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| Lagrangian | angular momentum | flux |
| potential | Gauss's law | coherence |
| diffraction | phase difference | entropy |

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| The surface integral of a field's perpendicular component over an area. | the spin storage I omega, conserved when no external torque acts | Kinetic energy minus potential energy for the standard mechanical system. |
| A physical condition, not a drawing convention. | The electric flux through a closed surface equals the enclosed charge divided by the permittivity of vacuum. | Electric potential energy per unit positive charge at a point, relative to a chosen reference. |
| A thermodynamic measure related to energy dispersal and the number of microscopic arrangements consistent with a system's macroscopic state. | The difference in position within an oscillation cycle between two oscillations or points on waves. | The spreading or redistribution of waves as they pass an edge or aperture. |

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| partition function | first law | normalisation |
| operator | wavefunction | precision |
| covariance | Proper time | selection rule |

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| Making total probability equal to one. | Energy conservation for a thermodynamic system: $\Delta U = Q - W$ when Q is heat supplied to the system and W is work done by the system. | The canonical sum of Boltzmann weights over microstates, used to normalise their probabilities and determine equilibrium thermodynamic properties. |
| How closely repeated measurements agree. | A complex probability amplitude representing a quantum state; in the position representation, $\|\psi\|^2$ is a position probability density for a normalized state. | A mathematical action representing an observable. |
| A restriction on transitions for a specified interaction mechanism. | Time elapsed on a clock along its own path; in the inertial time-dilation example, both events occur at one position in the clock's rest frame and $\Delta t = \gamma \Delta \tau$. | A measure of joint variation used for correlated uncertainties. |

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| Zeeman splitting | electric-dipole | band gap |
| half-life | Binding energy | canonical momentum |
| luminosity | external impulse | turning point |

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| An energy interval with no allowed bulk electronic states in the band model. | In atomic spectra, describing a radiative transition coupled through an atom's electric dipole moment; allowed one-electron orbital transitions obey $\Delta l = \pm 1$ and $\Delta m = 0, \pm 1$. | Magnetic-field splitting of atomic energy levels. |
| The derivative of the Lagrangian with respect to a generalised velocity. | The positive energy required to separate a nucleus into free nucleons. | The time for the number of undecayed nuclei in a radioactive sample to halve. |
| In one-dimensional motion, a position where a particle reverses direction. | Time integral of the net force from outside the chosen system. | The total energy a star or other source emits as radiation per unit time. |

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| momentum vectors | moment of inertia | terminal speed |
| no-slip constraint | constraint | relative velocity |
| acceleration | solid angle | induced surface charge |

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| Steady speed at which opposing forces balance. | A measure of an object's resistance to angular acceleration about a specified axis, depending on its mass and how far that mass lies from the axis. | Momentum quantities with direction as well as magnitude; $p = mv$ in the nonrelativistic model, and total momentum is conserved component by component when net external impulse is zero. |
| Velocity of one object measured in another moving frame. | A condition linking allowed positions or motions of connected bodies. | The condition that touching surfaces have zero relative tangential velocity at contact; for rolling on a fixed surface, the centre's speed is $v = \omega R$. |
| Charge rearranged on a conductor to satisfy electrostatic equilibrium. | Angular area subtended by a surface, measured in steradians. | The rate of change of velocity. |

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| Electrostatic equilibrium | root mean square | flux linkage |
| network | displacement current | Poynting vector |
| dielectric | displacement antinode | Doppler factor |

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| Sum of magnetic flux through a coil's turns. | Square root of the mean squared value, used for effective AC current or voltage. | A condition in which charges have no net motion; in a conductor, its interior electric field is zero and it is at one potential. |
| Electromagnetic energy flux per unit area and time. | The term for a changing electric field, which produces a magnetic field just as a current does. | A connected set of circuit elements, analysed with Kirchhoff's rules. |
| Frequency multiplier produced by a specified source or observer motion. | A standing-wave position where the air displacement amplitude is maximal. | An electrical insulator that can become polarised in an electric field. |

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|---|---|---|
| Doppler effect | resolving power | optical path length |
| interferometer | orthogonality | Fourier coefficient |
| Even symmetry | entropy production | coefficient of performance |

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| Geometric path weighted by refractive index along the ray. | Wavelength divided by the smallest resolvable wavelength separation. | A change in observed wave frequency caused by relative motion between a source and an observer. |
| Weight of a sine, cosine or constant basis component in a periodic expansion. | A zero integral of the product of distinct basis functions over the specified interval. | An instrument splitting and recombining beams to measure tiny path differences by interference. |
| Useful heat transferred divided by work input for a refrigerator or heat pump. | Nonnegative total entropy generated by irreversibility. | A function with $f(-x) = f(x)$, symmetric about the y-axis. |

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| refrigerator | probability density | partition function |
| canonical ensemble | standard uncertainty | Poisson approximation |
| proper time | rest energy | Total energy |

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| The canonical sum of Boltzmann weights over microstates, used to normalise their probabilities and determine equilibrium thermodynamic properties. | Probability per unit of a continuous variable, whose integral gives interval probability. | A device that removes heat from a colder region and rejects it to a hotter region using an energy input; the cycle in this lesson uses work input. |
| Rare independent-event count model with variance equal to its mean. | Uncertainty expressed as a standard deviation under a stated measurement model. | An equilibrium ensemble with fixed temperature, volume and particle number, in which the system can exchange energy with a heat bath. |
| For a free relativistic particle, its energy including rest and kinetic energy: $E^2 = p^2c^2 + m^2c^4$, with $E = \gamma mc^2$ for a massive particle. | Energy $mc^2$ associated with an object's rest mass. | Time recorded by a clock moving with the object along its worldline. |

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| work function | reduced mass | photoelectric effect |
| reflection coefficient | degeneracy | Transmission probability |
| binding energy per nucleon | Hall coefficient | Hall effect |

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| The emission of electrons from a material when it absorbs electromagnetic radiation of sufficiently high frequency. | Two-body effective mass m1m2/(m1+m2) for relative motion. | The minimum energy needed to remove an electron from a material's surface. |
| The ratio of transmitted to incident probability current in a scattering state; differing wave numbers mean it need not equal the squared transmission amplitude alone. | The number of such triples: (N+1)(N+2)/2. | Reflected probability-current fraction relative to incident current. |
| The development of a transverse voltage when a magnetic field deflects moving charge carriers in a current-carrying material. | Signed proportionality relating transverse Hall field to current density and magnetic field under a stated convention. | Nuclear binding energy divided by nucleon count. |

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|---|---|---|
| holonomic constraint | cyclic coordinate | Euler-Lagrange equation |
| Coriolis force | centrifugal force | rotating frame |
| volume flow rate | dynamic viscosity | Continuity |

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| The variational equation $\mathrm{d}/\mathrm{dt}(\partial \mathrm{L}/\partial \dot{\mathrm{q}}) = \partial \mathrm{L}/\partial \mathrm{q}$ giving the motion from the Lagrangian. | Absent from L itself, so its canonical momentum is conserved. | A constraint written as a relation among coordinates and time. |
| A reference frame whose axes rotate relative to an inertial frame; its equations of motion include centrifugal and Coriolis terms, and an Euler term if its angular velocity changes. | The apparent rotating-frame force $-\mathrm{m}\Omega\times(\Omega\times\mathrm{r})$, directed away from the rotation axis. | The apparent rotating-frame force $-2\mathrm{m}\Omega\times\mathrm{v}'$ caused by relative motion. |
| The continuity equation for charge or fluid: what flows in minus what flows out equals what accumulates. | The coefficient relating shear stress to velocity gradient in a Newtonian fluid. | Volume crossing a section per unit time, Q=Av for mean speed v. |

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| electric polarisation | magnetisation | capacitance |
| time constant | impedance | Malus's law |
| Brewster angle | polariser | diffraction envelope |

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|---|---|---|
| Stored electric charge per unit potential difference between conductors. | Magnetic dipole moment per unit volume, M, entering $B=\mu_0(H+M)$. | Electric dipole moment per unit volume, P, contributing bound charge. |
| $I_out = I_in \cos^2\theta$ for an ideal linear analyser. | The AC version of resistance, a complex number that also includes the phase shift. | The characteristic time for an exponential process to change by a factor of e; in decay, the quantity falls to one over e of its starting value. |
| The aperture-dependent intensity factor that modulates the interference pattern. | A device that selectively transmits light in particular polarisation states. | Incidence angle where the reflected p component vanishes. |

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|---|---|---|
| missing order | interference | envelope |
| virtual image | transverse magnification | converging lens |
| thermal resistance | latent heat | heat rate |

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| In this two-slit pattern, the broad single-slit diffraction factor that modulates the finer interference fringes; its zeros can suppress interference orders. | The superposition of waves, producing a combined displacement that depends on their relative phase. | An interference order cancelled because it coincides with an aperture intensity zero. |
| A lens with positive focal length in the lesson's convention that brings paraxial rays parallel to its axis toward a real focus; its action depends on both shape and surrounding medium. | The product of the individual signed magnifications for aligned paraxial elements. | An image formed where light rays appear to come from, without actually converging there. |
| The rate of heat transfer, in watts. | Energy transferred during a change of state without a temperature change. | Temperature difference per steady heat-transfer rate, measured in K/W. |

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|---|---|---|
| energy fluctuation | Helmholtz free energy | partition function |
| mean occupation | equipartition | Occupation number |
| first-order energy shift | degenerate perturbation theory | degenerate subspace |

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| The canonical sum of Boltzmann weights over microstates, used to normalise their probabilities and determine equilibrium thermodynamic properties. | Thermodynamic potential $F=U-TS$, equal to $-kBT\ \ln Z$ for the canonical ensemble. | Canonical spread of energy about its ensemble mean, quantified by the energy variance. |
| The number of particles occupying a complete single-particle quantum state; its ensemble average is the mean occupation number and may be fractional. | Classical equilibrium rule assigning $kBT/2$ to each independent quadratic Hamiltonian term. | Ensemble average number of particles in one complete quantum state or a specified group of states. |
| The space spanned by independent energy eigenstates with the same eigenvalue; a degenerate energy has more than one independent eigenstate. | Method that first diagonalises the perturbation within an unperturbed degenerate subspace. | Leading weak-perturbation correction given by the unperturbed state's expectation value. |

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| spin singlet | Slater determinant | antisymmetric |
| bound state | radial probability density | finite well |
| Landé factor | Stark splitting | Zeeman effect |

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| Changing sign under exchange; the total wavefunction of identical fermions is antisymmetric when all position and spin labels of two particles are exchanged. | Antisymmetric fermionic construction from complete single-particle states. | Antisymmetric two-spin-1/2 state with total spin S=0. |
| In this lesson, a square potential well of finite width and depth, with a finite set of bound energies and wavefunctions that decay outside rather than vanish at its edges. | Probability per radial distance, including the spherical-shell measure after angular integration. | Normalisable stationary state with confined probability and discrete energy in the specified model. |
| The splitting of spectral lines in a magnetic field. | Electric-field-induced separation of atomic energy levels, with symmetry and degeneracy controlling leading order. | Projection factor relating a weak-field LS-coupled magnetic shift to g_J m_J. |

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| spectral radiance | series limit | Wien's law |
| spacetime interval | proper length | dead time |
| input impedance | voltmeter | half-value layer |

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| The wavelength-density peak of a blackbody spectrum. | Limiting bound-bound photon energy or wavelength as the initial level approaches the continuum for a fixed final level. | Radiation intensity per projected area, solid angle and stated spectral interval. |
| The minimum interval after one recorded event during which the detector cannot record another. | The endpoint separation measured in the object's rest frame. | The invariant combination $c^2\Delta t^2 - \Delta x^2$ under the declared sign convention, whose sign classifies an event separation. |
| The material thickness that halves an exponentially attenuated beam, equal to $\ln 2/\mu$. | An instrument connected across two points to measure their potential difference. | The effective load a measuring instrument presents to the circuit under test. |

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| population inversion | attenuation | Bragg condition |
| Fermi energy | Bragg diffraction | Q value |
| activity | separation of variables | stability condition |

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|---|---|---|
| Constructive reflection from lattice planes when 2d $\sin\theta = n\lambda$, with $\theta$ measured from the plane. | A reduction in a wave or beam's intensity as it travels through a medium. | A non-equilibrium state with more population in the upper laser level than the lower, enabling net stimulated emission. |
| The net energy released in a nuclear reaction, equal to the decrease in total rest energy. | Constructive scattering by crystal planes when $2d \sin\theta = n\lambda$, where d is the plane spacing and $\theta$ is measured from the planes, not their normal. | The highest occupied electron energy at zero temperature in the free-electron model. |
| The step-size restriction that keeps a numerical recurrence from amplifying errors. | Solving a partial differential equation by writing the unknown as a product of single-variable factors. | The decay rate $\lambda N$ of a radioactive sample, measured in becquerel. |

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| divergence | | |
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| | | The outflow of a vector field per unit volume, $\nabla \cdot \mathrm{F}$; Gauss's law is a divergence statement. |
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