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Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, August 2024

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry

PY 1231.2 : THERMAL PHYSICS

(2018 – 2022 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions; each carries 1 mark.

1. State Fick's law.
2. Define diffusivity.
3. State Stefan's law.
4. Define absorptive power.
5. State Wiedemann-Franz law.
6. Define adiabatic process.
7. State Clausius second law of thermodynamics.
8. Name the four strokes in the diesel cycle.
9. State the principle of increase of entropy.
10. Define entropy.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight**; each carries **2** marks.

11. Compare liquid diffusion and heat conduction through a solid.
12. Distinguish between emissive power and emissivity.
13. State and explain Kirchoff's law.
14. Distinguish between isothermal and adiabatic process.
15. State two demerits of diesel engine.
16. Derive an expression for the work done in an isothermal process.
17. Draw TS diagram of Carnot cycle.
18. Write a note on entropy and disorder.
19. State and explain Planck's law.
20. Draw indicator diagram of petrol engine.
21. Show that change in entropy is zero in a Carnot cycle.
22. Give the expression for the efficiency of a petrol engine and explain the symbols involved.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six**; each carries **4** marks.

23. A body at 1500K emits maximum energy at wavelength 20,000 Å. If the sun emits maximum energy at wavelength 5500 Å, what would be the temperature of the sun?
24. A brass boiler has a base area $0.15\,m^2$ and thickness 1 cm. It boils water at the rate of 6 kg/min when placed on a gas stove. Estimate the temperature of the part of the flame in contact with the boiler.

    K for brass = $109\,Js^{-1}m^{-1}K^{-1}$

    Heat of vaporization of water = 2256 J/Kg
25. One mole of a gas at 27°C expands adiabatically until its volume is doubled. Calculate the work done ($\gamma = 1.4$).

26. Show that adiabatic elasticity is Y times isothermal elasticity.

27. A Carnot engine working between two temperatures has efficiency 0.2. When the temperature of the source is increased by 25°C, the efficiency increases to 0.25. Find the temperature of the source and sink.

28. Calculate the change in entropy when 200 gram of ice at 0°C is converted into water at the same temperature.

    Given Latent heat of fusion of ice = 3.35×10^5 J/kg

29. Calculate the wavelength and frequency of a quantum of radiation of energy.

    1.65×10^{-18} J. Given $h = 6.6 \times 10^{-34}$ J.s, $c = 3 \times 10^8$ m/s

30. A quantity of air at 27°C and atmospheric pressure is suddenly compressed to half its original volume. Find the final pressure and temperature ($\gamma = 1.4$).

31. Calculate the work done if 1 mole of an ideal gas is compressed isothermally at 27°C to 1/5 of the original volume.

    $R = 8.31$ Jmol^{-1}K^{-1}

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two**; each carries **15** marks.

32. Describe Lee's disc method to determine the thermal conductivity of a bad conductor.

33. Describe Carnot's cycle and obtain an expression for the efficiency of an ideal heat engine in terms of temperature.

34. Derive an expression for the change of entropy when 1Kg of ice is converted into steam at 100°C.

35. Define solar constant. Describe an experiment to determine solar constant. How can we determine surface temperature of the sun?

(2 × 15 = 30 Marks)