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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**

**(2023 Admission)**

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. State the second law of thermodynamics.
2. What is meant by a black body?
3. Define Fick's law.
4. Define thermometric conductivity.
5. What is Wien's displacement law?
6. What is meant by the solar constant?
7. What is the principle of increase of entropy?
8. What is Graham's law and explain mathematically?

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9. What is absorptive and emissive power?
10. What are the four steps of the Carnot cycle?

(10 × 1 = 10 Marks)

### SECTION – B

Answer any **eight** questions. Each carries **2** marks.

11. What is Kirchhoff's 1<sup>st</sup> and 2<sup>nd</sup> law?
12. Show that the slope of an adiabatic is  $\gamma$  times that of an isothermal.
13. Explain the concept of reversible and irreversible process.
14. Obtain the expressions for change in entropy for unit mass of a perfect gas in terms of pressure and temperature.
15. What is the difference between liquid diffusion and heat conduction?
16. What is meant by thermal conductivity?
17. What is the Wiedemann-Franz law?
18. Briefly discuss disorder in terms of entropy.
19. State and explain Stefan's law.
20. Explain Clausius statement.
21. Draw the slopes of adiabatic and isothermals with explanation.
22. Write four examples of irreversible process.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Find the efficiency of the Carnot's engine working between the steam point and the ice point.
24. A black body at 300K radiates energy at the rate of  $459 \text{ Wm}^{-2}$ . Deuce  
(a) The value of Stefan's constant,  
(b) The amount of heat radiated per second by a sphere of radius  $5 \times 10^{-2} \text{ m}$  at a temperature of 1200 K.
25. Calculate the change in entropy when 0.010 kg of ice at  $0^\circ\text{C}$  is converted in to water at the same temperature. Latent heat of ice is  $336 \times 10^3 \text{ J/kg}$ .
26. A carnot engine working between a source at temperature  $27^\circ\text{C}$  and a sink at  $-73^\circ\text{C}$  delivers 300 calorie of heat to the latter in one cycle. Calculate the work performed in joule by the engine per cycle.
27. Calculate the efficiency of a diesel engine having compression ratio 13.8 and expansion ratio 6. (Given: Ratio of specific heat capacity = 1.4)
28. One gram molecule of a gas expands isothermally to four times of its volume. Calculate the work done in times of the gas constant.
29. Draw P-V diagram and T-S diagram. Explain.
30. Briefly explain the distribution of energy in black body spectrum.
31. A slab is 2 cm thick and  $0.01 \text{ m}^2$  in cross sectional area. It is found that 4.2 J of heat flows through the slab per second, when the difference of temperature between the end faces is 100 K. Find the thermal conductivity of the slab.

**(6 × 4 = 24 Marks)**

## SECTION – D

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

32. Describe Lee's method to find the coefficient of thermal conductivity of poorly conducting materials.
33. Draw the cycle of diesel engine. Explain the cycle of a diesel engine and write the expression for efficiency.
34. Derive the expression for the change of entropy in an irreversible and reversible isothermal process.
35. Calculate the work done in a Carnot's cycle of operations. Derive an expression for its efficiency.

**(2 × 15 = 30 Marks)**

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