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Second Semester B.Sc. Degree Examination, December 2021

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1231.1 HEAT AND THERMODYNAMICS

(2014-2017 Admission)

Time : 3 Hours Max. Marks : 80

PART – A

Answer **all** questions. Answer should not exceed two sentences. Each question carries **1** mark.

1. What is the effect of pressure on thermal conductivity?

2. Define coefficient of thermal conductivity.

3. What is meant by a perfectly black body?

4. Explain the term absorptive power of a body.

5. State the Clausius's statement of second law thermodynamics.

6. Explain the physical significance of first law of thermodynamics.

7. The efficiency of actual diesel engine is greater than that of a petrol engine, Explain the reason.

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8. Mention the physical significance and properties of entropy.

9. What is the unit of entropy?

10. Explain the term isoentropics.

(10 × 1 = 10 Marks)

PART – B

Answer **any eight** questions. Answer should not exceed **one** small paragraph. Each question carries **2** marks.

11. State and explain thermometric conductivity.

12. Discuss the distribution of energy in the spectrum of black body.

13. Define the term thermal radiation.

14. State Wien's displacement law.

15. Discuss the term adiabatic process.

16. Derive the equation for isothermal elasticity.

17. What do you mean by quasi-static process?

18. Explain the terms (a) Isochoric process (b) Isobaric process.

19. What happens to change in entropy of a system which undergoes an adiabatic process? Explain.

20. Explain the concept of entropy and disorder.

21. Write the expression for efficiency of a reversible Carnot's engine and draw the T.S diagram.

22. Draw and explain the labeled indicator diagram for diesel engine.

(8 × 2 = 16 Marks)

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PART – C

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

23. An ice box is built of wood 1.75 cm thick, lined inside with cork 3 cm thick. If the temperature of the inner surface of the cork is 0°C and that of the outer surface of wood is 12°C. what is the temperature of the interface? The thermal conductivity of wood and cork are 0.0006 and 0.00012 CGS units respectively.

24. A furnace is at a temperature of 2500K. At what wavelength will you expect the greatest intensity radiation? Is it in the visible region?

    (Wien's constant b = 2.892×10^{-3} mK)

25. Find the efficiency of the Carnot's engine working between the steam point and the ice point.

26. Calculate the increase in entropy of 10kg of water at 100°C when it changes to vapour. Given latent heat of steam = 540 cal/gram.

27. Two large closely spaced concentric spheres (both are black body radiators) are maintained at temperatures 100K and 200K respectively. The space in between the two spheres is evacuated. Calculate the net rate of energy transfer between the two spheres. Given that Stefan's constant = 5.672×10^{-8} S units.

28. Show that Planck's law reduces to Wien's law for shorter wavelengths and Rayleigh-Jeans law for longer wavelengths.

29. Show that entropy remains constant in reversible process.

30. State and prove the principle of increase of entropy.

31. Deduce an expression for work done during an adiabatic process.

($6 \times 4 = 24$ Marks)

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PART – D

Answer **any two** questions. Each question carries **15** marks.

32. Define solar constant. How do you find the temperature of the sun from knowledge of solar constant and Stefan's law?

33. What are Planck's hypotheses? Derive an expression for Planck's law of radiation.

34. What is T-S diagram? Find the expression for efficiency of a reversible Carnot's engine with the help of T-S diagram.

35. (a) What is an indicator diagram? State its importance.

    (b) Deduce the expression for work done during isothermal processes.

(2 × 15 = 30 Marks)

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