SRI A S N M GOVERNMENT COLLEGE (A), PALAKOL, W.G. DT

II B. Sc. Physics Semester-IV: Syllabus 2019-2020

Department of Physics

PAPER IV: Thermodynamics &Radiation Physics

4 Hour/Week
Total Hours: 60

UNIT I (11 hrs)

1.Kinetic theory of gases:

Introduction –Deduction of Maxwell's law of distribution of molecular speeds, experimental verification. Transport phenomena – Mean free path - Viscosity of gases-thermal conductivity-diffusion of gases.

Addl. Inputs: Verification of Maxwell's law of distribution of molecular speeds by toothed wheel experiment.

UNIT II(14 hrs)

2. Thermodynamics:

Introduction- Isothermal and adiabatic process- Reversible and irreversible processes-Carnnot's engine and its efficiency-Carnot's theorem-Second law of thermodynamics. Kelvin's and Claussius statements-Entropy, physical significance –Change in entropy in reversible and irreversible processes-Entropy and disorder-Entropy of Universe–Temperature-Entropy (T-S) diagram and its uses - Change of entropy of a perfect gas- change of entropy when ice changes into steam.

Add.Inputs: Introduction to Celsius Scale and Fahrenheit Scale, Relation between them. Thermodynamic scale of temperature, Diesel engine.

UNIT III(11 hrs)

3. Thermodynamic potentials and Maxwell's equations

Thermodynamic potentials-Derivation of Maxwell's thermodynamic relations-Clausius-Clayperon's equation-Derivation for ratio of specific heats-Derivation for difference of two specific heats for perfect gas.Joule Kelvin effect-expression for Joule Kelvin coefficient for perfect and vander Waal's gas.

UNIT IV(10 hrs)

4. Low temperature Physics

Introduction-Joule Kelvin effect-Porous plug experiment - Joule expansion-Distinction between adiabatic and Joule Thomson expansion-Expression for Joule Thomson cooling-Liquefaction of helium, Kapitza's method-Adiabatic demagnetization, Production of low temperatures -applications of substances at low temperature-effects of chloro and fluoro carbons on ozone layer.

UNIT V(14 hrs)

5. Quantum theory of radiation

Blackbody-Ferry's black body-distribution of energy in the spectrum of black body-Wein's displacement law,Wein's law, Rayleigh-Jean's law-Quantum theory of radiation-Planck's law-Measurement of radiation-Types of pyrometers-Disappearing filament optical pyrometer-experimental determination – Angstrompyrheliometer-determination of solar constant, Temperature of Sun.

Add.Inputs: Deduce Wein's law and Rayleigh-Jean's law from Planck's Law.

TEXT BOOKS:

1. BSc Physics, Vol.2, *Telugu Akademy, Hyderabad*
2. Thermodynamics, R.C. Srivastava, Subit K. Saha&Abhay K. *Jain Eastern Economy Edition*.
3. Unified Physics Vol.2, Optics & Thermodynamics, *Jai Prakash Nath&Co.Ltd., Meerut*
4. Second Year Physics, K. Ramakrishna,D.V.Brahmaji,A.Sreenivasa Rao & S.L.V. Mallikarjun, VikasPublications,Guntur.

REFERENCE BOOKS:

1. Fundamentals of Physics. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*
2. Heat, Thermodynamics and Statistical Physics-N Brij Lal, P Subrahmanyam, PS Hemne, *S.Chand& Co.,2012*
3. Heat and Thermodynamics- MS Yadav,*Anmol Publications Pvt. Ltd, 2000*
4. University Physics, HD Young, MW Zemansky,FW Sears, *Narosa Publishers, New Delhi*
5. Text Book of +3 Physics – Samal, Mishra &Mohanty, National Library, Min.of Culture, Govt of India.
6. Modern Engineering Physics, A.S. Vasudeva, S.Chand& Co.,

Practical Paper IV: Thermodynamics

Work load: 45 hrs
3 hrs/week

Minimum of 6 experiments to be done and recorded

1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
2. Thermal conductivity of bad conductor-Lee's method
3. Thermal conductivity of rubber.
4. Measurement of Stefan's constant.
5. Specific heat of a liquid by applying Newton's law of cooling correction.
6. Heating efficiency of electrical kettle with varying voltages.
7. Mechanical equivalent of heat
8. Thermo emf - thermocouple potentiometer
9. Coefficient of thermal conductivity of copper- Searle's apparatus.
10. Thermal behavior of an electric bulb (filament/torch light bulb)
11. Measurement of Stefan's constant- emissive method
12. Study of variation of resistance with temperature – thermistor.

Practicals	**50 marks (3 hr)**
Formula & Explanation	6
Tabular form +graph +circuit diagram	6
Observations	12
Calculation, graph, precautions & Result	6
Viva-Voce	10
Record	10

BLUE-PRINT
II B.Sc. Physics Semester-IV,
Paper-IV: THERMODYNAMICS & RADIATION PHYSICS

Blue Print **Module**	**Essay Questions 10 marks**	**Short Questions 5 marks**	**Marks allotted**
1. Unit - I	2	1+1Problem	30
2. Unit - II	2	1+1Problem	30
3.Unit - III	2	1	25
4.Unit -IV	2	1	25
5.Unit - V	2	1+1Problem	30
Total		140	

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II B.Sc.: Physics Semester- IV (Model Paper)- (2018-20)
Paper IV – THERMODYNAMICS & RADIATION PHYSICS

Time: 3Hr **Max Marks: 75**

SECTION-A

Answer all Questions **5x10=50M**

1.a) Deduce Maxwell's law of distribution of molecular speeds and its derivation?
మేక్స్‌వెల్ అణు వేగ పితరణ సియమాన్ని పివరింపుము.

OR

b) Derive an expression for coefficient of viscosity on the basis of kinetic theory of gases.?
వాయు అణుచలన సిద్దాంతరంగా స్నిగ్నతాగుణకానికి సమీకరణం నాదించుము.

2.a) Describe the working of Carnots engine and derive an expression for its effiency?
కార్నాట్ ఉష్ణయంత్రమునిచేసే పిధానాన్ని పివరించి దాని దక్షతకుమీకరణం నాదించుము.

OR

b) Define entropy and explain entropy changes in reversible and irreversible process?
ఎంట్రోపిని నిర్వచించి, ద్విగత మరియు ఏకగత ప్రక్రియలలో ఎంట్రోపీలోని మార్పును వివరించుము.

OR

3.a) Define the four thermodynamic potentials , obtain Maxwell's thermodynamic equations using these potentials.
నాలుగు ఉష్ణగతిక శక్మాలను నిర్వచించి వాటి నుండి మేక్స్వెల్ సమీకరణాలను రాబట్టుము

OR

b) Derive an expression for the ratio of specific heats of gas.

4.(a) How are low temperatures produced by adiabatic demagnetization?
స్థిరోష్ణ నిరయస్కాంతీకరణ పద్దతిలో అల్ప ఉష్ణోగ్రతలను పొందే విధానమును వివరింపుము.

(Or)

(b) Explain the production of Liquification of Helium by Kapitza's method.

కపిట్జా పద్దతిలో హీలియం ను ద్రవీకరించే పద్దతిని వివరింపుము.

5.a) Explain Quantum theory of radiation and derive Plank's law.
క్వాంటమ్ వికిరణ సిద్దాంతాన్ని వివరించి ప్లాంక్ నియమాన్ని రాభట్టండి

OR

b) What are radiation pyrometers? Describe the working of disappearing filament optical pyrometer.
వికిరణ పైరోమీటర్ అనగా నేమి. మాయమైపోయే ఫిలమెంట్ పైరోమీటర్ పనిచేసే విధానాన్ని వివరింపుము.

SECTION-B

ANSWER ANY **FIVE** QUESTIONS **5 X 5 = 25M**

6. Explain transport phenomena?
అభిగమన ద్విగ్విషయాన్ని వివరింపుము.

7. State and prove Carnot's theorem.
కార్నో సిద్దాంతాన్ని నిర్వచించి నిరూపించుము

8. Deduce Clausius – Clapeyron equation. What is its importance.
క్లాసియాస్-క్లాపరాన్ సమీకరణాన్ని రాబట్టి దాని ప్రాముఖ్యతను వివరింపుము.

9. Explain Joule Thomson effect.
జౌల్ థామ్సన్ ఫలితాన్ని వివరింపుము.

10. Explain construction and working of Ferry's black body
ఫెరీ కృష్ణ వస్తువు నిర్మాణము మరియు పనిచేయు విధానం వివరింపుము.

11. Calculate the efficiency of reversible engine working between two temperature limits 72^oC and 127^oC .
72^oC and 127^oC ఉష్ణోగ్రతల మధ్య పనిచేసే ద్విగత యంత్రం యొక్క దక్షతను లెక్కించుము.

12. Find the RMS velocity of Hydrogen at NTP and 127^0C?
NTP మరియు 127^0C వద్దహైడ్రోజన్యొక్క RMS వేగాన్ని కనుగొనుము .

13. Determine the temperature of the sun with help of weins constant.
given b =$2.92X10^{-3}$ m-k, maximum wavelength is 4900A^o.
వీన్ స్థిరాంకంనుఉపయోగించి సూర్యుడిఉష్ణోగ్రతనుకనుకొనుము.(b = 2.92×10^{-3}m-k, గరిష్టతరంగ దైర్ఘ్యం4900A^o)