12. Write down the Stefan's law of radiation.

Setup the torch bulb apparatus to verify the Stefan's law of radiation and to determine Stefan's constant.Note all the experimental parameters.

To calibrate the torch bulb filament, first determine the Draper point and then use the required formula toplot $\frac{R_t}{R_d}$ vs absolute temperature T.Now, record deflection x vs temperature θ data and Now, record the current through the filament vs voltage data and calculate the power and temperature in each step. Plot $log_{10}P$vs $log_{10}T$ and determine the slope of the curve. Does the curve agree with Stefan's law?

1+3+(3+2)+1

13. Construct a circuit to study the V-I characteristics of a P-N junction diode.

Record the forward current (I) for different voltages (V)applied across the diode.

Obtain the value of Boltzmann constant from the graph of $log_{10}I$ vs V. 2+5+3

U.G. 6th Semester Examination - 2022

PHYSICS

[HONOURS]

Course Code : PHY-H-CC-P-13

(Electro-Magnetic Theory)

[PRACTICAL]

Full Marks : 20 Time : 4 Hours

The figures in the right-hand margin indicate marks.

Distribution of Marks:

Lab. Note Book : 05

Viva voce : 05

Experiment : 10

Answer any **one** question:

1. Write down the Malus law for plane polarized light law.

Setup the apparatus so that the intensity of the transmitted light through the polarizer and analyzer is maximum. Now, rotate the analyzer in steps of 10° from 0° to 360° and record the intensity in tabular form.

Plot intensity vs angle of rotation θ and also plot intensity vs$cos^2\theta$ to verify Malus law . 1+5+(2+2)

2. Write down the formula for the specific rotation of the plane of polarization through a sugar solution.

Prepare a sugar solution of 10% concentration and measure specific rotation using a polarimeter. Repeat the experiment for 7.5%, 5%, 2.5% and 0% concentration and record the data in tabular form.

Plot the specific rotation versus concentration. 1+8+1

3. Setup the apparatus to calibrate the Babinet's compensator using a monochromatic light.

Now replace the monochromatic light source by a white light source and introduce a quarter wave plate (making an angle θ) so that elliptically polarized light falls on the Babinet's compensator. Then adjusting the micrometre screw of the Babinet's compensator determine the angle θ.

Comment on the fringe pattern. 5+4+1

4. Setup a dipole transmitter antenna and a receiver antenna so that far field radiation can be characterized. Record the antenna parameters and rotate the transmitter antenna in steps of 10° from 0° to 360° and record the intensity in tabular form.

Plot the relative intensity in dB in Polar coordinates (Directional Diagram) 1+(1+6)+2

5. Write down all working formulae required to study the diffraction of light through ultrasonic grating.

Set up the spectrometer apparatus. Adjust the RF frequency so that the piezoelectric crystal resonates, and clear diffraction bands are observed in the telescope. Record the resonance frequency.

Now measure the angle of diffraction for all visible bands and from this, calculate the wavelength of the ultrasonic sound wave.

Also calculate the velocity of the ultrasonic sound wave. 1+1+(4+2)+2

6. Setup the apparatus to study the law of reflection of microwaves. Measure the angle of incidence and corresponding angle of reflection (at least five sets) to verify law of reflection.

Now, make necessary modifications in the setup to study the law of refraction. Measure the angle of incidence and corresponding angle of refraction (at least five sets) to verify law of reflection. 5+5

7. To study the polarization of microwaves, setup the apparatus so that maximum intensity is received by the receiver. First, verify that the microwaves generated by the transmitter are linearly polarized by rotating the receiver in steps of 10° from 0° to 180°.

Now reset the receiver angle to 0° and record the meter reading when the polarizer is aligned at 0°, 22.5°, 45°, 67.5° and 90°with respect to the horizontal.

Remove the polarizer slits and rotate the receiver by 90°. Record the meter reading. Then replace the Polarizer slits and record the meter readings with the Polarizer slits horizontal, vertical, and at 45°.

4+4+2

8. To study the interference of microwaves, setup the double-slit apparatus with slit width 1.5cm.Rotate the rotatable goniometer receiver arm and record the meter readings in steps of 5° from -80° to 80°.

   Plot intensity vs θ and from the graph determine the wavelength of the microwave. 6+3+1

9. Write down the working formula for determination of refractive index of a liquid by total internal reflection using Wollaston's air film.

   Setup the spectrometer and Wollaston's air-film apparatus.

   Obtain the critical angles by rotating the air film in both clockwise and anti-clockwise directions and record the spectrometer readings in tabular form.

   Calculate the refractive index of the given liquid from the above data. 1+2+6+1

10. Write down the working formulae to determine the refractive index of (a) glass and (b) a liquid by total internal reflection using a Gaussian eyepiece.

    Setup a broad monochromatic light source to obtain the line of demarcation and record the spectrometer readings, Next, send a white light through the Gaussian eyepiece for normal setting and record the spectrometer readings in tabular form. Calculate the refractive index of glass from the above data.

    Now attach a thin glass plate with the prism using a given liquid and repeat the above experiment to determine the refractive index of the liquid.

    2+4+4

11. Write down the two Fresnel reflection equations.
    Setup the spectrometer to observe the reflected light through a polaroid mounted on the telescope. Adjust the incident angle and rotate the polaroid so that the observed intensity is completely extinguished. Now, record the spectrometer readings to determine the angle of polarization. Repeat the experiment three times.
    Determine the refractive index of glass from this data.

    2+3+3+2

U.G. 6th Semester Examination - 2022

PHYSICS

[HONOURS]

Course Code : PHY-H-CC-P-14

(Statistical Mechanics)

[PRACTICAL]

Full Marks : 20 Time : 4 Hours

The figures in the right-hand margin indicate marks.

Distribution of Marks:

Lab. Note Book : 05

Viva voce : 05

Experiment : 10

1. Write down the expressions for Planck's law, Wein's Law and Raleigh-Jeans Law for blackbody radiation.

   Write a program in any suitable language to plot Planck's law for Black Body radiation.

   Now modify your program to compare the Planck's law with Wein's Law and Raleigh-Jeans Law at high temperature and low temperature. 2+4+(2+2)

2. Write down the expressions for Dulong-Petit law, Einstein law and Debye law.

   Write a program in any suitable language to calculate the specific heat of solid according to (a) Dulong-

Petit law, (b) Einstein distribution function and (c) Debye distribution function and plot them with temperature.

Compare the plots for high temperature (room temperature) and low temperature and comment. 2+5+3

3. Write down the expressions for Maxwell-Boltzmann distribution function.

Write a program in any suitable language to plot Maxwell-Boltzmann distribution function with energy at different temperatures.

Compare the plots and comment on it. 2+6+2

4. Write down the expressions for Bose-Einstein distribution function.

Write a program in any suitable language to plot Bose-Einstein distribution function with energy at different temperatures.

Compare the plots and comment on it. 2+6+2

5. Write down the expressions for Fermi-Dirac distribution function.

Write a program in any suitable language to plot Fermi-Dirac distribution function with energy at different temperatures.

Compare the plots and comment on it. 2+6+2

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