15U606   (Pages: 2)   Name: ……….……..……….

Time: Three Hours   Maximum: 80 Marks

Section A

Answer *all* the questions. Each question carries **1** Mark:

1. The process in which enthalpy is a constant is --------------

2. Name an extensive variable ?

3. The behaviour of electron gas can be described by -------------- statistics.

4. Name the thermodynamic process for which $dQ = dW$

5. What is the shape of T.S diagram for adiabatic process ?

6. An ideal gas is isothermally expanded. Its internal energy will --------------

7. A white dwarf, which is a highly degenerate system, can be studied using ---------- Statistics.

8. State Carnot's Theorem

9. Slope of Adiabatic process = -------------- slope of Isothermal process.

10. At absolute Zero, the value of entropy is --------------

(10 x 1 = 10 Marks)

Section B

Answer *all* the questions. Each question carries *2* marks:-

11. Deduce an expression for work done during an adiabatic process ?

12. Prove the relation $(\delta Cp/ \delta P)_T = -T (\delta^2 V/\delta rT^2)_P$.

13. State and explain equipartition theorem.

14. Calculate average energy per molecule of an ideal gas by Maxwell - Boltzmann distribution.?

15. Calculate the efficiency of Carnot engine from Temp – entropy diagram of Carnot cycle.?

16. Draw the entropy versus temperature curve of first & second order phase transitions.

17. What are the properties of fermions?

(7 x 2 = 14 Marks)

Section C

Answer ant *five* questions. Each question carries 4 marks

18. Distinguish between bosons & fermious ?
19. From 1st law of Thermodynamics, derive mayer's relation ?
20. Deduce an expression for change in entropy of a perfect gas in terms of
    1) P & T   2) V & T
21. Derive the relation $(\delta H/ \delta S)_P = T$.
22. State & explain Stefan's law of radiations ?
23. Explain the change in entropy during irreversible process ?
24. What are thermodynamic potentials ? Deduce their expressions ?

(5 x 4 = 20 Marks)

Section D

Answer any *four* questions. Each question carries 4 marks

25. Calculate the change in entropy when 1 litre of water at 27^0C is heated to 120^0C steam
26. An object is at a temperature of 400^0C .At what temperature would it radiate energy twice as fast ?
27. The initial temperature of a gas is 27^0C. Calculate the temperature when the gas is compressed suddenly to 8 times it's original pressure. ($\gamma = 1.5$)
28. 1 kg of water at 100^0C is dropped in to Indian Ocean at 25^0C. Calculate change in entropy of universe.
29. The efficiency of a Carnot engine is 1/6, on reducing temperature of sink by 65^0C efficiency becomes 1/3 . Find out initial temperatures of source and sink.
30. Two six faced dice each marked 1 to 6 are thrown. Calculate the probability that one of the dice shows 6 and the other shows 5?.
31. If the maximum wavelength of emission of a black body is $2x10^{-9}$nm, find its temperature. The value of Weins constant is 0.002899 mK.?

(4x4 = 16 Marks)

Section E

Answer any *two* questions. Each question carries *10* marks

32. Compare Maxwell – Boltzmann, Fermi Dirac & Bose – Einstein Statistics ?
33. What are the basic thermodynamic potentials ? Obtain Maxwell's thermodynamic relations from the thermodynamic potentials?
34. What is entropy- temperature diagram ? Mention its uses. Obtain the expression for efficiency of Carnot engine using temperature entropy diagram of Carnot cycle.
35. Explain four thermodynamic potentials. Explain Maxwell's T.d. relations by citing examples?

(2x10 = 20 Marks)

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