

PHYSWE

EXPERIMENTAL LITERATURE

PHYSICS

Dr. Ludolf von Alvensleben

Laboratory Experiments



1

Mechanics

1.1 Measurement Techniques

1.1.01	Measurement of basic constants: length, weight and time	
1.1.02	Force measurement with PC interface	Cobra
1.1.03	Measurement of rotational velocity	Cobra
1.1.04	Measurement of minimal force differences	Cobra

1.2 Statics

1.2.01	Moments
1.2.02	Modulus of elasticity
1.2.03	Mechanical hysteresis

1.3 Dynamics

1.3.01	Hooke's law	
1.3.02	Hooke's law with PC interface	Cobra
1.3.03	Newton's law / Air track	
1.3.04	Uniformly accelerated linear motion / Air track with PC interface	Cobra
1.3.05	Laws of collision / Air track	
1.3.07	Free fall	
1.3.08	Free fall with an interface system	Cobra
1.3.10	Atwood's machine with PC interface	Cobra
1.3.11	Projectile motion	
1.3.12	Ballistic pendulum	
1.3.13	Moment of inertia and angular acceleration	
1.3.14	Moment of inertia and angular acceleration with PC interface	Cobra
1.3.15	Moment and angular momentum	
1.3.16	Centrifugal force	
1.3.17	Dependence of central force on angular velocity, track radius and mass with PC interface	Cobra
1.3.18	Mechanical conservation of energy / Maxwell's wheel	
1.3.19	Laws of gyroscopes / 3-axis gyroscope	
1.3.20	Laws of gyroscopes / Cardanic gyroscope	
1.3.21	Mathematical pendulum	
1.3.22	Reversible pendulum	
1.3.23	Variable g pendulum	
1.3.24	Variable g pendulum – Pendulum oscillations with PC interface	Cobra
1.3.25	Coupled pendula	
1.3.26	Harmonic oscillations of spiral springs – Springs linked in parallel and in series	Cobra
1.3.27	Forced oscillations – Pohl's pendulum	
1.3.28	Parallel axis theorem / Steiner's theorem	
1.3.29	Moments of inertia of different bodies / Steiner's theorem with PC interface	Cobra
1.3.30	Torsional vibrations and torsion modulus	
1.3.31	Moment of inertia and torsional vibrations	
1.3.32	The propagation of a periodically excited continuous transverse wave	
1.3.33	Phase velocity of rope waves	

1.4 Mechanics of Liquids and Gaseous Bodies



1.4.01	Density of liquids
1.4.02	Surface of rotating liquids

1.4.03	Viscosity of Newtonian and non-Newtonian liquids (rotary viscometer)	
1.4.04	Viscosity measurements with the falling ball viscometer	
1.4.05	Surface tension by the ring method (Du Nouy method)	
1.4.06	Surface tension by the pull-out method with PC interface	Cobra
1.4.07	Barometric height formula	
1.4.08	Drag (resistance to flow)	
1.4.09	Lift and drag	



1.5 Mechanical Vibration Acoustics

1.5.01	Vibration of strings	
1.5.03	Velocity of sound in air and in metal rods w. PC-interface	Cobra
1.5.04	Acoustic Doppler effect	
1.5.05	Acoustic Doppler effect with PC interface	Cobra
1.5.06	Velocity of sound using Kundt's tube	
1.5.07	Wavelengths and frequencies with a Quincke tube	
1.5.08	Resonance frequencies of Helmholtz resonators with PC interface	Cobra
1.5.09	Interference of acoustic waves, stationary waves and diffraction at a slot with PC interface	Cobra
1.5.10	Optical determination of velocity of sound in liquids	
1.5.11	Phase and group velocity of ultrasonics in liquids	
1.5.12	Temperature dependence of the velocity of sound in liquids	

1.6 Applied Mechanics

1.6.01	Notch bar impact test	
1.6.02	Material testing: Tensile test / Compression test	

1.7 Handbooks

1.7.01	Physics Demonstration Experiments – Magnet Board Mechanics 1	
1.7.02	Physics Demonstration Experiments – Magnet Board Mechanics 2	

2

Optics

2.1 Geometrical Optics

2.1.01	Measuring the velocity of light
2.1.02	Laws of lenses and optical instruments
2.1.03	Dispersion and resolving power of the prism
2.1.04	Dispersion and resolving power of a grating / Grating spectroscope

2.2 Interference


2.2.01	Interference of light
2.2.02	Newton's rings
2.2.03	Interference at a Mica plate according to Pohl
2.2.04	Fresnel's zone construction / Zone plate
2.2.05	Michelson interferometer
2.2.06	Coherence and width of spectral lines with Michelson interferometer
2.2.07	Refraction index of air and CO ₂ with Michelson interferometer

2.3 Diffraction

2.3.01	Diffraction at a slit and Heisenberg's uncertainty principle
2.3.02	Diffraction of light at a slit and an edge

- 2.3.03 Intensity of diffractions due to pin hole diaphragms and circular obstacles
- 2.3.04 Determination of diffraction intensity due to multiple slits and grids
- 2.3.05 Determination of the diffraction intensity at slit and double slit systems
- 2.3.06 Diffraction intensity through a slit and a wire – Babinet's theorem


2.4 Photometry

- 2.4.01 Transmission of colour filters – Absorption of light (UV-VIS spectroscopy)
- 2.4.02 Photometric law of distance
- 2.4.03 Photometric law of distance with PC interface 
- 2.4.04 Lambert's law
- 2.4.05 Lambert-Beer law – Diode array spectrometer






2.5 Polarisation

- 2.5.01 Polarisation by quarterwave plates
- 2.5.02 Polarimetry
- 2.5.03 Fresnel's equations – Theory of reflection
- 2.5.04 Malus' law

2.6 Applied Optics

- 2.6.01 Faraday effect
- 2.6.02 Kerr effect
- 2.6.03 Recording and reconstruction of holograms
- 2.6.04 CO₂-laser
- 2.6.05 LDA – Laser-Doppler-Anemometry 
- 2.6.07 Helium Neon Laser
- 2.6.08 Optical pumping
- 2.6.09 Nd-YAG laser
- 2.6.10 Fibre optics
- 2.6.11 Fourier optics – 2f Arrangement
- 2.6.12 Fourier optics – 4f Arrangement – Filtering and reconstruction

2.7 Handbooks

- 2.7.01 Physics Demonstration Experiments – Magnet Board Optics 
- 2.7.02 Laser Physics I – Experiments with coherent light 
- 2.7.03 Laser Physics II – Experiments with coherent light – Holography 
- 2.7.04 Laser Physics III – Experiments with coherent light – Interferometry 
- 2.7.05 Diode array spectrometer 

3

Thermodynamics


3.1 Thermal Expansion

- 3.1.01 Thermal expansion in solids and liquids


3.2 Ideal and Real Gases

- 3.2.01 Equation of state of ideal gases
- 3.2.02 Heat capacity of gases
- 3.2.03 Maxwellian velocity distribution
- 3.2.04 Thermal equation of state and critical point
- 3.2.05 Adiabatic coefficient of gases – Flammersfeld oscillator
- 3.2.06 Joule-Thomson effect

3.3 Calorimetry, Friction Heat

- 3.3.01 Heat capacity of metals
- 3.3.02 Mechanical equivalent of heat
- 3.3.03 Heat of formation for CO₂ and CO (Hess' Law)
- 3.3.04 COBRA – Calorimetry 

3.4 Phase Transitions

- 3.4.01 Vapour pressure of water at high temperature
- 3.4.02 Vapour pressure of water below 100°C / Molar heat of vaporization
- 3.4.03 Boiling point elevation
- 3.4.04 Freezing point depression
- 3.4.05 Phase transitions / Differential thermoanalysis 




3.5 Transport and Diffusion

- 3.5.01 Stefan-Boltzmann's law of radiation
- 3.5.02 Thermal and electrical conductivity of metals
- 3.5.03 Diffusion potentials / Nernst equation

3.6 Applied Thermodynamics

- 3.6.01 Solar ray collector
- 3.6.02 Heat pump
- 3.6.03 Heat insulation / Heat conduction
- 3.6.04 Stirling engine

3.7 Handbooks

- 3.7.01 Glass jacket system 
- 3.7.02 Air cushion table 
- 3.7.03 Physics Demonstration Experiments – Magnet Board Thermodynamics 

4

Electricity


4.1 Stationary Currents

- 4.1.01 Measurement of low resistance
- 4.1.02 Wheatstone bridge
- 4.1.03 Internal resistance and matching in voltage source
- 4.1.04 Temperature dependence of different resistors and diodes
- 4.1.05 Working definition of voltage
- 4.1.06 Current balance / Force acting on a current-carrying conductor
- 4.1.07 Semiconductor thermogenerator
- 4.1.08 Peltier heat pump
- 4.1.09 Characteristic curves of a solar cell
- 4.1.10 Characteristic curves of electron tubes (diode, triode)
- 4.1.11 Characteristic and efficiency of PEM fuel cell and PEM electrolyser

4.2 Electric Field

- 4.2.01 Electrical fields and potentials in the plate capacitor
- 4.2.02 Charging curve of a capacitor
- 4.2.03 Capacitance of metal spheres and of a spherical capacitor
- 4.2.04 Coulomb's law / Image charge
- 4.2.05 Coulomb potential and Coulomb field of metal spheres
- 4.2.06 Dielectric constant of different materials

4.3 Magnetic Field

- 4.3.01 Earth's magnetic field
- 4.3.02 Magnetic field of single coils / Biot-Savart's law
- 4.3.03 Magnetic field of paired coils in Helmholtz arrangement
- 4.3.04 Magnetic moment in the magnetic field
- 4.3.05 Magnetic field outside a straight conductor
- 4.3.06 Magnetic field inside a conductor
- 4.3.07 Ferromagnetic hysteresis with PC interface system 


4.4 Electrodynamics

- 4.4.01 Transformer
- 4.4.02 Magnetic induction
- 4.4.03 Inductance of solenoids
- 4.4.04 Coil in the AC circuit
- 4.4.05 Capacitor in the AC circuit
- 4.4.06 RLC Circuit
- 4.4.07 Rectifier circuits
- 4.4.08 RC Filters
- 4.4.09 High-pass and low-pass filters
- 4.4.10 RLC measuring bridge
- 4.4.11 Resistance, phase shift and power in AC circuits

4.5 Electromagnetic Oscillations and Waves

- 4.5.02 Coupled oscillating circuits
- 4.5.04 Interference of microwaves
- 4.5.05 Diffraction of microwaves
- 4.5.06 Diffraction and polarization of microwaves
- 4.5.08 Radiation field of a horn antenna / Microwaves
- 4.5.09 Frustrated total reflection / Microwaves


4.6 Handbooks

- 4.6.01 Electrical Energy and Power 

5







Physical Structure of Matter

5.1 Physics of the Electron

- 5.1.01 Elementary charge and Millikan experiment
- 5.1.02 Specific charge of the electron – e/m
- 5.1.03 Franck-Hertz experiment 
- 5.1.04 Planck's "quantum of action" from photoelectric effect (line separation by interference filters)
- 5.1.05 Planck's "quantum of action" from the photoelectric effect (line separation by diffraction grating)
- 5.1.06 Fine structure and one-electron spectrum
- 5.1.07 Balmer series / Determination of Rydberg's constant
- 5.1.08 Atomic spectra of two-electron systems: He, Hg
- 5.1.09 Two-electron spectra with the prism spectrometer
- 5.1.10 Zeeman effect
- 5.1.11 Stern-Gerlach experiment
- 5.1.12 Electron spin resonance
- 5.1.13 Electron diffraction

5.2 Radioactivity




- 5.2.01 Half-life and radioactive equilibrium

- 5.2.02 Law of radioactive decay 
- 5.2.03 Influence of the dead time of the counter tube on the pulse distribution 
- 5.2.04 Visualisation of radioactive particles / Diffusion cloud chamber
- 5.2.05 Poisson's distribution and Gaussian distribution of radioactive decay 
- 5.2.06 COBRA – Radioactivity 
- 5.2.07 COBRA – Statistics of the radioactive decay 
- 5.2.21 Rutherford experiment
- 5.2.22 Fine structure of the α -spectrum of ^{241}Am
- 5.2.23 Study of the α -energies of ^{226}Ra
- 5.2.24 Energy loss of α -particles in gases
- 5.2.31 Electron absorption
- 5.2.32 β -spectroscopy
- 5.2.41 Law of distance and absorption of gamma rays
- 5.2.42 Energy dependence of the γ -absorption coefficient
- 5.2.43 Absorption of γ -quantums and their dependence on the material density 
- 5.2.44 Compton effect
- 5.2.45 Internal conversion in $^{137\text{m}}\text{Ba}$
- 5.2.46 Photonuclear cross-section / Compton scattering cross-section
- 5.2.47 X-ray fluorescence and Moseley's law

5.3 Solid-state Physics






- 5.3.01 Hall effect in p-germanium
- 5.3.02 Hall effect in n-germanium
- 5.3.03 Hall effect in metals
- 5.3.04 Band gap of germanium
- 5.3.05 Superconductivity / Transition temperature
- 5.3.06 Superconductivity / Influence of current and B-field

5.4 X-ray Physics

- 5.4.01 Characteristic X-rays and Bragg scattering with higher order
- 5.4.02 X-ray monochromatization
- 5.4.03 Duane-Hunt displacement law and Planck's "quantum of action"
- 5.4.04 X-ray absorption
- 5.4.05 K and L-absorption edges of X-rays / Moseley's law and Rydberg constant 
- 5.4.06 Planck's "quantum of action"
- 5.4.07 Compton scattering of X-rays
- 5.4.08 X-ray investigation of structures / Debye-Scherrer and Laue methods
- 5.4.10 X-ray dosimetry
- 5.4.11 Physics Demonstration Experiments – Magnet Board Optics 
- 5.4.12 COBRA – X-ray Spectroscopy 

6

Handbooks

- 6.1.01 Science with COBRA 
- 6.1.02 COBRA – Force 
- 6.1.03 COBRA – Movement recording 
- 6.1.05 COBRA – Pulse Rate, Frequency and Time 
- 6.1.06 COBRA – Lux and Oxygen 



Mechanics

Contents

1.1 Measurement Techniques

- 1.1.01 Measurement of basic constants: length, weight and time
- 1.1.02 Force measurement with PC interface
- 1.1.03 Measurement of rotational velocity
- 1.1.04 Measurement of minimal force differences

1.2 Statics

- 1.2.01 Moments
- 1.2.02 Modulus of elasticity
- 1.2.03 Mechanical hysteresis

1.3 Dynamics

- 1.3.01 Hooke's law
- 1.3.02 Hooke's law with PC interface
- 1.3.03 Newton's law / Air track
- 1.3.04 Uniformly accelerated linear motion / Air track with PC interface
- 1.3.05 Laws of collision / Air track
- 1.3.07 Free fall
- 1.3.08 Free fall with an interface system
- 1.3.10 Atwood's machine with PC interface
- 1.3.11 Projectile motion
- 1.3.12 Ballistic pendulum
- 1.3.13 Moment of inertia and angular acceleration
- 1.3.14 Moment of inertia and angular acceleration with PC interface
- 1.3.15 Moment and angular momentum
- 1.3.16 Centrifugal force
- 1.3.17 Dependence of central force on angular velocity, track radius and mass with PC interface
- 1.3.18 Mechanical conservation of energy / Maxwell's wheel
- 1.3.19 Laws of gyroscopes / 3-axis gyroscope
- 1.3.20 Laws of gyroscopes / Cardanic gyroscope
- 1.3.21 Mathematical pendulum
- 1.3.22 Reversible pendulum
- 1.3.23 Variable g pendulum
- 1.3.24 Variable g pendulum – Pendulum oscillations with PC interface
- 1.3.25 Coupled pendula
- 1.3.26 Harmonic oscillations of spiral springs – Springs linked in parallel and in series

- 1.3.27 Forced oscillations – Pohl's pendulum
- 1.3.28 Parallel axis theorem / Steiner's theorem
- 1.3.29 Moments of inertia of different bodies/Steiner's theorem with PC interface
- 1.3.30 Torsional vibrations and torsion modulus
- 1.3.31 Moment of inertia and torsional vibrations
- 1.3.32 The propagation of a periodically excited continuous transverse wave
- 1.3.33 Phase velocity of rope waves

1.4 Mechanics of Liquids and Gaseous Bodies

- 1.4.01 Density of liquids
- 1.4.02 Surface of rotating liquids
- 1.4.03 Viscosity of Newtonian and non-Newtonian liquids (rotary viscometer)
- 1.4.04 Viscosity measurements with the falling ball viscometer
- 1.4.05 Surface tension by the ring method (Du Nouy method)
- 1.4.06 Surface tension by the pull-out method with PC interface
- 1.4.07 Barometric height formula
- 1.4.08 Drag (resistance to flow)
- 1.4.09 Lift and drag

1.5 Mechanical Vibration Acoustics

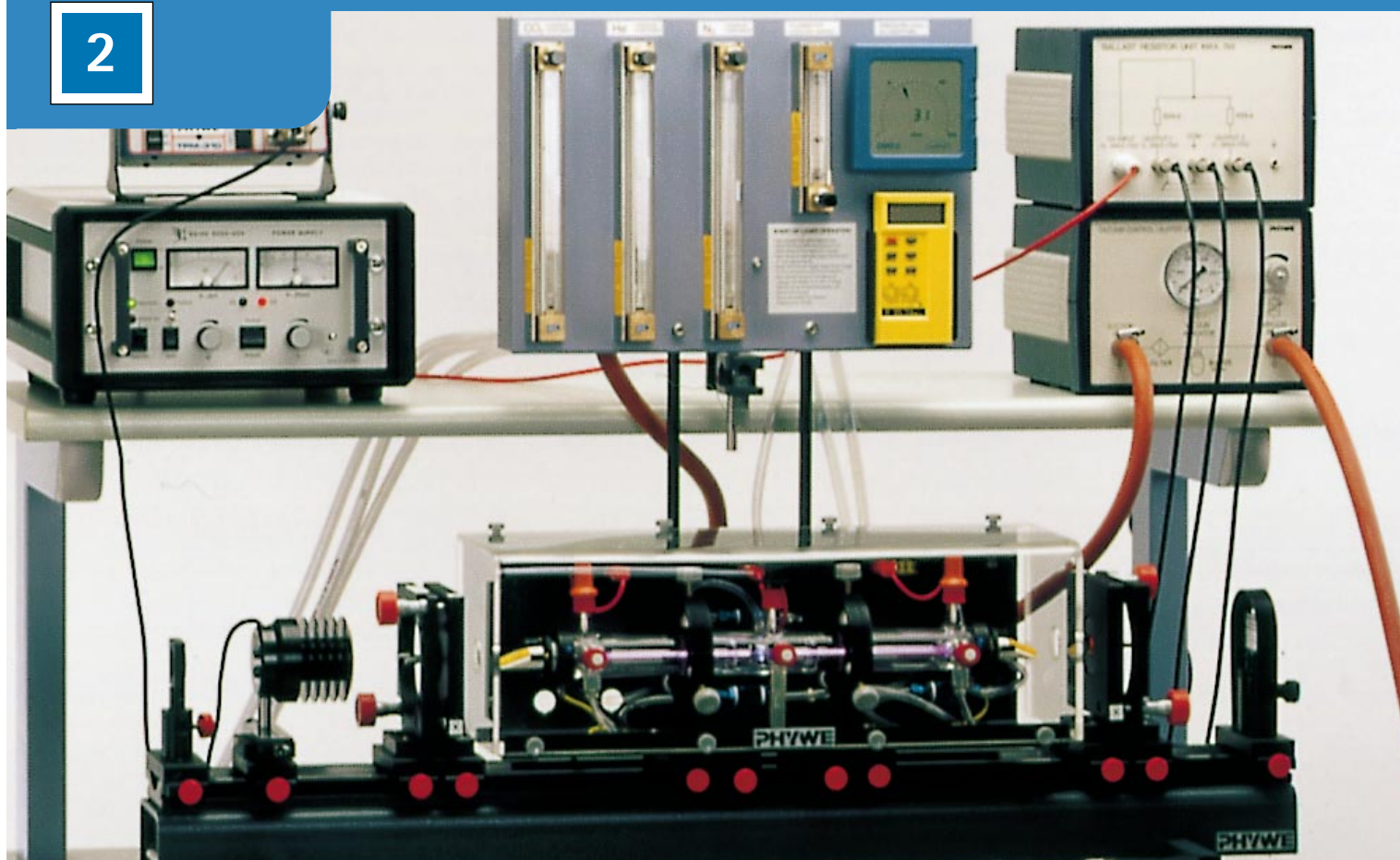
- 1.5.01 Vibration of strings
- 1.5.03 Velocity of sound in air and in metal rods with PC-interface
- 1.5.04 Acoustic Doppler effect
- 1.5.05 Acoustic Doppler effect with PC interface
- 1.5.06 Velocity of sound using Kundt's tube
- 1.5.07 Wavelengths and frequencies with a Quincke tube
- 1.5.08 Resonance frequencies of Helmholtz resonators with PC interface
- 1.5.09 Interference of acoustic waves, stationary waves and diffraction at a slot with PC interface
- 1.5.10 Optical determination of velocity of sound in liquids
- 1.5.11 Phase and group velocity of ultrasonics in liquids
- 1.5.12 Temperature dependence of the velocity of sound in liquids

1.6 Applied Mechanics

- 1.6.01 Notch bar impact test
- 1.6.02 Material testing: Tensile test / Compression test

1.7 Handbooks

- 1.7.01 Physics Demonstration Experiments – Magnet Board Mechanics 1
- 1.7.02 Physics Demonstration Experiments – Magnet Board Mechanics 2



Optics

Contents

2.1 Geometrical Optics

- 2.1.01 Measuring the velocity of light
- 2.1.02 Laws of lenses and optical instruments
- 2.1.03 Dispersion and resolving power of the prism
- 2.1.04 Dispersion and resolving power of a grating / Grating spectroscope

2.2 Interference

- 2.2.01 Interference of light
- 2.2.02 Newton's rings
- 2.2.03 Interference at a Mica plate according to Pohl
- 2.2.04 Fresnel's zone construction / Zone plate
- 2.2.05 Michelson interferometer
- 2.2.06 Coherence and width of spectral lines with Michelson interferometer
- 2.2.07 Refraction index of air and CO₂ with Michelson interferometer

2.3 Diffraction

- 2.3.01 Diffraction at a slit and Heisenberg's uncertainty principle
- 2.3.02 Diffraction of light at a slit and an edge
- 2.3.03 Intensity of diffractions due to pin hole diaphragms and circular obstacles
- 2.3.04 Determination of diffraction intensity due to multiple slits and grids
- 2.3.05 Determination of the diffraction intensity at slit and double slit systems
- 2.3.06 Diffraction intensity through a slit and a wire – Babinet's theorem

2.4 Photometry

- 2.4.01 Transmission of colour filters – Absorption of light (UV-VIS spectroscopy)
- 2.4.02 Photometric law of distance
- 2.4.03 Photometric law of distance with PC interface

- 2.4.04 Lambert's law
- 2.4.05 Lambert-Beer law – Diode array spectrometer

2.5 Polarisation

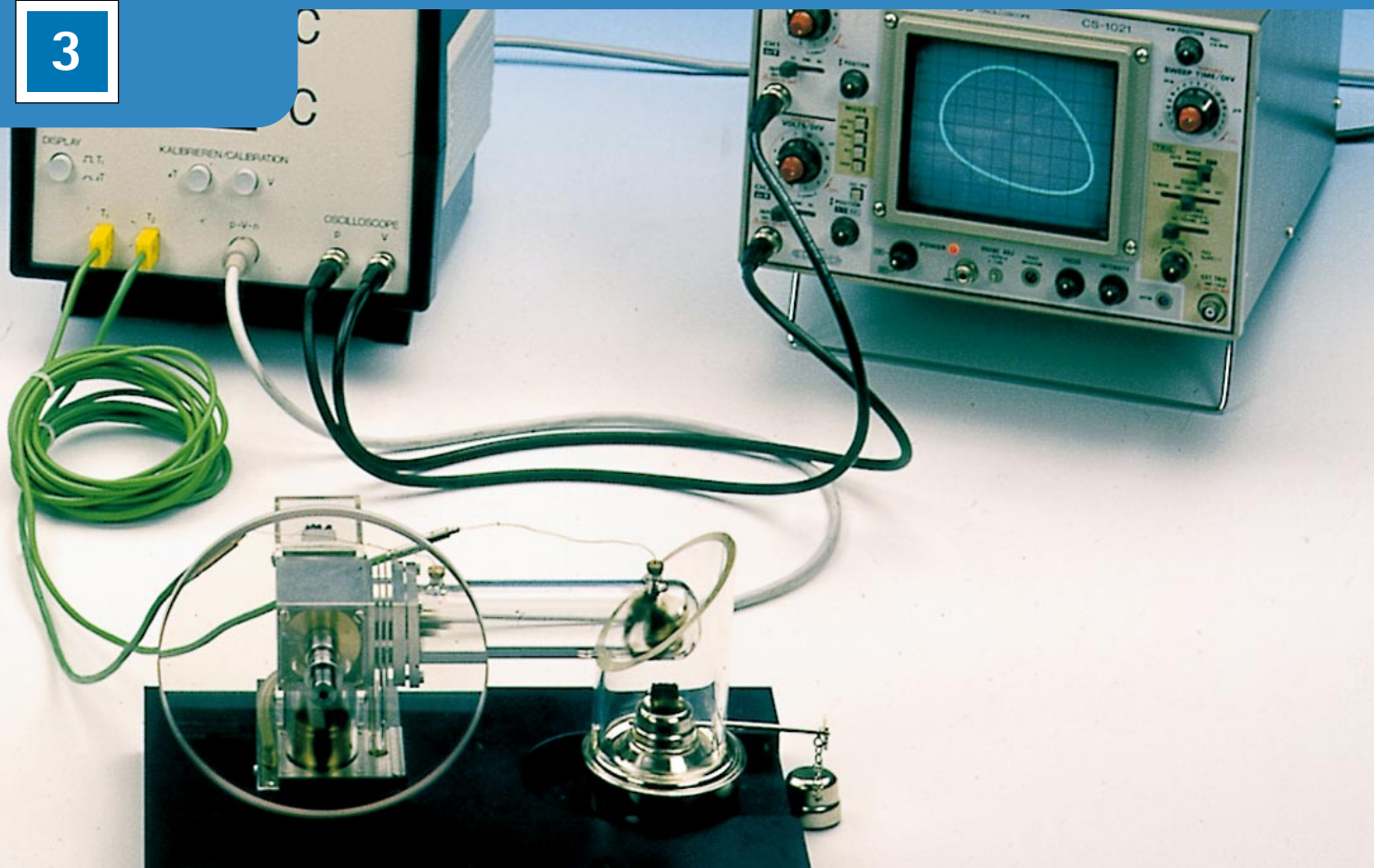
- 2.5.01 Polarisation by quarterwave plates
- 2.5.02 Polarimetry
- 2.5.03 Fresnel's equations – Theory of reflection
- 2.5.04 Malus' law

2.6 Applied Optics

- 2.6.01 Faraday effect
- 2.6.02 Kerr effect
- 2.6.03 Recording and reconstruction of holograms
- 2.6.04 CO₂-laser
- 2.6.05 LDA – Laser-Doppler-Anemometry
- 2.6.07 Helium Neon Laser
- 2.6.08 Optical pumping
- 2.6.09 Nd-YAG laser
- 2.6.10 Fibre optics
- 2.6.11 Fourier optics – 2f Arrangement
- 2.6.12 Fourier optics – 4f Arrangement – Filtering and reconstruction

2.7 Handbooks

- 2.7.01 Physics Demonstration Experiments – Magnet Board Optics
- 2.7.02 Laser Physics I – Experiments with coherent light
- 2.7.03 Laser Physics II – Experiments with coherent light – Holography
- 2.7.04 Laser Physics III – Experiments with coherent light – Interferometry
- 2.7.05 Diode array spectrometer



Thermodynamics

Contents

3.1 Thermal Expansion

3.1.01 Thermal expansion in solids and liquids

3.2 Ideal and Real Gases

3.2.01 Equation of state of ideal gases

3.2.02 Heat capacity of gases

3.2.03 Maxwellian velocity distribution

3.2.04 Thermal equation of state and critical point

3.2.05 Adiabatic coefficient of gases – Flammersfeld oscillator

3.2.06 Joule-Thomson effect

3.3 Calorimetry, Friction Heat

3.3.01 Heat capacity of metals

3.3.02 Mechanical equivalent of heat

3.3.03 Heat of formation for CO_2 and CO (Hess' Law)

3.3.04 COBRA – Calorimetry

3.4 Phase Transitions

3.4.01 Vapour pressure of water at high temperature

3.4.02 Vapour pressure of water below 100°C / Molar heat of vaporization

3.4.03 Boiling point elevation

3.4.04 Freezing point depression

3.4.05 Phase transitions / Differential thermoanalysis

3.5 Transport and Diffusion

3.5.01 Stefan-Boltzmann's law of radiation

3.5.02 Thermal and electrical conductivity of metals

3.5.03 Diffusion potentials / Nernst equation

3.6 Applied Thermodynamics

3.6.01 Solar ray collector

3.6.02 Heat pump

3.6.03 Heat insulation / Heat conduction

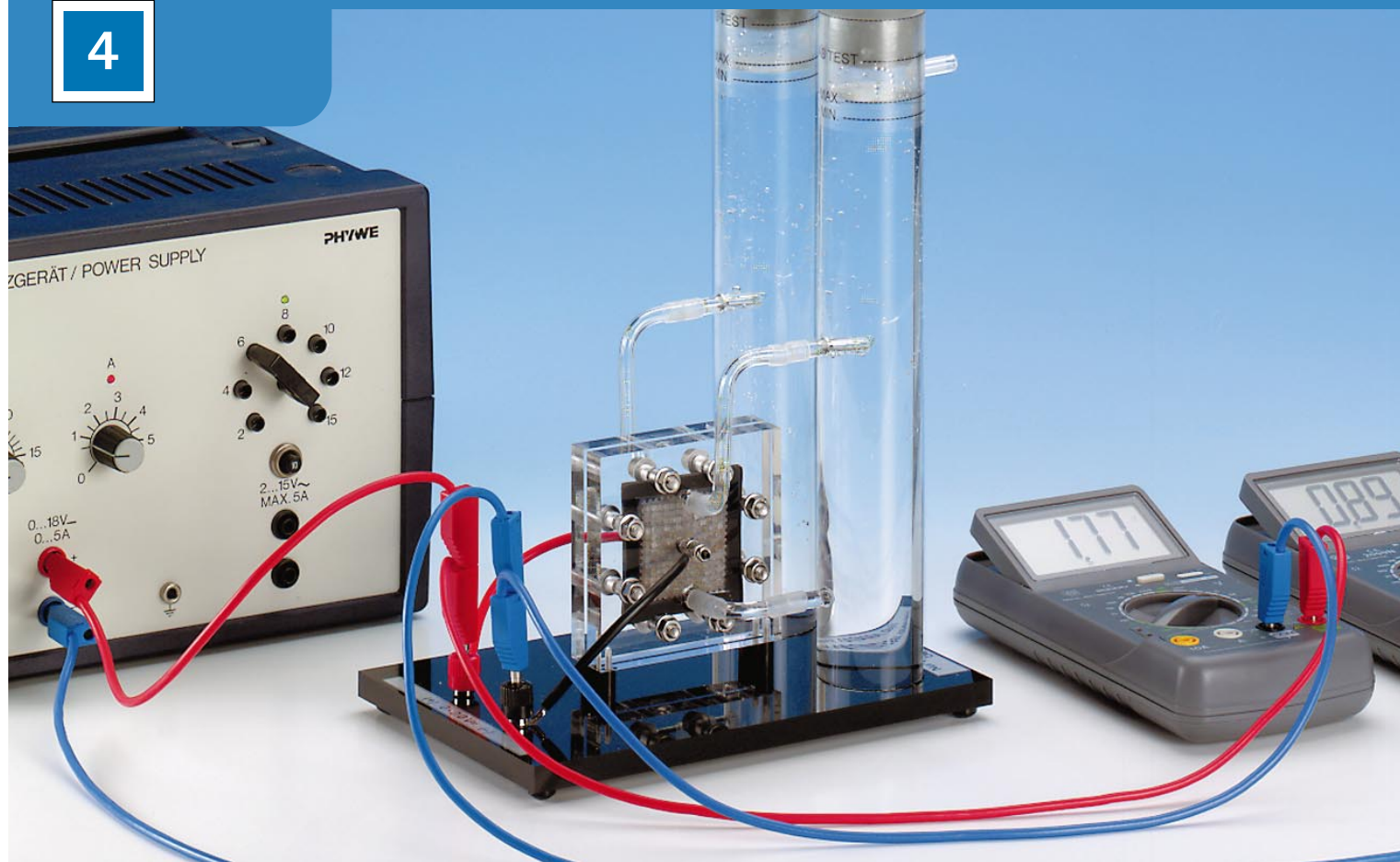
3.6.04 Stirling engine

3.7 Handbooks

3.7.01 Glass jacket system

3.7.02 Air cushion table

3.7.03 Physics Demonstration Experiments – Magnet Board Thermodynamics



Electricity

Contents

4.1 Stationary Currents

- 4.1.01 Measurement of low resistance
- 4.1.02 Wheatstone bridge
- 4.1.03 Internal resistance and matching in voltage source
- 4.1.04 Temperature dependence of different resistors and diodes
- 4.1.05 Working definition of voltage
- 4.1.06 Current balance / Force acting on a current-carrying conductor
- 4.1.07 Semiconductor thermogenerator
- 4.1.08 Peltier heat pump
- 4.1.09 Characteristic curves of a solar cell
- 4.1.10 Characteristic curves of electron tubes (diode, triode)
- 4.1.11 Characteristic and efficiency of PEM fuel cell and PEM electrolyser

4.2 Electric Field

- 4.2.01 Electrical fields and potentials in the plate capacitor
- 4.2.02 Charging curve of a capacitor
- 4.2.03 Capacitance of metal spheres and of a spherical capacitor
- 4.2.04 Coulomb's law / Image charge
- 4.2.05 Coulomb potential and Coulomb field of metal spheres
- 4.2.06 Dielectric constant of different materials

4.3 Magnetic Field

- 4.3.01 Earth's magnetic field
- 4.3.02 Magnetic field of single coils / Biot-Savart's law
- 4.3.03 Magnetic field of paired coils in Helmholtz arrangement
- 4.3.04 Magnetic moment in the magnetic field

- 4.3.05 Magnetic field outside a straight conductor
- 4.3.06 Magnetic field inside a conductor
- 4.3.07 Ferromagnetic hysteresis with PC interface system

4.4 Electrodynamics

- 4.4.01 Transformer
- 4.4.02 Magnetic induction
- 4.4.03 Inductance of solenoids
- 4.4.04 Coil in the AC circuit
- 4.4.05 Capacitor in the AC circuit
- 4.4.06 RLC Circuit
- 4.4.07 Rectifier circuits
- 4.4.08 RC Filters
- 4.4.09 High-pass and low-pass filters
- 4.4.10 RLC measuring bridge
- 4.4.11 Resistance, phase shift and power in AC circuits

4.5 Electromagnetic Oscillations and Waves

- 4.5.02 Coupled oscillating circuits
- 4.5.04 Interference of microwaves
- 4.5.05 Diffraction of microwaves
- 4.5.06 Diffraction and polarization of microwaves
- 4.5.08 Radiation field of a horn antenna / Microwaves
- 4.5.09 Frustrated total reflection / Microwaves

4.6 Handbooks

- 4.6.01 Electrical Energy and Power



Physical Structure of Matter

Contents

5.1 Physics of the Electron

- 5.1.01 Elementary charge and Millikan experiment
- 5.1.02 Specific charge of the electron – e/m
- 5.1.03 Franck-Hertz experiment
- 5.1.04 Planck's "quantum of action" from photoelectric effect (line separation by interference filters)
- 5.1.05 Planck's "quantum of action" from the photoelectric effect (line separation by diffraction grating)
- 5.1.06 Fine structure and one-electron spectrum
- 5.1.07 Balmer series / Determination of Rydberg's constant
- 5.1.08 Atomic spectra of two-electron systems: He, Hg
- 5.1.09 Two-electron spectra with the prism spectrometer
- 5.1.10 Zeeman effect
- 5.1.11 Stern-Gerlach experiment
- 5.1.12 Electron spin resonance
- 5.1.13 Electron diffraction

5.2 Radioactivity

- 5.2.01 Half-life and radioactive equilibrium
- 5.2.02 Law of radioactive decay
- 5.2.03 Influence of the dead time of the counter tube on the pulse distribution
- 5.2.04 Visualisation of radioactive particles / Diffusion cloud chamber
- 5.2.05 Poisson's distribution and Gaussian distribution of radioactive decay
- 5.2.06 COBRA – Radioactivity
- 5.2.07 COBRA – Statistics of the radioactive decay
- 5.2.21 Rutherford experiment
- 5.2.22 Fine structure of the α -spectrum of ^{241}Am
- 5.2.23 Study of the α -energies of ^{226}Ra
- 5.2.24 Energy loss of α -particles in gases

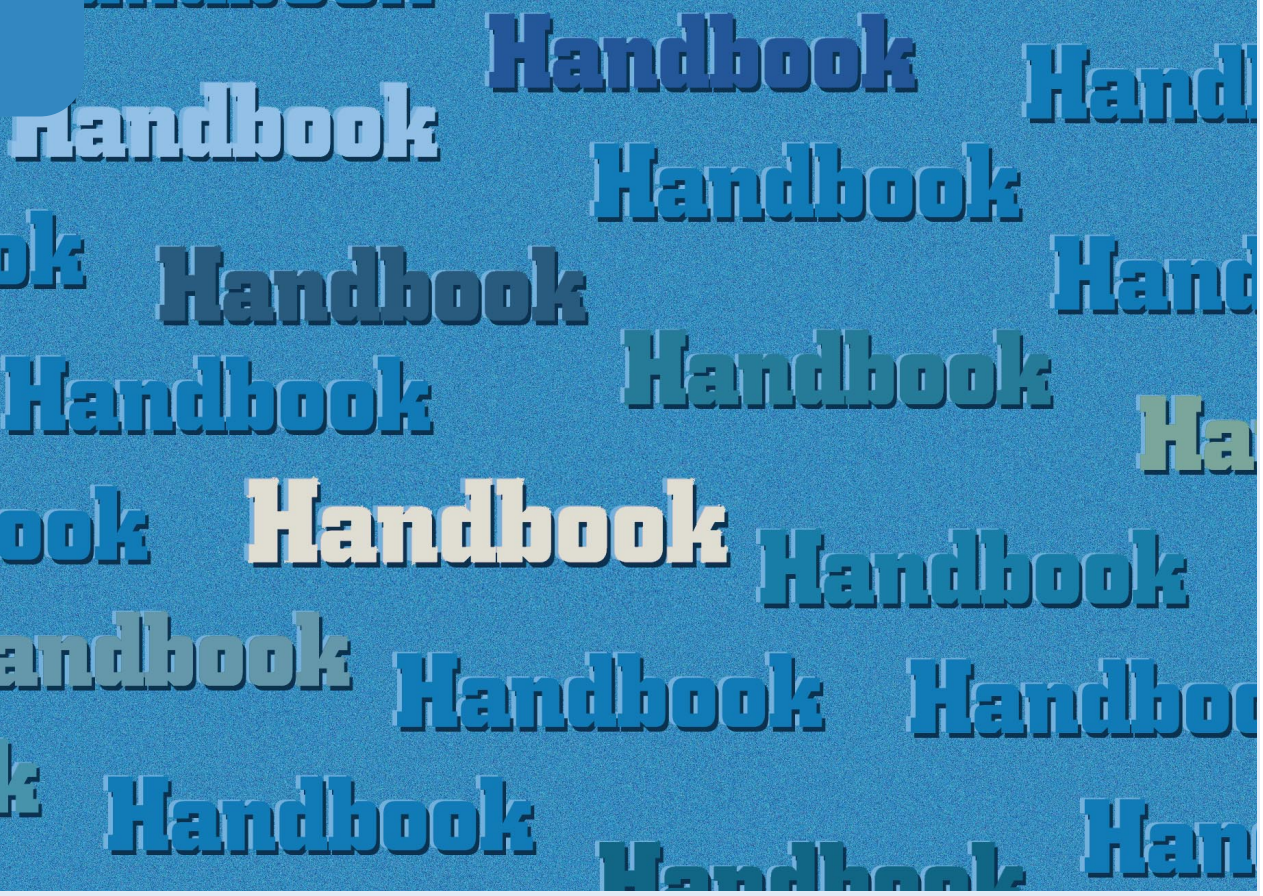
- 5.2.31 Electron absorption
- 5.2.32 β -spectroscopy
- 5.2.41 Law of distance and absorption of gamma rays
- 5.2.42 Energy dependence of the γ -absorption coefficient
- 5.2.43 Absorption of γ -quanta and their dependence on the material density
- 5.2.44 Compton effect
- 5.2.45 Internal conversion in ^{137}mBa
- 5.2.46 Photonuclear cross-section / Compton scattering cross-section
- 5.2.47 X-ray fluorescence and Moseley's law

5.3 Solid-state physics

- 5.3.01 Hall effect in p-germanium
- 5.3.02 Hall effect in n-germanium
- 5.3.03 Hall effect in metals
- 5.3.04 Band gap of germanium
- 5.3.05 Superconductivity / Transition temperature
- 5.3.06 Superconductivity / Influence of current and B-field

5.4 X-ray physics

- 5.4.01 Characteristic X-rays and Bragg scattering with higher order
- 5.4.02 X-ray monochromatization
- 5.4.03 Duane-Hunt displacement law and Planck's "quantum of action"
- 5.4.04 X-ray absorption
- 5.4.05 K and L-absorption edges of X-rays / Moseley's law and Rydberg constant
- 5.4.06 Planck's "quantum of action"
- 5.4.07 Compton scattering of X-rays
- 5.4.08 X-ray investigation of structures / Debye-Scherrer and Laue methods
- 5.4.10 X-ray dosimetry
- 5.4.11 Experiments of the X-ray unit
- 5.4.12 COBRA – X-ray Spectroscopy



Handbooks

Contents

- 6.1.01 Science with COBRA
- 6.1.02 COBRA – Force
- 6.1.03 COBRA – Movement recording
- 6.1.05 COBRA – Pulse Rate, Frequency and Time
- 6.1.06 COBRA – Lux and Oxygen