MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

Second Semester B.Sc. Degree Examination, June 2016
First Degree Programme under CBCSS
Complementary Course: Physics – II (for Chemistry)
AUPY231.2b: Thermal Physics

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. State Graham's law of diffusion.
2. State Fick's law.
3. Define temperature gradient.
4. Define thermometric conductivity.
5. State Weidmann Franz law.
6. Define emissive power.
7. Define isothermal process.
8. What is the ratio of adiabatic to isothermal elasticity ?
9. What is the unit of entropy ?
10. What is the relation between entropy and available energy ?

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. Discuss the analogy between liquid diffusion and heat conduction.
12. Obtain an expression for heat conducted by a body and hence define thermal conductivity.
13. Define radiation of heat; mention any three properties of heat radiation.
14. State and explain Kirchhoff's law.
15. State and explain Stefan's law.

16. Discuss Planck's explanation of energy distribution in the spectrum of a black body.
17. Obtain an expression for work done during an adiabatic process.
18. What are heat engines ? Explain the essential parts of a heat engine.
19. Distinguish first and second order phase transitions.
20. Explain change in entropy during reversible and irreversible process.
21. Obtain an expression for change in entropy when ice at 0° C is converted to steam at 100° C.
22. Draw TS diagram for a Carnot's cycle and obtain an equation for its efficiency.

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type / Problems : Answer any **SIX** questions.*

23. An ice box is made of wood 1.75 cm thick, lined inside with cork 3 cm thick. If the temperature of inner surface of cork is 273 K and outer surface of wood is 285 K, find the temperature of interface. The thermal conductivity of wood and cork are 0.0006 and 0.00012 cgs units respectively.
24. Two large closely spaced concentric spheres are maintained at temperatures 200 K and 300 K respectively. The space in between is evacuated. Calculate the net rate of energy transfer between the spheres. Given $\sigma = 5.67 \times 10^{-8}$ SI units.
25. Calculate surface temperature of sun. Given the wave length of maximum intensity of radiation emitted by sun is 475.3 nm.
26. One mole of He at 300 K is adiabatically compressed so that pressure increases by 10 times. Find the final temperature attained. Given $\gamma = 1.67$.
27. One mole of a gas at 92° C expands isothermally to double its volume. Calculate the work done.
28. Find the efficiency of a Carnot's engine working between ice point and steam point.
29. A petrol engine using ideal air as working substance has its compression ratio raised from 5 to 6. Find the % increase in efficiency.
30. Calculate the change in entropy when 10 gram ice at 0° C is converted to water at same temperature. Given L_f of ice is 336000 J/Kg.
31. One gram molecule of a gas expands isothermally to four times its volume. Calculate the change in entropy.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. Obtain an equation to find thermal conductivity of a rubber tube and hence discuss the experiment to find its thermal conductivity.
33. Explain distribution of energy in a black body and explain Wien's, Rayleigh – Jean's and Planck's explanation of the spectrum.
34. Explain Carnot's cycle and deduce an equation for efficiency of an ideal heat engine.
35. Describe the construction and working of a petrol engine and hence obtain an equation for its efficiency.

(2 × 15 = 30 Marks)

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