**Measurement of the density of solids**

 Copper block:

 length = 50 ± 1 mm, breadth = 42 ± 1 mm, height = 36 ± 1mm

 mass = 670.85 ± 0.01 g

**Determination of unknown masses by using the principle of moments**





|  |  |
| --- | --- |
| Distance, *d* / mm | Force, *F* / N |
| 100 | 2.7 |
| 250 | 5.5 |
| 400 | 8.7 |
| 550 | 11.4 |
| 700 | 14.6 |
| 850 | 17.4 |

**Measurement of *g* by freefall**

|  |  |
| --- | --- |
| Height / m | Time / s |
| 1.00 | 0.44 |
| 1.20 | 0.49 |
| 1.40 | 0.52 |
| 1.60 | 0.56 |
| 1.80 | 0.60 |
| 2.00 | 0.64 |
| 2.20 | 0.67 |
| 2.40 | 0.70 |

**Investigation of Newton’s 2nd law**

|  |  |  |
| --- | --- | --- |
| Mass / kg | Gravitational force,*mg* / N | Acceleration/ m s-2 |
| 0.010 | 0.0981 | 0.53 |
| 0.015 | 0.147 | 0.82 |
| 0.020 | 0.196 | 1.14 |
| 0.025 | 0.245 | 1.48 |
| 0.030 | 0.294 | 1.81 |
| 0.035 | 0.343 | 2.26 |

**Determination of Young modulus of a metal (steel) in the form of a wire**

Original length = 2.43 m

Mean diameter = 0.38 mm

|  |  |
| --- | --- |
| Load / N | Extension / mm |
| 0 | 0 |
| 4.9 | 0.53 |
| 9.8 | 0.80 |
| 14.7 | 1.35 |
| 19.6 | 1.83 |
| 24.5 | 2.18 |

**Investigation of the force-extension relationship for rubber**

|  |  |
| --- | --- |
| Force / N | Extension / cm |
| 0 | 0 |
| 4.9 | 4.1 |
| 9.8 | 12.3 |
| 14.7 | 28.9 |
| 19.6 | 36.1 |
| 24.5 | 39.2 |
| 29.4 | 40.0 |

**Investigation of the *I-V* characteristics of the filament of a lamp and a metal wire at constant temperature**

**Metal wire at constant temperature**

|  |  |
| --- | --- |
| Current, *I* / A | pd, *V* / V |
| 0.00 | 0.0 |
| 0.07 | 2.0 |
| 0.16 | 4.0 |
| 0.22 | 6.0 |
| 0.30 | 8.0 |
| 0.38 | 10.0 |

**Filament of a lamp**

|  |  |
| --- | --- |
| Current, *I* / A | pd, *V* / V |
| 0.00 | 0.0 |
| 1.00 | 2.0 |
| 1.70 | 4.0 |
| 2.00 | 6.0 |
| 2.19 | 8.0 |
| 2.30 | 10.0 |
| 2.37 | 12.0 |

**Determination of resistivity of a metal (constantan wire)**

Diameter = 0.38 mm

|  |  |  |
| --- | --- | --- |
| Length / cm | Current, *I* / A | pd, *V* / V |
| 0.0 | 0.42 | 0 |
| 10.0 | 0.42 | 0.18 |
| 20.0 | 0.42 | 0.36 |
| 30.0 | 0.42 | 0.54 |
| 40.0 | 0.42 | 0.73 |
| 50.0 | 0.42 | 0.91 |
| 60.0 | 0.42 | 1.09 |
| 70.0 | 0.42 | 1.26 |
| 80.0 | 0.42 | 1.45 |
| 90.0 | 0.42 | 1.63 |
| 100.0 | 0.42 | 1.81 |

**Investigation of the variation of resistance with temperature for a metal (copper) wire**

|  |  |
| --- | --- |
| Temperature / oC | Resistance / Ω |
| 10 | 2.48 |
| 20 | 2.61 |
| 30 | 2.69 |
| 40 | 2.77 |
| 60 | 2.95 |
| 80 | 3.17 |

**Determination of the internal resistance of a cell**

|  |  |
| --- | --- |
| Load resistance, *R* / Ω | Current, *I* / A |
| 1.4 | 0.94 |
| 3.3 | 0.43 |
| 4.7 | 0.31 |
| 5.6 | 0.26 |
| 8.0 | 0.19 |

**Measurement of the intensity variations for polarisation**

|  |  |
| --- | --- |
| Angle / o | Intensity / % |
| 0 | 100 |
| 45 | 50 |
| 90 | 0 |
| 135 | 50 |
| 180 | 100 |
| 225 | 50 |
| 270 | 0 |
| 315 | 50 |
| 360 | 100 |

**Determination of wavelength using Young’s double slits**

*d* = 0.1 mm

|  |  |
| --- | --- |
| *D* / m | Δ*y* / cm |
| 0.500 | 0.30 |
| 1.000 | 0.70 |
| 1.500 | 1.0 |
| 2.000 | 1.3 |
| 2.500 | 1.7 |
| 3.000 | 2.0 |

**Determination of wavelength using a diffraction grating**

300 lines per mm **or** 300 000 lines per m

|  |  |
| --- | --- |
| *D* / m | *x* / cm |
|  | *n* = 1 | *n* = 2 |
| 0.5 | 10.0 | 21.4 |
| 1.0 | 20.5 | 42.4 |
| 1.5 | 29.9 | 63.6 |

**Determination of the speed of sound using stationary waves**

|  |  |
| --- | --- |
| Length, *l* / cm | Frequency / Hz |
| 14.7 | 512 |
| 15.5 | 480 |
| 20.2 | 384 |
| 23.9 | 320 |
| 30.7 | 256 |

**Measurement of the refractive index of a material**

|  |  |
| --- | --- |
| Angle of incidence, *θi* / o | Angle of refraction, *θr* / o |
| 20 | 13 |
| 30 | 20 |
|  40 | 25 |
| 50 | 31 |
| 60 | 35 |
| 70 | 39 |
| 80 | 41 |

**Determination of *h* using LEDs**

|  |  |  |
| --- | --- | --- |
| Wavelength ($λ$) of LED / nm | $\frac{1}{λ}$ / m-1 | Switching on pd / V |
| 465 | 2.15×106 | 2.78 |
| 569 | 1.76 × 106 | 2.26 |
| 660 | 1.52×106 | 1.91 |
| 820 | 1.22×106 | 1.47 |
| 890 | 1.12 × 106 | 1.44 |
| 950 | 1.05×106 | 1.29 |