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J – 2707

Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, May 2020

First Degree Programme Under CBCSS

Complementary Course for Chemistry

PY 1231.2 – THERMAL PHYSICS

(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. **Each** question carries **1** mark.

1. State Fick's law.
2. State Graham's law of diffusion..
3. Define coefficient of thermal conductivity
4. State Wiedemann and Franz law.
5. What is perfect blackbody?
6. State Planck's radiation law.
7. Define isothermal process.

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8. State Kelvin-Planck statements.

9. Define entropy.

10. State the second law of thermodynamics in terms of entropy.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions, **not** exceeding a paragraph. **Each** question carries **2** marks.

11. Compare liquid diffusion and heat conduction.

12. Explain the terms emissive power and absorptive power.

13. Derive an expression for the work done during an adiabatic process.

14. Obtain the relation between isothermal and adiabatic elasticity.

15. Briefly explain Carnot cycle.

16. Derive an expression for the change of entropy during irreversible cycle.

17. Briefly discuss Temperature-Entropy diagram.

18. State and explain the principle of degradation of energy.

19. State and explain Kirchhoffs law of heat radiation.

20. Briefly discuss entropy and disorder.

21. State and explain Clausius's statement.

22. Explain the cycle of petrol engine.

(8 × 2 = 16 Marks)

SECTION – C

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

23. An icebox is built of wood 1.75cm thick, lined inside with cork 3cm 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 0.000 12 CGS units respectively.

24. The sun radiates energy at the rate of 6.4×10^7 W/m^2. Calculate its temperature assuming it to be a black body. $\sigma = 5.67 \times 10^{-8}$ MKS units.

25. Calculate the surface temperature of the sun, given that $\lambda_m = 4753$°A, λ_m being wavelength of maximum intensity of emission, $b = 2.898 \times 10^{-3}$ mK.

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

27. A gas occupying a volume of 10^{-2} m^3 at a pressure of 5 atmosphere expands isothermally to a pressure of 1 atmosphere. Calculate the work done.

28. A Carnot engine has an efficiency of 30 % when the temperature of the sink is 27°C. What must be the change in temperature of the source to make its efficiency 50%?

29. In a Carnot engine the temperature of source and sink are 500K and 375K. If the engine consumes 25×10^5 J per cycle. Find the (i) efficiency of the engine (ii) Work done per cycle (iii) Heat rejected to the sink per cycle.

30. Calculate the change in entropy when 100 grams of ice at 0°C is converted into water at the same temperature. Latent heat of ice 80cal/g.

31. Calculate the number of modes in a chamber of volume 50cc in the frequency range 4×10^{14} and 4.01×10^{14} s^{-1}.

(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 metals.

33. Briefly discuss Wein's displacement law and Rayleigh Jeans's law. What are its limitations?

34. Draw the Diesel cycle. Explain the cycle of a diesel engine and write the expression for efficiency.

35. Derive an expression for the change in entropy when 1Kg of ice at 0°C is converted to steam at 100°C.

(2 × 15 = 30 Marks)