is an intensive coordinate ?

    a) Area   b) Temperature

    c) Length   d) None of these

    ii) The mathematical form of first law of thermodynamics is

    a) $dQ=dU + dW$ b) $dQ=dU - dW$

    c) $dW=dU + dQ$ d) $dU=dQ + dW$

    iii) The maximum efficiency of a heat engine is

    a) 0.25   b) 0.50

    c) 0.75   d) 1.00

    iv) A device which converts thermal energy into mechanical work continuously
    is called

    a) Heat engine   b) Refrigerator

    c) Thermostat   d) None of these   **(W = 1)**

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2. i) The unit of entropy is
   a) J/K
   b) JK
   c) K/J
   d) $J^{-1}K^{-1}$

   ii) The numerical value of the slope of an isenthalpic curve is called
   a) JK coefficient
   b) Temperature Coefficient
   c) Volume Coefficient
   d) Critical constant

   iii) Bosons are particles of
   a) Any spin
   b) Spin half
   c) Spin Zero
   d) Odd half integral spins

   iv) The average energy per degree of freedom of a molecule is
   a) KT
   b) 0.5KT
   c) 2KT
   d) 0.25KT

   (W = 1)

SECTION – B

Answer **any six** questions. **Each** question carries a weight of **1**.

3. State the zeroth law of thermodynamics. Briefly explain.

4. Distinguish between isothermal and adiabatic process.

5. Explain quasi-static process.

6. Give any four postulates of Kinetic theory of the ideal gas.

7. What are the essential parts of a heat engine ?

8. Explain the effect of pressure on the boiling point of liquid.

9. Explain the third law of thermodynamics.

10. Discuss Fermi-Dirac statistics.

   (6×1=6)

SECTION – C

Answer **any nine** questions. **Each** question carries a weight of **2**.

11. Derive an expression for workdone during an isothermal process.

12. Show that the slope of the adiabatic is γ times the slope of an isothermal, where γ is the ratio of specific heats of an ideal gas.

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13. A quantity of dry air at 27°C is compressed adiabatically to half of its volume. Calculate the change in its temperature. (γ=1.4).

14. Explain the cycle of operations involved in a gasoline engine.

15. The efficiency of a Carnot engine working between two temperatures is 0.2. When the temperature of the source is increased by 25°C the efficiency increases to 0.25. Find the temperature of source and sink.

16. Prove that $Tds = C_v dT + T\left(\dfrac{\partial P}{\partial T}\right)_T dV$.

17. Briefly explain first order phase transition.

18. Calculate under what pressure water would boil at 150°C if the change in specific volume when Ig of water is converted into steam is 1676cc. Given latent heat of vapourisation of steam is 2268 JK^{-1}.

19. Write three differences between MB, BE and FD statistics.

20. Calculate the change in temperature of boiling water when the pressure is increased by 27.12 mm of Hg. The normal boiling point of water at atmospheric pressure is 100°C. Latent heat of steam is 2255400 J/Kg and specific volume of steam is 1674×10^{-6} m^3.

21. Explain enthalpy and Gibbs potential.

22. State and explain first law of thermodynamics.

   (9×2=18)

SECTION – D

Answer **any one** question. **Each** question carries a weight of **4**.

23. Explain the Carnot Cycle and the working of Carnot Engine. Derive an equation for the efficiency of Carnot Engine.

24. Derive Maxwell's thermodynamic relations. Also obtain the two Tds equations.

   (1×4=4)

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