Tick Here	PACS number	Keywords
	00.	GENERAL
	01.	Communication, education, history, and philosophy
	01.10.-m	Announcements, news, and organizational activities
	01.10.Cr	Announcements, news, and awards
	01.10.Fv	Conferences, lectures, and institutes
	01.10.Hx	Physics organizational activities
	01.20.+x	Communication forms and techniques (written, oral, electronic, etc.)
	01.30.-y	Physics literature and publications
	01.30.Bb	Publications of lectures (advanced institutes, summer schools, etc.)
	01.30.Cc	Conference proceedings
	01.30.Ee	Monographs and collections
	01.30.Kj	Handbooks, dictionaries, tables, and data compilations
	01.30.L-	Physics laboratory manuals
	01.30.la	Secondary schools
	01.30.lb	Undergraduate schools
	01.30.M-	Textbooks
	01.30.mm	Textbooks for graduates and researchers
	01.30.mp	Textbooks for undergraduates
	01.30.mr	Textbooks for students in grades 9-12
	01.30.mt	Textbooks for students in grades K-8
	01.30.Os	Books of general interest to physics teachers
	01.30.Rr	Surveys and tutorial papers; resource letters
	01.30.Tt	Bibliographies
	01.30.Vv	Book reviews
	01.30.Ww	Editorials
	01.30.Xx	Publications in electronic media
	01.40.-d	Education
	01.40.Di	Course design and evaluation
	01.40.E-	Science in school
	01.40.eg	Elementary school
	01.40.ek	Secondary school
	01.40.Fk	Research in physics education
	01.40.G-	Curricula and evaluation
	01.40.gb	Teaching methods and strategies
	01.40.gf	Theory of testing and techniques
	01.40.Ha	Learning theory and science teaching
	01.40.J-	Teacher training
	01.40.jc	Pre-service training
	01.40.jh	In-service training
	01.50.-i	Educational aids
	01.50.F-	Audio and visual aids
	01.50.fd	Audio devices
	01.50.ff	Films; electronic video devices
	01.50.fh	Posters, cartoons, art, etc.
	01.50.H-	Computers in education
	01.50.ht	Instructional computer use
	01.50.hv	Computer software and software reviews
	01.50.Kw	Techniques of testing
	01.50.Lc	Laboratory computer use
	01.50.My	Demonstration experiments and apparatus
	01.50.Pa	Laboratory experiments and apparatus
	01.50.Qb	Laboratory course design, organization, and evaluation
	01.50.Rt	Physics tournaments and contests
	01.50.Wg	Physics of toys
	01.50.Zv	Errors in physics classroom materials
	01.52.+r	National and international laboratory facilities
	01.55.+b	General physics
	01.60.+q	Biographies, tributes, personal notes, and obituaries
	01.65.+g	History of science
	01.70.+w	Philosophy of science
	01.75.+m	Science and
	01.78.+p	Science and government (funding, politics, etc.)

01.80.+b	Physics of games and sports
01.85.+f	Careers in physics and science
01.90.+g	Other topics of general
02.	Mathematical methods in physics
02.10.-v	Logic, set theory, and algebra
02.10.Ab	Logic and set theory
02.10.De	Algebraic structures and number theory
02.10.Hh	Rings and algebras
02.10.Kn	Knot theory
02.10.Ox	Combinatorics; graph theory
02.10.Ud	Linear algebra
02.10.Xm	Multilinear algebra
02.10.Yn	Matrix theory
02.20.-a	Group theory
02.20.Bb	General structures of groups
02.20.Hj	Classical groups
02.20.Qs	General properties, structure, and representationof Lie groups
02.20.Rt	Discrete subgroups of Lie groups
02.20.Sv	Lie algebras of Lie groups
02.20.Tw	Infinite-dimensional Lie groups
02.20.Uw	Quantum groups
02.30.-f	Function theory, analysis
02.30.Cj	Measure and integration
02.30.Em	Potential theory
02.30.Fn	Several complex variables and analytic spaces
02.30.Gp	Special functions
02.30.Hq	Ordinary differential equations
02.30.Ik	Integrable systems
02.30.Jr	Partial differential equations
02.30.Ks	Delay and functional equations
02.30.Lt	Sequences, series, and summability
02.30.Mv	Approximations and expansions
02.30.Nw	Fourier analysis
02.30.Oz	Bifurcation theory
02.30.Px	Abstract harmonic analysis
02.30.Rz	Integral equations
02.30.Sa	Functional analysis
02.30.Tb	Operator theory
02.30.Uu	Integral transforms
02.30.Vv	Operational calculus
02.30.Xx	Calculus of variations
02.30.Yy	Control theory
02.30.Zz	Inverse problems
02.40.-k	Geometry, differential geometry, and topology
02.40.Dr	Euclidean and projective geometries
02.40.Ft	Convex sets and geometric inequalities
02.40.Gh	Non-commutative geometry
02.40.Hw	Classical differential geometry
02.40.Ky	Riemannian geometries
02.40.Ma	Global differential geometry
02.40.Pc	General topology
02.40.Re	Algebraic topology
02.40.Sf	Manifolds and cell complexes
02.40.Tt	Complex manifolds
02.40.Vh	Global analysis and analysis on manifolds
02.40.Xx	Singularity theory
02.40.Yy	Geometric mechanics
02.50.-r	Probability theory, stochastic processes, and statistics
02.50.Cw	Probability theory
02.50.Ey	Stochastic processes
02.50.Fz	Stochastic analysis
02.50.Ga	Markov processes
02.50.Le	Decision theory and game theory
02.50.Ng	Distribution theory and Monte Carlo studies

02.50.Sk	Multivariate analysis
02.50.Tt	Inference methods
02.60.-x	Numerical approximation and analysis
02.60.Cb	Numerical simulation; solution of equations
02.60.Dc	Numerical linear algebra
02.60.Ed	Interpolation; curve fitting
02.60.Gf	Algorithms for functional approximation
02.60.Jh	Numerical differentiation and integration
02.60.Lj	Ordinary and partial differential equations; boundary value problems
02.60.Nm	Integral and integro-differential equations
02.60.Pn	Numerical optimization
02.70.-c	Computational techniques
02.70.Bf	Finite-difference methods
02.70.Dh	Finite-element and Galerkin methods
02.70.Hm	Spectral methods
02.70.Jn	Collocation methods
02.70.Ns	Molecular dynamics and particle methods
02.70.Pt	Boundary-integral methods
02.70.Rr	General statistical methods
02.70.Ss	Quantum Monte Carlo methods
02.70.Tt	Justifications or modifications of Monte Carlo methods
02.70.Uu	Applications of Monte Carlo methods
02.70.Wz	Symbolic computation (computer algebra)
02.90.+p	Other topics in mathematical methods in physics
03.	Quantum mechanics, field theories, and special relativity
03.30.+p	Special relativity
03.50.-z	Classical field theories
03.50.De	Classical electromagnetism, Maxwell
03.50.Kk	Other special classical field theories
03.65.-w	Quantum mechanics
03.65.Aa	Quantum systems with finite Hilbert space
03.65.Ca	Formalism
03.65.Db	Functional analytical methods
03.65.Fd	Algebraic methods
03.65.Ge	Solutions of wave equations: bound states
03.65.Nk	Scattering theory
03.65.Pm	Relativistic wave equations
03.65.Sq	Semi-classical theories and applications
03.65.Ta	Foundations of quantum mechanics; measurement theory
03.65.Ud	Entanglement and quantum non-locality
03.65.Vf	Phases: geometric; dynamic or topological
03.65.Wj	State reconstruction, quantum tomography
03.65.Xp	Tunneling, traversal time, quantum Zeno dynamics
03.65.Yz	Decoherence; open systems; quantum statistical methods
03.67.-a	Quantum information
03.67.Ac	Quantum algorithms, protocols, and simulations
03.67.Bg	Entanglement production and manipulation
03.67.Dd	Quantum cryptography and communication security
03.67.Hk	Quantum communication
03.67.Lx	Quantum computation architectures and implementations
03.67.Mn	Entanglement measures, witnesses, and other characterizations
03.67.Pp	Quantum error correction and other methods for protection against decoherence
03.70.+k	Theory of quantized fields
03.75.-b	Matter waves
03.75.Be	Atom and neutron optics
03.75.Dg	Atom and neutron interferometry
03.75.Gg	Entanglement and decoherence in Bose-Einstein condensates
03.75.Hh	Static properties of condensates; thermodynamical,statistical, and structural properties
03.75.Kk	Dynamic properties of condensates; collective andhydrodynamic excitations, superfluid flow
03.75.Lm	Tunneling, Josephson effect, Bose-Einstein condensates in periodic potentials, solitons, vortices
03.75.Mn	Multicomponent condensates; spinor condensates
03.75.Nt	Other Bose-Einstein condensation phenomena
03.75.Pp	Atom lasers

03.75.Ss	Degenerate Fermi gases
	Quantum sensing
	Quantum simulations
	Non-Hermitian physics
	Trapped ions architecture for quantum information processing and quantum technologies
	Superconducting qubits for quantum information processing and quantum technologies
	Nitrogen-vacancy centers for quantum information processing and quantum technologies
	Optical architecture for quantum information processing and quantum technologies
	Adiabatic quantum computing
	Other architectures for quantum technologies
	Machine learning
	Quantum thermodynamics
	Non-Markovian quantum dynamics
	Open quantum systems
	Quantum networks
	Complex quantum networks
	Quantum machine learning
04.	General relativity and gravitation
04.20.-q	Classical general relativity
04.20.Cv	Fundamental problems and general formalism
04.20.Dw	Singularities and cosmic censorship
04.20.Ex	Initial value problem, existence and uniqueness ofsolutions
04.20.Fy	Canonical formalism, Lagrangians, and variationalprinciples
04.20.Gz	Spacetime topology, causal structure, spinor structure
04.20.Ha	Asymptotic structure
04.20.Jb	Exact solutions
04.25.-g	Approximation methods; equations of motion
04.25.D-	Numerical relativity
04.25.dc	Numerical studies of critical behavior, singularities, and cosmic censorship
04.25.dg	Numerical studies of black holes and black-hole binaries
04.25.dk	Numerical studies of other relativistic binaries
04.25.Nx	Post-Newtonian approximation; perturbation theory;related approximations
04.30.-w	Gravitational waves
04.30.Db	Wave generation and sources
04.30.Nk	Wave propagation and interactions
04.30.Tv	Gravitational-wave astrophysics
04.40.-b	Self-gravitating systems; continuous media and classical fields in curved spacetime
04.40.Dg	Relativistic stars: structure, stability, and oscillations
04.40.Nr	Einstein-Maxwell spacetimes, spacetimes with fluids, radiation or classical fields
04.50.-h	Higher-dimensional gravity and other theories of gravity
04.50.Cd	Kaluza-Klein theories
04.50.Gh	Higher-dimensional black holes, black strings, andrelated objects
04.50.Kd	Modified theories of gravity
04.60.-m	Quantum gravity
04.60.Bc	Phenomenology of quantum gravity
04.60.Cf	Gravitational aspects of string theory
04.60.Ds	Canonical quantization
04.60.Gw	Covariant and sum-over-histories quantization
04.60.Kz	Lower dimensional models; mini-superspace models
04.60.Nc	Lattice and discrete methods
04.60.Pp	Loop quantum gravity, quantum geometry, spin foams
04.60.Rt	Topologically massive gravity
04.62.+v	Quantum fields in curved spacetime
04.65.+e	Supergravity
04.70.-s	Physics of black holes
04.70.Bw	Classical black holes
04.70.Dy	Quantum aspects of black holes, evaporation, thermodynamics
04.80.-y	Experimental studies of gravity
04.80.Cc	Experimental tests of gravitational theories
04.80.Nn	Gravitational wave detectors and experiments
04.90.+e	Other topics in general relativity and gravitation
	Group field theory

05.	Statistical physics, thermodynamics, and nonlinear dynamical systems
05.10.-a	Computational methods in statistical physics and nonlinear dynamics
05.10.Cc	Renormalization group methods
05.10.Gg	Stochastic analysis methods (Fokker-Planck, Langevin, etc.)
05.10.Ln	Monte Carlo methods
05.20.-y	Classical statistical mechanics
05.20.Dd	Kinetic theory
05.20.Gg	Classical ensemble theory
05.20.Jj	Statistical mechanics of classical fluids
05.30.-d	Quantum statistical mechanics
05.30.Ch	Quantum ensemble theory
05.30.Fk	Fermion systems and electron gas
05.30.Jp	Boson systems
05.30.Pr	Fractional statistics systems (anyons, etc.)
05.30.Rt	Quantum phase transitions
05.40.-a	Fluctuation phenomena, random processes, noise, and Brownian motion
05.40.Ca	Noise
05.40.Fb	Random walks and Levy flights
05.40.Jc	Brownian motion
05.45.-a	Nonlinear dynamics and chaos
05.45.Ac	Low-dimensional chaos
05.45.Df	Fractals
05.45.Gg	Control of chaos, applications of chaos
05.45.Jn	High-dimensional chaos
05.45.Mt	Quantum chaos; semi-classical methods
05.45.Pq	Numerical simulations of chaotic systems
05.45.Ra	Coupled map lattices
05.45.Tp	Time series analysis
05.45.Vx	Communication using chaos
05.45.Xt	Synchronization; coupled oscillators
05.45.Yv	Solitons
05.50.+q	Lattice theory and statistics (Ising, Potts, etc.)
05.60.-k	Transport processes
05.60.Cd	Classical transport
05.60.Gg	Quantum transport
05.65.+b	Self-organized systems
05.70.-a	Thermodynamics
05.70.Ce	Thermodynamic functions and equations of state
05.70.Fh	Phase transitions: general studies
05.70.Jk	Critical point phenomena
05.70.Ln	Nonequilibrium and irreversible thermodynamics
05.70.Np	Interface and surface thermodynamics
05.90.+m	Other topics in statistical physics, thermodynamics, and nonlinear dynamical systems
	Statistical physics and networks
	Dynamical processes on networks
	Multilayer networks
	Data-driven analysis of complex systems
	Anomalous diffusion processes
	Nonlinear time series analysis
	Generalized entropies
	Non-Markovian processes
06.	Metrology, measurements, and laboratory procedures
06.20.-f	Metrology
06.20.Dk	Measurement and error theory
06.20.F-	Units and standards
06.20.fa	Units
06.20.fb	Standards and calibration
06.20.Jr	Determination of fundamental constants
06.30.-k	Measurements common to several branches of physicsand astronomy
06.30.Bp	Spatial dimensions (e.g., position, lengths, volume, angles, and displacements)
06.30.Dr	Mass and density
06.30.Ft	Time and frequency
06.30.Gv	Velocity, acceleration, and rotation

06.30.Ka	Basic electromagnetic quantities
06.60.-c	Laboratory procedures
06.60.Ei	Sample preparation (including design of sample holders)
06.60.Jn	High-speed techniques (microsecond to femtosecond)
06.60.Mr	Testing and inspecting procedures
06.60.Sx	Positioning and alignment; manipulating, remote handling
06.60.Vz	Workshop procedures (welding, machining, lubrication, bearings, etc.)
06.60.Wa	Laboratory safety procedures
06.90.+v	Other topics in metrology, measurements, and laboratory procedures
	Quantum metrology
07.	Instruments, apparatus, and components common to several branches of physics and astronomy
07.05.-t	Computers in experimental physics
07.05.Bx	Computer systems: hardware, operating systems, computer languages, and utilities
07.05.Dz	Control systems
07.05.Fb	Design of experiments
07.05.Hd	Data acquisition: hardware and software
07.05.Kf	Data analysis: algorithms and implementation; datamanagement
07.05.Mh	Neural networks, fuzzy logic, artificial intelligence
07.05.Pj	Image processing
07.05.Rm	Data presentation and visualization: algorithms and implementation
07.05.Tp	Computer modeling and simulation
07.05.Wr	Computer interfaces
07.07.-a	General equipment
07.07.Df	Sensors (chemical, optical, electrical, movement,gas, etc.); remote sensing
07.07.Hj	Display and recording equipment, oscilloscopes, TVcameras, etc.
07.07.Mp	Transducers
07.07.Tw	Servo and control equipment; robots
07.07.Vx	Hygrometers; hygrometry
07.10.-h	Mechanical instruments and equipment
07.10.Cm	Micromechanical devices and systems
07.10.Fq	Vibration isolation
07.10.Lw	Balance systems, tensile machines, etc.
07.10.Pz	Instruments for strain, force, and torque
07.20.-n	Thermal instruments and apparatus
07.20.Dt	Thermometers
07.20.Fw	Calorimeters
07.20.Hy	Furnaces; heaters
07.20.Ka	High-temperature instrumentation; pyrometers
07.20.Mc	Cryogenics; refrigerators, low-temperature detectors, and other low-temperature equipment
07.20.Pe	Heat engines; heat pumps; heat pipes
07.30.-t	Vacuum apparatus
07.30.Bx	Degasification, residual gas
07.30.Cy	Vacuum pumps
07.30.Dz	Vacuum gauges
07.30.Hd	Vacuum testing methods; leak detectors
07.30.Kf	Vacuum chambers, auxiliary apparatus, and materials
07.35.+k	High-pressure apparatus; shock tubes; diamond anvil cells
07.50.-e	Electrical and electronic instruments and components
07.50.Ek	Circuits and circuit components
07.50.Hp	Electrical noise and shielding equipment
07.50.Ls	Electrometers
07.50.Qx	Signal processing electronics
07.55.-w	Magnetic instruments and components
07.55.Db	Generation of magnetic fields; magnets
07.55.Ge	Magnetometers for magnetic field measurements
07.55.Jg	Magnetometers for susceptibility, magnetic moment,and magnetization measurements
07.55.Nk	Magnetic shielding in instruments
07.57.-c	Infrared, submillimeter wave, microwave and radiowave instruments and equipment
07.57.Hm	Infrared, submillimeter wave, microwave, and radiowave sources
07.57.Kp	Bolometers; infrared, submillimeter wave, microwave, and radiowave receivers and detectors
07.57.Pt	Submillimeter wave, microwave and radiowave spectrometers; magnetic resonance spectrometers, auxiliary equipment

07.57.Ty	Infrared spectrometers, auxiliary equipment, and techniques
07.60.-j	Optical instruments and equipment
07.60.Dq	Photometers, radiometers, and colorimeters
07.60.Fs	Polarimeters and ellipsometers
07.60.Hv	Refractometers and reflectometers
07.60.Ly	Interferometers
07.60.Pb	Conventional optical microscopes
07.60.Rd	Visible and ultraviolet spectrometers
07.60.Vg	Fiber-optic instruments
07.64.+z	Acoustic instruments and equipment
07.68.+m	Photography, photographic instruments; xerography
07.75.+h	Mass spectrometers
07.77.-n	Atomic, molecular, and charged-particle sources and detectors
07.77.Gx	Atomic and molecular beam sources and detectors
07.77.Ka	Charged-particle beam sources and detectors
07.78.+s	Electron, positron, and ion microscopes; electrondiffractometers
07.79.-v	Scanning probe microscopes and components
07.79.Cz	Scanning tunneling microscopes
07.79.Fc	Near-field scanning optical microscopes
07.79.Lh	Atomic force microscopes
07.79.Pk	Magnetic force microscopes
07.79.Sp	Friction force microscopes
07.81.+a	Electron and ion spectrometers
07.85.-m	X- and Gamma-ray instruments
07.85.Fv	X- and Gamma-ray sources, mirrors, gratings, and detectors
07.85.Jy	Diffractometers
07.85.Nc	X-ray and Gamma-ray spectrometers
07.85.Qe	Synchrotron radiation instrumentation
07.85.Tt	X-ray microscopes
07.87.+v	Spaceborne and space research instruments, apparatus, and components
07.88.+y	Instruments for environmental pollution measurements
07.89.+b	Environmental effects on instruments (e.g., radiation and pollution effects)
07.90.+c	Other topics in instruments, apparatus, and components common to several branches of physics and astronomy
10.	THE PHYSICS OF ELEMENTARY PARTICLES AND FIELDS
11.	General theory of fields and particles
11.10.-z	Field theory
11.10.Cd	Axiomatic approach
11.10.Ef	Lagrangian and Hamiltonian approach
11.10.Gh	Renormalization
11.10.Hi	Renormalization group evolution of parameters
11.10.Jj	Asymptotic problems and properties
11.10.Kk	Field theories in dimensions other than four
11.10.Lm	Nonlinear or nonlocal theories and models
11.10.Nx	Non-commutative field theory
11.10.St	Bound and unstable states; Bethe-Salpeter equations
11.10.Wx	Finite-temperature field theory
11.15.-q	Gauge field theories
11.15.Bt	General properties of perturbation theory
11.15.Ex	Spontaneous breaking of gauge symmetries
11.15.Ha	Lattice gauge theory
11.15.Kc	Classical and semi-classical techniques
11.15.Me	Strong-coupling expansions
11.15.Pg	Expansions for large numbers of components (e.g.,1Nc expansions)
11.15.Tk	Other nonperturbative techniques
11.15.Wx	Topologically massive gauge theories
11.15.Yc	Chern-Simons gauge theory
11.25.-w	Strings and branes
11.25.Db	Properties of perturbation theory
11.25.Hf	Conformal field theory, algebraic structures
11.25.Mj	Compactification and four-dimensional models
11.25.Pm	Noncritical string theory

	11.25.Sq	Nonperturbative techniques; string field theory
	11.25.Tq	Gauge/string duality
	11.25.Uv	D branes
	11.25.Wx	String and brane phenomenology
	11.25.Yb	M theory
	11.27.+d	Extended classical solutions; cosmic strings, domain walls, texture
	11.30.-j	Symmetry and conservation laws
	11.30.Cp	Lorentz and Poincaré invariance
	11.30.Er	Charge conjugation, parity, time reversal, and other discrete symmetries
	11.30.Fs	Global symmetries (e.g., baryon number, lepton number)
	11.30.Hv	Flavor symmetries
	11.30.Ly	Other internal and higher symmetries
	11.30.Na	Nonlinear and dynamical symmetries (spectrum-generating symmetries)
	11.30.Pb	Supersymmetry
	11.30.Qc	Spontaneous and radiative symmetry breaking
	11.30.Rd	Chiral symmetries
	11.40.-q	Currents and their properties
	11.40.Dw	General theory of currents
	11.40.Ex	Formal properties of current algebras
	11.40.Ha	Partially conserved axial-vector currents
	11.55.-m	S-matrix theory; analytic structure of amplitudes
	11.55.Bq	Analytic properties of S matrix
	11.55.Ds	Exact S matrices
	11.55.Fv	Dispersion relations
	11.55.Hx	Sum rules
	11.55.Jy	Regge formalism
	11.80.-m	Relativistic scattering theory
	11.80.Cr	Kinematical properties (helicity and invariant amplitudes, kinematic singularities, etc.)
	11.80.Et	Partial-wave analysis
	11.80.Fv	Approximations (eikonal approximation, variationalprinciples, etc.)
	11.80.Gw	Multichannel scattering
	11.80.Jy	Many-body scattering and Faddeev equation
	11.80.La	Multiple scattering
	11.90.+t	Other topics in general theory of fields and particles
	12.	Specific theories and interaction models; particle systematics
	12.10.-g	Unified field theories and models
	12.10.Dm	Unified theories and models of strong and electroweak interactions
	12.10.Kt	Unification of couplings; mass relations
	12.15.-y	Electroweak interactions
	12.15.Ff	Quark and lepton masses and mixing
	12.15.Hh	Determination of Cabibbo-Kobayashi & Maskawa (CKM)matrix elements
	12.15.Ji	Applications of electroweak models to specific processes
	12.15.Lk	Electroweak radiative corrections
	12.15.Mm	Neutral currents
	12.20.-m	Quantum electrodynamics
	12.20.Ds	Specific calculations
	12.20.Fv	Experimental tests
	12.38.-t	Quantum chromodynamics
	12.38.Aw	General properties of QCD (dynamics, confinement,etc.)
	12.38.Bx	Perturbative calculations
	12.38.Cy	Summation of perturbation theory
	12.38.Gc	Lattice QCD calculations
	12.38.Lg	Other nonperturbative calculations
	12.38.Mh	Quark-gluon plasma
	12.38.Qk	Experimental tests
	12.39.-x	Phenomenological quark models
	12.39.Ba	Bag model
	12.39.Dc	Skyrmions
	12.39.Fe	Chiral Lagrangians
	12.39.Hg	Heavy quark effective theory
	12.39.Jh	Nonrelativistic quark model
	12.39.Ki	Relativistic quark model
	12.39.Mk	Glueball and nonstandard multi-quark/gluon states

12.39.Pn	Potential models
12.39.St	Factorization
12.40.-y	Other models for strong interactions
12.40.Ee	Statistical models
12.40.Nn	Regge theory, duality, absorptive/optical models
12.40.Vv	Vector-meson dominance
12.40.Yx	Hadron mass models and calculations
12.60.-i	Models beyond the standard model
12.60.Cn	Extensions of electroweak gauge sector
12.60.Fr	Extensions of electroweak Higgs sector
12.60.Jv	Supersymmetric models
12.60.Nz	Technicolor models
12.60.Rc	Composite models
12.90.+b	Miscellaneous theoretical ideas and models
13.	Specific reactions and phenomenology
13.15.+g	Neutrino interactions
13.20.-v	Leptonic, semileptonic, and radiative decays of mesons
13.20.Cz	Decays of ? mesons
13.20.Eb	Decays of K mesons
13.20.Fc	Decays of charmed mesons
13.20.Gd	Decays of J/Psi, Upsilon, and other quarkonia
13.20.He	Decays of bottom mesons
13.20.Jf	Decays of other mesons
13.25.-k	Hadronic decays of mesons
13.25.Cq	Decays of ? mesons
13.25.Es	Decays of /K/ mesons
13.25.Ft	Decays of charmed mesons
13.25.Gv	Decays of /J//?, ?, and other quarkonia
13.25.Hw	Decays of bottom mesons
13.25.Jx	Decays of other mesons
13.30.-a	Decays of baryons
13.30.Ce	Leptonic, semileptonic, and radiative decays
13.30.Eg	Hadronic decays
13.35.-r	Decays of leptons
13.35.Bv	Decays of muons
13.35.Dx	Decays of taus
13.35.Hb	Decays of heavy neutrinos
13.38.-b	Decays of intermediate bosons
13.38.Be	Decays of W bosons
13.38.Dg	Decays of Z bosons
13.40.-f	Electromagnetic processes and properties
13.40.Dk	Electromagnetic mass differences
13.40.Em	Electric and magnetic moments
13.40.Gp	Electromagnetic form factors
13.40.Hq	Electromagnetic decays
13.40.Ks	Electromagnetic corrections to strong- and weak-interaction processes
13.60.-r	Photon and charged-lepton interactions with hadrons
13.60.Fz	Elastic and Compton scattering
13.60.Hb	Total and inclusive cross sections (including deep-inelastic processes)
13.60.Le	Meson production
13.60.Rj	Baryon production
13.66.-a	Lepton-lepton interactions
13.66.Bc	Hadron production in e- e+ interactions
13.66.De	Lepton production in e- e+ interactions
13.66.Fg	Gauge and Higgs boson production in e- e+ interactions
13.66.Hk	Production of non-standard model particles in e- e+ interactions
13.66.Jn	Precision measurements in e- e+ interactions
13.66.Lm	Processes in other lepton-lepton interactions
13.75.-n	Hadron-induced low- and intermediate-energy reactions and scattering (energy ? 10 GeV)
13.75.Cs	Nucleon-nucleon interactions (including antinucleons, deuterons, etc.)
13.75.Ev	Hyperon-nucleon interactions
13.75.Gx	Pion-baryon interactions
13.75.Jz	Kaon-baryon interactions
13.75.Lb	Meson-meson interactions

13.85.-t	Hadron-induced high- and super-high-energy interactions (energy > 10 GeV)
13.85.Dz	Elastic scattering
13.85.Fb	Inelastic scattering: two-particle final states
13.85.Hd	Inelastic scattering: many-particle final states
13.85.Lg	Total cross sections
13.85.Ni	Inclusive production with identified hadrons
13.85.Qk	Inclusive production with identified leptons, photons, or other nonhadronic particles
13.85.Rm	Limits on production of particles
13.85.Tp	Cosmic-ray interactions
13.87.-a	Jets in large-Q2 scattering
13.87.Ce	Production
13.87.Fh	Fragmentation into hadrons
13.88.+e	Polarization in interactions and scattering
13.90.+i	Other topics in specific reactions and phenomenology of elementary particles
14.	Properties of specific particles
14.20.-c	Baryons (including antiparticles)
14.20.Dh	Protons and neutrons
14.20.Gk	Baryon resonances (S=C=B=0)
14.20.Jn	Hyperons
14.20.Lq	Charmed baryons (|C|>0, B=0)
14.20.Mr	Bottom baryons (|B|>0)
14.20.Pt	Exotic baryons
14.40.-n	Mesons
14.40.Be	Light mesons (S=C=B=0)
14.40.Df	Strange mesons (S>0, C=B=0)
14.40.Lb	Charmed mesons (C>0, B=0)
14.40.Nd	Bottom mesons (B>0)
14.40.Pq	Heavy quarkonia
14.40.Rt	Exotic mesons
14.60.-z	Leptons
14.60.Cd	Electrons (including positrons)
14.60.Ef	Muons
14.60.Fg	Taus
14.60.Hi	Other charged heavy leptons
14.60.Lm	Ordinary neutrinos
14.60.Pq	Neutrino mass and mixing
14.60.St	Non-standard-model neutrinos, right-handed neutrinos, etc.
14.65.-q	Quarks
14.65.Bt	Light quarks
14.65.Dw	Charmed quarks
14.65.Fy	Bottom quarks
14.65.Ha	Top quarks
14.65.Jk	Other quarks (e.g., 4th generations)
14.70.-e	Gauge bosons
14.70.Bh	Photons
14.70.Dj	Gluons
14.70.Fm	W bosons
14.70.Hp	Z bosons
14.70.Kv	Gravitons
14.70.Pw	Other gauge bosons
14.80.-j	Other particles (including hypothetical)
14.80.Bn	Standard-model Higgs bosons
14.80.Da	Supersymmetric Higgs bosons
14.80.Ec	Other neutral Higgs bosons
14.80.Fd	Other charged Higgs bosons
14.80.Hv	Magnetic monopoles
14.80.Ly	Supersymmetric partners of known particles
14.80.Nb	Neutralinos and charginos
14.80.Pq	R-hadrons
14.80.Rt	Kaluza-Klein excitations
14.80.Sv	Leptoquarks
14.80.Tt	Technicolor
14.80.Va	Axions and other Nambu-Goldstone bosons (Majorons,familons, etc.)

20.	NUCLEAR PHYSICS
21.	Nuclear structure
21.10.-k	Properties of nuclei; nuclear energy levels
21.10.Dr	Binding energies and masses
21.10.Ft	Charge distribution
21.10.Gv	Nucleon distributions and halo features
21.10.Hw	Spin, parity, and isobaric spin
21.10.Jx	Spectroscopic factors and asymptotic normalizationcoefficients
21.10.Ky	Electromagnetic moments
21.10.Ma	Level density
21.10.Pc	Single-particle levels and strength functions
21.10.Re	Collective levels
21.10.Sf	Coulomb energies, analogue states
21.10.Tg	Lifetimes, widths
21.30.-x	Nuclear forces
21.30.Cb	Nuclear forces in vacuum
21.30.Fe	Forces in hadronic systems and effective interactions
21.45.-v	Few-body systems
21.45.Bc	Two-nucleon system
21.45.Ff	Three-nucleon forces
21.60.-n	Nuclear structure models and methods
21.60.Cs	Shell model
21.60.De	Ab initio methods
21.60.Ev	Collective models
21.60.Fw	Models based on group theory
21.60.Gx	Cluster models
21.60.Jz	Nuclear Density Functional Theory and extensions
21.60.Ka	Monte Carlo models
21.65.-f	Nuclear matter
21.65.Cd	Asymmetric matter, neutron matter
21.65.Ef	Symmetry energy
21.65.Jk	Mesons in nuclear matter
21.65.Mn	Equations of state of nuclear matter
21.65.Qr	Quark matter
21.80.+a	Hypernuclei
21.85.+d	Mesic nuclei
21.90.+f	Other topics in nuclear structure
23.	Radioactive decay and in-beam spectroscopy
23.20.-g	Electromagnetic transitions
23.20.En	Angular distribution and correlation measurements
23.20.Gq	Multipole mixing ratios
23.20.Js	Multipole matrix elements
23.20.Lv	Gamma transitions and level energies
23.20.Nx	Internal conversion and extranuclear effects
23.20.Ra	Internal pair production
23.35.+g	Isomer decay
23.40.-s	Beta decay; double beta decay; electron and muon capture
23.40.Bw	Weak-interaction and lepton (including neutrino) aspects
23.40.Hc	Relation with nuclear matrix elements and nuclearstructure
23.50.+z	Decay by proton emission
23.60.+e	Alpha decay
23.70.+j	Heavy-particle decay
23.90.+w	Other topics in radioactive decay and in-beam spectroscopy
24.	Nuclear reactions: general
24.10.-i	Nuclear reaction models and methods
24.10.Cn	Many-body theory
24.10.Eq	Coupled-channel and distorted-wave models
24.10.Ht	Optical and diffraction models

24.10.Jv	Relativistic models
24.10.Lx	Monte Carlo simulations (including hadron and parton cascades and string breaking models)
24.10.Nz	Hydrodynamic models
24.10.Pa	Thermal and statistical models
24.30.-v	Resonance reactions
24.30.Cz	Giant resonances
24.30.Gd	Other resonances
24.50.+g	Direct reactions
24.60.-k	Statistical theory and fluctuations
24.60.Dr	Statistical compound-nucleus reactions
24.60.Gv	Statistical multistep direct reactions
24.60.Ky	Fluctuation phenomena
24.60.Lz	Chaos in nuclear systems
24.70.+s	Polarization phenomena in reactions
24.75.+i	General properties of fission
24.80.+y	Nuclear tests of fundamental interactions and symmetries
24.85.+p	Quarks, gluons, and QCD in nuclear reactions
24.87.+y	Surrogate reactions
24.90.+d	Other topics in nuclear reactions: general
25.	Nuclear reactions: specific reactions
25.10.+s	Nuclear reactions involving few-nucleon systems
25.20.-x	Photonuclear reactions
25.20.Dc	Photon absorption and scattering
25.20.Lj	Photoproduction reactions
25.30.-c	Lepton-induced reactions
25.30.Bf	Elastic electron scattering
25.30.Dh	Inelastic electron scattering to specific states
25.30.Fj	Inelastic electron scattering to continuum
25.30.Hm	Positron-induced reactions
25.30.Mr	Muon-induced reactions (including the EMC effect)
25.30.Pt	Neutrino-induced reactions
25.30.Rw	Electroproduction reactions
25.40.-h	Nucleon-induced reactions
25.40.Cm	Elastic proton scattering
25.40.Dn	Elastic neutron scattering
25.40.Ep	Inelastic proton scattering
25.40.Fq	Inelastic neutron scattering
25.40.Hs	Transfer reactions
25.40.Kv	Charge-exchange reactions
25.40.Lw	Radiative capture
25.40.Ny	Resonance reactions
25.40.Qa	(p, pi) reactions
25.40.Sc	Spallation reactions
25.40.Ve	Other reactions above meson production thresholds(energies > 400 MeV)
25.43.+t	Antiproton-induced reactions
25.45.-z	2H-induced reactions
25.45.De	Elastic and inelastic scattering
25.45.Hi	Transfer reactions
25.45.Kk	Charge-exchange reactions
25.55.-e	3H-, 3He-, and 4He-induced reactions
25.55.Ci	Elastic and inelastic scattering
25.55.Hp	Transfer reactions
25.55.Kr	Charge-exchange reactions
25.60.-t	Reactions induced by unstable nuclei
25.60.Bx	Elastic scattering
25.60.Dz	Interaction and reaction cross sections
25.60.Gc	Breakup and momentum distributions
25.60.Je	Transfer reactions
25.60.Lg	Charge-exchange reactions
25.60.Pj	Fusion reactions
25.60.Tv	Radiative capture
25.70.-z	Low and intermediate energy heavy-ion reactions
25.70.Bc	Elastic and quasielastic scattering

25.70.De	Coulomb excitation
25.70.Ef	Resonances
25.70.Gh	Compound nucleus
25.70.Hi	Transfer reactions
25.70.Jj	Fusion and fusion-fission reactions
25.70.Kk	Charge-exchange reactions
25.70.Lm	Strongly damped collisions
25.70.Mn	Projectile and target fragmentation
25.70.Pq	Multifragment emission and correlations
25.75.-q	Relativistic heavy-ion collisions
25.75.Ag	Global features in relativistic heavy ion collisions
25.75.Bh	Hard scattering in relativistic heavy ion collisions
25.75.Cj	Photon, lepton, and heavy quark production in relativistic heavy ion collisions
25.75.Dw	Particle and resonance production
25.75.Gz	Particle correlations and fluctuations
25.75.Ld	Collective flow
25.75.Nq	Quark deconfinement, quark-gluon plasma production, and phase transitions
25.80.-e	Meson- and hyperon-induced reactions
25.80.Dj	Pion elastic scattering
25.80.Ek	Pion inelastic scattering
25.80.Gn	Pion charge-exchange reactions
25.80.Hp	Pion-induced reactions
25.80.Ls	Pion inclusive scattering and absorption
25.80.Nv	Kaon-induced reactions
25.80.Pw	Hyperon-induced reactions
25.85.-w	Fission reactions
25.85.Ca	Spontaneous fission
25.85.Ec	Neutron-induced fission
25.85.Ge	Charged-particle-induced fission
25.85.Jg	Photofission
25.90.+k	Other topics in nuclear reactions: specific reactions
26.	Nuclear astrophysics
26.20.-f	Hydrostatic stellar nucleosynthesis
26.20.Cd	Stellar hydrogen burning
26.20.Fj	Stellar helium burning
26.20.Kn	s-process
26.20.Np	Nucleosynthesis in late stellar evolution
26.20.Qr	Quasistatistical processes
26.30.-k	Nucleosynthesis in novae, supernovae, and other explosive environments
26.30.Ca	Explosive burning in accreting binary systems (novae, x-ray bursts)
26.30.Ef	Explosive burning in supernovae shock fronts
26.30.Hj	r-process
26.30.Jk	Weak interaction and neutrino induced processes, galactic radioactivity
26.35.+c	Big Bang nucleosynthesis
26.40.+r	Cosmic ray nucleosynthesis
26.50.+x	Nuclear physics aspects of novae, supernovae, andother explosive environments
26.60.-c	Nuclear matter aspects of neutron stars
26.60.Dd	Neutron star core
26.60.Gj	Neutron star crust
26.60.Kp	Equations of state of neutron-star matter
26.65.+t	Solar neutrinos
26.90.+n	Other topics in nuclear astrophysics
27.	Properties of specific nuclei listed by mass ranges
27.10.+h	A (less-than-or-equal-to) 5
27.20.+n	6 (less-than-or-equal-to) A (less-than-or-equal-to) 19
27.30.+t	20 (less-than-or-equal-to) A (less-than-or-equal-to) 38
27.40.+z	39 (less-than-or-equal-to) A (less-than-or-equal-to) 58
27.50.+e	59 (less-than-or-equal-to) A (less-than-or-equal-to) 89
27.60.+j	90 (less-than-or-equal-to) A (less-than-or-equal-to) 149
27.70.+q	150 (less-than-or-equal-to) A (less-than-or-equal-to) 189
27.80.+w	190 (less-than-or-equal-to) A (less-than-or-equal-to) 219
27.90.+b	A (less-than-or-equal-to) 220

28.	Nuclear engineering and nuclear power studies
28.20.-v	Neutron physics
28.20.Cz	Neutron scattering
28.20.Fc	Neutron absorption
28.20.Gd	Neutron transport: diffusion and moderation
28.20.Ka	Thermal neutron cross sections
28.20.Np	Neutron capture -rays
28.20.Pr	Neutron imaging; neutron tomography
28.41.-i	Fission reactors
28.41.Ak	Theory, design, and computerized simulation
28.41.Bm	Fuel elements, preparation, reloading, and reprocessing
28.41.Fr	Reactor coolants, reactor cooling, and heat recovery
28.41.Kw	Radioactive wastes, waste disposal
28.41.My	Reactor control systems
28.41.Pa	Moderators
28.41.Qb	Structural and shielding materials
28.41.Rc	Instrumentation
28.41.Te	Protection systems, safety, radiation monitoring,accidents, and dismantling
28.41.Vx	Fuel cycles
28.50.-k	Fission reactor types
28.50.Dr	Research reactors
28.50.Ft	Fast and breeder reactors
28.50.Hw	Power and production reactors
28.50.Ky	Propulsion reactors
28.50.Ma	Auxiliary generators
28.52.-s	Fusion reactors
28.52.Av	Theory, design, and computerized simulation
28.52.Cx	Fueling, heating and ignition
28.52.Fa	Materials
28.52.Lf	Components and instrumentation
28.52.Nh	Safety
28.60.+s	Isotope separation and enrichment
28.65.+a	Accelerator-driven transmutation of nuclear waste
28.70.+y	Nuclear explosions
28.90.+i	Other topics in nuclear engineering and nuclear power studies
29.	Experimental methods and instrumentation for elementary-particle and nuclear physics
29.20.-c	Accelerators
29.20.Ba	Electrostatic accelerators
29.20.D-	Cyclic accelerators and storage rings
29.20.db	Storage rings and colliders
29.20.df	Betatrons
29.20.dg	Cyclotrons
29.20.dk	Synchrotrons
29.20.Ej	Linear accelerators
29.25.-t	Particle sources and targets
29.25.Bx	Electron sources
29.25.Dz	Neutron sources
29.25.Lg	Ion sources: polarized
29.25.Ni	Ion sources: positive and negative
29.25.Pj	Polarized and other targets
29.25.Rm	Sources of radioactive nuclei
29.27.-a	Beams in particle accelerators
29.27.Ac	Beam injection and extraction
29.27.Bd	Beam dynamics; collective effects and instabilities
29.27.Eg	Beam handling; beam transport
29.27.Fh	Beam characteristics
29.27.Hj	Polarized beams
29.30.-h	Spectrometers and spectroscopic techniques
29.30.Aj	Charged-particle spectrometers: electric and magnetic
29.30.Dn	Electron spectroscopy
29.30.Ep	Charged-particle spectroscopy
29.30.Hs	Neutron spectroscopy

29.30.Kv	X- and Gamma-ray spectroscopy
29.30.Lw	Nuclear orientation devices
29.38.-c	Radioactive beams
29.38.Db	Fast radioactive beam techniques
29.38.Gj	Reaccelerated radioactive beams
29.40.-n	Radiation detectors
29.40.Cs	Gas-filled counters: ionization chambers, proportional, and avalanche counters
29.40.Gx	Tracking and position-sensitive detectors
29.40.Ka	Cherenkov detectors
29.40.Mc	Scintillation detectors
29.40.Rg	Nuclear emulsions
29.40.Vj	Calorimeters
29.40.Wk	Solid-state detectors
29.50.+v	Computer interfaces
29.85.-c	Computer data analysis
29.85.Ca	Data acquisition and sorting
29.85.Fj	Data analysis
29.87.+g	Nuclear data compilation
29.90.+r	Other topics in elementary-particle and nuclear physics experimental methods and instrumentation
30.	ATOMIC AND MOLECULAR PHYSICS
31.	Electronic structure of atoms and molecules: theory
31.10.+z	Theory of electronic structure, electronic transitions, and chemical binding
31.15.-p	Calculations and mathematical techniques in atomicand molecular physics
31.15.A-	Ab initio calculations
31.15.ac	High-precision calculations for few-electron (or few-body) atomic systems
31.15.ae	Electronic structure and bonding characteristics
31.15.ag	Excitation energies and lifetimes; oscillator strengths
31.15.aj	Relativistic corrections, spin-orbit effects, finestructure; hyperfine structure
31.15.am	Relativistic configuration interaction (CI) and many-body perturbation calculations
31.15.ap	Polarizabilities and other atomic and molecular properties
31.15.aq	Strongly correlated electron systems: generalizedtight-binding method
31.15.at	Molecule transport characteristics; molecular dynamics; electronic structure of polymers
31.15.B-	Approximate calculations
31.15.bt	Statistical model calculations
31.15.bu	Semi-empirical and empirical calculations
31.15.bw	Coupled-cluster theory
31.15.E-	Density-functional theory
31.15.ec	Hohenberg-Kohn theorem and formal mathematical properties, completeness theorems
31.15.ee	Time-dependent density functional theory
31.15.eg	Exchange-correlation functionals (in current density functional theory)
31.15.ej	Spin-density functionals
31.15.em	Corrections for core-spin polarization, surface effects, etc.
31.15.ep	Variational particle-number approach
31.15.es	Applications of density-functional theory
31.15.V-	Electron correlation calculations for atoms, ionsand molecules
31.15.ve	Electron correlation calculations for atoms and ions: ground state
31.15.vj	Electron correlation calculations for atoms and ions: excited states
31.15.vn	Electron correlation calculations for diatomic molecules
31.15.vq	Electron correlation calculations for polyatomic molecules
31.15.X-	Alternative approaches
31.15.xf	Finite-difference schemes
31.15.xg	Semi-classical methods
31.15.xh	Group-theoretical methods
31.15.xj	Hyperspherical methods
31.15.xk	Path-integral methods
31.15.xm	Quasiparticle methods
31.15.xp	Perturbation theory
31.15.xr	Self-consistent-field methods
31.15.xt	Variational techniques
31.15.xv	Molecular dynamics and other numerical methods
31.15.xw	Valence bond calculations

31.30.-i	Corrections to electronic structure
31.30.Gs	Hyperfine interactions and isotope effects
31.30.J-	Relativistic and quantum electrodynamic (QED) effects in atoms, molecules, and ions
31.30.jc	Relativistic corrections to atomic structure and properties
31.30.jd	Relativistic corrections due to negative-energy states or processes
31.30.jf	QED calculations of level energies, transition frequencies, fine structure intervals
31.30.jg	QED corrections to parity non-conserving transition amplitudes and CP violations
31.30.jh	QED corrections to long-range and weak interactions
31.30.jn	QED corrections to electric dipole moments and other atomic properties
31.30.jp	Electron electric dipole moment
31.30.jr	QED corrections (Lamb shift) in muonic hydrogen and deuterium
31.30.js	Corrections to bound-electron g factor
31.30.jx	Nonrelativistic limits of Dirac-Fock calculations
31.30.jy	Higher-order effective Hamiltonians
31.30.jz	Decay rates of hydrogen-antihydrogen quasimolecules
31.50.-x	Potential energy surfaces
31.50.Bc	Potential energy surfaces for ground electronic states
31.50.Df	Potential energy surfaces for excited electronic states
31.50.Gh	Surface crossings, non-adiabatic couplings
31.70.-f	Effects of atomic and molecular interactions on electronic structure
31.70.Dk	Environmental and solvent effects
31.70.Hq	Time-dependent phenomena: excitation and relaxation processes, and reaction rates
31.70.Ks	Molecular solids
31.90.+s	Other topics in the theory of the electronic structure of atoms and molecules
	Cold and ultracold collisions
	Supersolidity
	Synthetic dimensions and matter
32.	Atomic properties and interactions with photons
32.10.-f	Properties of atoms
32.10.Bi	Atomic masses, mass spectra, abundances, and isotopes
32.10.Dk	Electric and magnetic moments, polarizabilities
32.10.Ee	Magnetic bound states, magnetic trapping of Rydberg states
32.10.Fn	Fine and hyperfine structure
32.10.Hq	Ionization potentials, electron affinities
32.30.-r	Atomic spectra
32.30.Bv	Radio-frequency, microwave, and infrared spectra
32.30.Dx	Magnetic resonance spectra
32.30.Jc	Visible and ultraviolet spectra
32.30.Rj	X-ray spectra
32.50.+d	Fluorescence, phosphorescence (including quenching)
32.60.+i	Zeeman and Stark effects
32.70.-n	Intensities and shapes of atomic spectral lines
32.70.Cs	Oscillator strengths, lifetimes, transition moments
32.70.Fw	Absolute and relative intensities
32.70.Jz	Line shapes, widths, and shifts
32.80.-t	Photoionization and excitation
32.80.Aa	Inner-shell excitation and ionization
32.80.Ee	Rydberg states
32.80.Fb	Photoionization of atoms and ions
32.80.Gc	Photodetachment of atomic negative ions
32.80.Hd	Auger effect
32.80.Qk	Coherent control of atomic interactions with photons
32.80.Rm	Multiphoton ionization and excitation to highly excited states
32.80.Wr	Other multiphoton processes
32.80.Xx	Level crossing and optical pumping
32.80.Zb	Autoionization
32.90.+a	Other topics in atomic properties and interactionsof atoms with photons
33.	Molecular properties and interactions with photons
33.15.-e	Properties of molecules
33.15.Bh	General molecular conformation and symmetry; stereochemistry
33.15.Dj	Interatomic distances and angles
33.15.Fm	Bond strengths, dissociation energies

33.15.Hp	Barrier heights
33.15.Kr	Electric and magnetic moments (and derivatives), polarizability, and magnetic susceptibility
33.15.Mt	Rotation, vibration, and vibration-rotation constants
33.15.Pw	Fine and hyperfine structure
33.15.Ry	Ionization potentials, electron affinities, molecular core binding energy
33.15.Ta	Mass spectra
33.15.Vb	Correlation times in molecular dynamics
33.20.-t	Molecular spectra
33.20.Bx	Radio-frequency and microwave spectra
33.20.Ea	Infrared spectra
33.20.Fb	Raman and Rayleigh spectra (including optical scattering)
33.20.Kf	Visible spectra
33.20.Lg	Ultraviolet spectra
33.20.Ni	Vacuum ultraviolet spectra
33.20.Rm	X-ray spectra
33.20.Sn	Rotational analysis
33.20.Tp	Vibrational analysis
33.20.Vq	Vibration-rotation analysis
33.20.Wr	Vibronic, rovibronic, and rotation-electron-spin interactions
33.20.Xx	Spectra induced by strong-field or attosecond laser irradiation
33.25.+k	Nuclear resonance and relaxation
33.35.+r	Electron resonance and relaxation
33.40.+f	Multiple resonances
33.45.+x	Mössbauer spectra
33.50.-j	Fluorescence and phosphorescence; radiationless transitions, quenching
33.50.Dq	Fluorescence and phosphorescence spectra
33.50.Hv	Radiationless transitions, quenching
33.55.+b	Optical activity and dichroism
33.57.+c	Magneto-optical and electro-optical spectra and effects
33.60.+q	Photoelectron spectra
33.70.-w	Intensities and shapes of molecular spectral linesand bands
33.70.Ca	Oscillator and band strengths, lifetimes, transition moments, and Franck-Condon factors
33.70.Fd	Absolute and relative line and band intensities
33.70.Jg	Line and band widths, shapes, and shifts
33.80.-b	Photon interactions with molecules
33.80.Be	Level crossing and optical pumping
33.80.Eh	Autoionization, photoionization, and photodetachment
33.80.Gj	Diffuse spectra; predissociation, photodissociation
33.80.Rv	Multiphoton ionization and excitation to highly excited states
33.80.Wz	Other multiphoton processes
33.90.+h	Other topics in molecular properties and interactions with photons
34.	Atomic and molecular collision processes and interactions
34.10.+x	General theories and models of atomic and molecular collisions and interactions
34.20.-b	Interatomic and intermolecular potentials and forces, potential energy surfaces for collisions
34.20.Cf	Interatomic potentials and forces
34.20.Gj	Intermolecular and atom-molecule potentials and forces
34.35.+a	Interactions of atoms and molecules with surfaces
34.50.-s	Scattering of atoms and molecules
34.50.Bw	Energy loss and stopping power
34.50.Cx	Elastic; ultracold collisions
34.50.Ez	Rotational and vibrational energy transfer
34.50.Fa	Electronic excitation and ionization of atoms
34.50.Gb	Electronic excitation and ionization of molecules
34.50.Lf	Chemical reactions
34.50.Rk	Laser-modified scattering and reactions
34.70.+e	Charge transfer
34.80.-i	Electron and positron scattering
34.80.Bm	Elastic scattering
34.80.Dp	Atomic excitation and ionization
34.80.Gs	Molecular excitation and ionization
34.80.Ht	Dissociation and dissociative attachment
34.80.Lx	Recombination, attachment, and positronium formation

34.80.Nz	Spin dependence of cross sections; polarized beamexperiments
34.80.Pa	Coherence and correlation
34.80.Qb	Laser-modified scattering
34.80.Uv	Positron scattering
34.90.+q	Other topics in atomic and molecular collision processes and interactions
36.	Exotic atoms and molecules; macromolecules; clusters
36.10.-k	Exotic atoms and molecules
36.10.Dr	Positronium
36.10.Ee	Muonium, muonic atoms and molecules
36.10.Gv	Mesonic, hyperonic and antiprotonic atoms and molecules
36.20.-r	Macromolecules and polymer molecules
36.20.Cw	Molecular weights, dispersity
36.20.Ey	Conformation (statistics and dynamics)
36.20.Fz	Constitution (chains and sequences)
36.20.Hb	Configuration (bonds, dimensions)
36.20.Kd	Electronic structure and spectra
36.20.Ng	Vibrational and rotational structure, infrared andRaman spectra
36.40.-c	Atomic and molecular clusters
36.40.Cg	Electronic and magnetic properties of clusters
36.40.Ei	Phase transitions in clusters
36.40.Gk	Plasma and collective effects in clusters
36.40.Jn	Reactivity of clusters
36.40.Mr	Spectroscopy and geometrical structure of clusters
36.40.Qv	Stability and fragmentation of clusters
36.40.Sx	Diffusion and dynamics of clusters
36.40.Vz	Optical properties of clusters
36.40.Wa	Charged clusters
36.90.+f	Other topics in exotic atoms and molecules; macromolecules; clusters
37.	Mechanical control of atoms, molecules, and ions
37.10.-x	Atom, molecule, and ion cooling methods
37.10.De	Atom cooling methods
37.10.Gh	Atom traps and guides
37.10.Jk	Atoms in optical lattices
37.10.Mn	Slowing and cooling of molecules
37.10.Pq	Trapping of molecules
37.10.Rs	Ion cooling
37.10.Ty	Ion trapping
37.10.Vz	Mechanical effects of light on atoms, molecules, and ions
37.20.+j	Atomic and molecular beam sources and techniques
37.25.+k	Atom interferometry techniques
37.30.+i	Atoms, molecules, and ions in cavities
37.90.+j	Other topics in mechanical control of atoms, molecules, and ions
40.	ELECTROMAGNETISM, OPTICS, ACOUSTICS, HEAT TRANSFER, CLASSICAL MECHANICS, AND FLUID DYNAMICS
41.	Electromagnetism; electron and ion optics
41.20.-q	Applied classical electromagnetism
41.20.Cv	Electrostatics; Poisson and Laplace equations, boundary-value problems
41.20.Gz	Magnetostatics; magnetic shielding, magnetic induction, boundaryvalue problems
41.20.Jb	Electromagnetic wave propagation; radiowave propagation
41.50.+h	X-ray beams and x-ray optics
41.60.-m	Radiation by moving charges
41.60.Ap	Synchrotron radiation
41.60.Bq	Cherenkov radiation
41.60.Cr	Free-electron lasers
41.60.Dk	Transition radiation
41.75.-i	Charged-particle beams
41.75.Ak	Positive-ion beams
41.75.Cn	Negative-ion beams
41.75.Fr	Electron and positron beams

41.75.Ht	Relativistic electron and positron beams
41.75.Jv	Laser-driven acceleration
41.75.Lx	Other advanced accelerator concepts
41.85.-p	Beam optics
41.85.Ar	Particle beam extraction, beam injection
41.85.Ct	Particle beam shaping, beam splitting
41.85.Ew	Particle beam profile, beam intensity
41.85.Gy	Chromatic and geometrical aberrations
41.85.Ja	Particle beam transport
41.85.Lc	Particle beam focusing and bending magnets, wiggler magnets, and quadrupoles
41.85.Ne	Electrostatic lenses, septa
41.85.Qg	Particle beam analyzers, beam monitors, and Faraday cups
41.85.Si	Particle beam collimators, monochromators
41.90.+e	Other topics in electromagnetism; electron and ionoptics
42.	Optics
42.15.-i	Geometrical optics
42.15.Dp	Wave fronts and ray tracing
42.15.Eq	Optical system design
42.15.Fr	Aberrations
42.25.-p	Wave optics
42.25.Bs	Wave propagation, transmission and absorption
42.25.Dd	Wave propagation in random media
42.25.Fx	Diffraction and scattering
42.25.Gy	Edge and boundary effects; reflection and refraction
42.25.Hz	Interference
42.25.Ja	Polarization
42.25.Kb	Coherence
42.25.Lc	Birefringence
42.30.-d	Imaging and optical processing
42.30.Kq	Fourier optics
42.30.Lr	Modulation and optical transfer functions
42.30.Ms	Speckle and moiré patterns
42.30.Rx	Phase retrieval
42.30.Sy	Pattern recognition
42.30.Tz	Computer vision; robotic vision
42.30.Va	Image forming and processing
42.30.Wb	Image reconstruction; tomography
42.40.-i	Holography
42.40.Eq	Holographic optical elements; holographic gratings
42.40.Ht	Hologram recording and readout methods
42.40.Jv	Computer-generated holograms
42.40.Kw	Holographic interferometry; other holographic techniques
42.40.Lx	Diffraction efficiency, resolution, and other hologram characteristics
42.40.My	Applications
42.40.Pa	Volume holograms
42.50.-p	Quantum optics
42.50.Ar	Photon statistics and coherence theory
42.50.Ct	Quantum description of interaction of light and matter; related experiments
42.50.Dv	Quantum state engineering and measurements
42.50.Ex	Optical implementations of quantum information processing and transfer
42.50.Gy	Effects of atomic coherence on propagation, absorption, and amplification of light
42.50.Hz	Strong-field excitation of optical transitions inquantum systems; multiphoton processes; dynamic Stark
42.50.Lc	Quantum fluctuations, quantum noise, and quantum jumps
42.50.Md	Optical transient phenomena
42.50.Nn	Quantum optical phenomena in absorbing, amplifying, dispersive and conducting media
42.50.Pq	Cavity quantum electrodynamics; micromasers
42.50.St	Nonclassical interferometry, subwavelength lithography
42.50.Tx	Optical angular momentum and its quantum aspects
42.50.Wk	Mechanical effects of light on material media, microstructures and particles
42.50.Xa	Optical tests of quantum theory
42.55.-f	Lasers
42.55.Ah	General laser theory

	42.55.Ks	Chemical lasers
	42.55.Lt	Gas lasers including excimer and metal-vapor lasers
	42.55.Mv	Dye lasers
	42.55.Px	Semiconductor lasers; laser diodes
	42.55.Rz	Doped-insulator lasers and other solid state lasers
	42.55.Sa	Microcavity and microdisk lasers
	42.55.Tv	Photonic crystal lasers and coherent effects
	42.55.Vc	X- and Gamma-ray lasers
	42.55.Wd	Fiber lasers
	42.55.Xi	Diode-pumped lasers
	42.55.Ye	Raman lasers
	42.55.Zz	Random lasers
	42.60.-v	Laser optical systems: design and operation
	42.60.By	Design of specific laser systems
	42.60.Da	Resonators, cavities, amplifiers, arrays, and rings
	42.60.Fc	Modulation, tuning, and mode locking
	42.60.Gd	Q-switching
	42.60.Jf	Beam characteristics: profile, intensity, and power; spatial pattern formation
	42.60.Lh	Efficiency, stability, gain, and other operationalparameters
	42.60.Mi	Dynamical laser instabilities; noisy laser behavior
	42.60.Pk	Continuous operation
	42.60.Rn	Relaxation oscillations and long pulse operation
	42.62.-b	Laser applications
	42.62.Be	Biological and medical applications
	42.62.Cf	Industrial applications
	42.62.Eh	Metrological applications; optical frequency synthesizers for precision spectroscopy
	42.62.Fi	Laser spectroscopy
	42.65.-k	Nonlinear optics
	42.65.An	Optical susceptibility, hyperpolarizability
	42.65.Dr	Stimulated Raman scattering; CARS
	42.65.Es	Stimulated Brillouin and Rayleigh scattering
	42.65.Hw	Phase conjugation; photorefractive and Kerr effects
	42.65.Jx	Beam trapping, self-focusing and defocusing; self-phase modulation
	42.65.Ky	Frequency conversion; harmonic generation, including higher-order harmonic
	42.65.Lm	Parametric down conversion and production of entangled photons
	42.65.Pc	Optical bistability, multistability, and switching, including local field effects
	42.65.Re	Ultrafast processes; optical pulse generation andpulse compression
	42.65.Sf	Dynamics of nonlinear optical systems; optical instabilities, optical chaos and complexity
	42.65.Tg	Optical solitons; nonlinear guided waves
	42.65.Wi	Nonlinear waveguides
	42.65.Yj	Optical parametric oscillators and amplifiers
	42.66.-p	Physiological
	42.66.Ct	Anatomy and optics of eye
	42.66.Ew	Physiology of eye; optic-nerve structure and function
	87.19.lt	Sensory systems: visual, auditory, tactile, taste,and olfaction)
	42.66.Lc	Vision: light detection, adaptation, and discrimination
	42.66.Ne	Color vision: color detection, adaptation, and discrimination
	42.66.Qg	Scales for light and color detection
	42.66.Si	Psychophysics of vision, visual perception; binocular vision
	42.68.-w	Atmospheric and ocean optics
	42.68.Ay	Propagation, transmission, attenuation, and radiative transfer
	42.68.Bz	Atmospheric turbulence
	42.68.Ca	Spectral absorption by atmospheric gases
	42.68.Ge	Effects of clouds and water; ice crystal
	42.68.Jg	Effects of aerosols
	42.68.Kh	Effects of air pollution
	42.68.Mj	Scattering, polarization
	42.68.Sq	Image transmission and formation
	42.68.Wt	Remote sensing; LIDAR and adaptive systems
	42.68.Xy	Ocean optics
	42.70.-a	Optical materials
	42.70.Ce	Glasses, quartz
	42.70.Df	Liquid crystals
	42.70.Gi	Light-sensitive materials
	42.70.Hj	Laser materials
	42.70.Jk	Polymers and organics

42.70.Km	Infrared transmitting materials
42.70.Ln	Holographic recording materials; optical storage media
42.70.Mp	Nonlinear optical crystals
42.70.Nq	Other nonlinear optical materials; photorefractiveand semiconductor materials
42.70.Qs	Photonic bandgap materials
42.72.-g	Optical sources and standards
42.72.Ai	Infrared sources
42.72.Bj	Visible and ultraviolet sources
42.79.-e	Optical elements, devices, and systems
42.79.Ag	Apertures, collimators
42.79.Bh	Lenses, prisms and mirrors
42.79.Ci	Filters, zone plates, and polarizers
42.79.Dj	Gratings
42.79.Ek	Solar collectors and concentrators
42.79.Fm	Reflectors, beam splitters, and deflectors
42.79.Gn	Optical waveguides and couplers
42.79.Hp	Optical processors, correlators, and modulators
42.79.Jq	Acousto-optical devices
42.79.Kr	Display devices, liquid-crystal devices
42.79.Ls	Scanners, image intensifiers, and image converters
42.79.Mt	Schlieren devices
42.79.Nv	Optical frequency converters
42.79.Pw	Imaging detectors and sensors
42.79.Qx	Range finders, remote sensing devices; laser Doppler velocimeters, SAR, and LIDAR
42.79.Ry	Gradient-index (GRIN) devices
42.79.Sz	Optical communication systems, multiplexers, and demultiplexers
42.79.Ta	Optical computers, logic elements, interconnects,switches; neural networks
42.79.Vb	Optical storage systems, optical disks
42.79.Wc	Optical coatings
42.81.-i	Fiber optics
42.81.Bm	Fabrication, cladding, and splicing
42.81.Cn	Fiber testing and measurement of fiber parameters
42.81.Dp	Propagation, scattering, and losses; solitons
42.81.Gs	Birefringence, polarization
42.81.Ht	Gradient-index (GRIN) fiber devices
42.81.Pa	Sensors, gyros
42.81.Qb	Fiber waveguides, couplers, and arrays
42.81.Uv	Fiber networks
42.81.Wg	Other fiber-optical devices
42.82.-m	Integrated optics
42.82.Bq	Design and performance testing of integrated-optical systems
42.82.Cr	Fabrication techniques; lithography, pattern transfer
42.82.Ds	Interconnects, including holographic interconnects
42.82.Et	Waveguides, couplers, and arrays
42.82.Fv	Hybrid systems
42.82.Gw	Other integrated-optical elements and systems
42.86.+b	Optical workshop techniques
42.87.-d	Optical testing techniques
42.87.Bg	Phase shifting interferometry
42.88.+h	Environmental and radiation effects on optical elements, devices, and systems
42.90.+m	Other topics in optics
	Parity-time symmetrical and non-Hermitian devices
43.	Acoustics
43.20.+g	General linear acoustics
43.25.+y	Nonlinear acoustics
43.28.+h	Aeroacoustics and atmospheric sound
43.30.+m	Underwater sound
43.35.+d	Ultrasonics, quantum acoustics, and physical effects of sound
43.38.+n	Transduction; acoustical devices for the generation and reproduction of sound
43.40.+s	Structural acoustics and vibration
43.50.+y	Noise: its effects and control
43.55.+p	Architectural acoustics
43.58.+z	Acoustical measurements and instrumentation

43.60.+d	Acoustic signal processing
43.64.+r	Physiological acoustics
43.70.+i	Speech production
43.71.+m	Speech perception
43.72.+q	Speech processing and communication systems
43.75.+a	Music and musical instruments
43.80.+p	Bioacoustics
43.90.+v	Other topics in acoustics
44.	Heat transfer
44.05.+e	Analytical and numerical techniques
44.10.+i	Heat conduction
44.15.+a	Channel and internal heat flow
44.20.+b	Boundary layer heat flow
44.25.+f	Natural convection
44.27.+g	Forced convection
44.30.+v	Heat flow in porous media
44.35.+c	Heat flow in multiphase systems
44.40.+a	Thermal radiation
44.90.+c	Other topics in heat transfer
	Heat rectification
45.	Classical mechanics of discrete systems
45.05.+x	General theory of classical mechanics of discretesystems
45.10.-b	Computational methods in classical mechanics
45.10.Db	Variational and optimization methods
45.10.Hj	Perturbation and fractional calculus methods
45.10.Na	Geometrical and tensorial methods
45.20.-d	Formalisms in classical mechanics
45.20.D-	Newtonian mechanics
45.20.da	Forces and torques
45.20.dc	Rotational dynamics
45.20.df	Momentum conservation
45.20.dg	Mechanical energy, work, and power
45.20.dh	Energy conservation
45.20.Jj	Lagrangian and Hamiltonian mechanics
45.30.+s	General linear dynamical systems
45.40.-f	Dynamics and kinematics of rigid bodies
45.40.Aa	Translation kinematics
45.40.Bb	Rotational kinematics
45.40.Cc	Rigid body and gyroscope motion
45.40.Gj	Ballistics (projectiles; rockets)
45.40.Ln	Robotics
45.50.-j	Dynamics and kinematics of a particle and a systemof particles
45.50.Dd	General motion
45.50.Jf	Few- and many-body systems
45.50.Pk	Celestial mechanics
45.50.Tn	Collisions
45.70.-n	Granular systems
45.70.Cc	Static sandpiles; granular compaction
45.70.Ht	Avalanches
45.70.Mg	Granular flow: mixing, segregation and stratification
45.70.Qj	Pattern formation
45.70.Vn	Granular models of complex systems; traffic flow
45.80.+r	Control of mechanical systems
45.90.+t	Other topics in classical mechanics of discrete systems
46.	Continuum mechanics of solids
46.05.+b	General theory of continuum mechanics of solids
46.15.-x	Computational methods in continuum mechanics
46.15.Cc	Variational and optimizational methods
46.15.Ff	Perturbation and complex analysis methods
46.25.-y	Static elasticity

46.25.Cc	Theoretical studies
46.25.Hf	Thermoelasticity and electromagnetic elasticity (electroelasticity, magnetoelasticity)
46.32.+x	Static buckling and instability
46.35.+z	Viscoelasticity, plasticity, viscoplasticity
46.40.-f	Vibrations and mechanical waves
46.40.Cd	Mechanical wave propagation (including diffraction, scattering, and dispersion)
46.40.Ff	Resonance, damping, and dynamic stability
46.40.Jj	Aeroelasticity and hydroelasticity
46.50.+a	Fracture mechanics, fatigue and cracks
46.55.+d	Tribology and mechanical
46.65.+g	Random phenomena and media
46.70.-p	Application of continuum mechanics to structures
46.70.De	Beams, plates, and shells
46.70.Hg	Membranes, rods, and strings
46.70.Lk	Other structures
46.80.+j	Measurement methods and techniques in continuum mechanics of solids
46.90.+s	Other topics in continuum mechanics of solids
47.	Fluid dynamics
47.10.-g	General theory in fluid dynamics
47.10.A-	Mathematical formulations
47.10.ab	Conservation laws and constitutive relations
47.10.ad	Navier-Stokes equations
47.10.Df	Hamiltonian formulations
47.10.Fg	Dynamical systems methods
47.11.-j	Computational methods in fluid dynamics
47.11.Bc	Finite difference methods
47.11.Df	Finite volume methods
47.11.Fg	Finite element methods
47.11.Hj	Boundary element methods
47.11.Kb	Spectral methods
47.11.Mn	Molecular dynamics methods
47.11.Qr	Lattice gas
47.11.St	Multi-scale methods
47.15.-x	Laminar flows
47.15.Cb	Laminar boundary layers
47.15.Fe	Stability of laminar flows
47.15.G-	Low-Reynolds-number (creeping) flows
47.15.gm	Thin film flows
47.15.gp	Hele-Shaw flows
47.15.K-	Inviscid laminar flows
47.15.ki	Inviscid flows with vorticity
47.15.km	Potential flows
47.15.Rq	Laminar flows in cavities, channels, ducts, and conduits
47.15.St	Free shear layers
47.15.Tr	Laminar wakes
47.15.Uv	Laminar jets
47.20.-k	Flow instabilities
47.20.Bp	Buoyancy-driven instabilities (e.g., Rayleigh-Benard)
47.20.Cq	Inviscid instability
47.20.Dr	Surface-tension-driven instability
47.20.Ft	Instability of shear flows (e.g., Kelvin-Helmholtz)
47.20.Gv	Viscous and viscoelastic instabilities
47.20.Hw	Morphological instability; phase changes
47.20.Ib	Instability of boundary layers; separation
47.20.Ky	Nonlinearity, bifurcation, and symmetry breaking
47.20.Lz	Secondary instabilities
47.20.Ma	Interfacial instabilities (e.g., Rayleigh-Taylor)
47.20.Pc	Flow receptivity
47.20.Qr	Centrifugal instabilities (e.g., Taylor-Couette flow)
47.27.-i	Turbulent flows
47.27.Ak	Fundamentals
47.27.Cn	Transition to turbulence
47.27.De	Coherent structures
47.27.E-	Turbulence simulation and modeling

	47.27.eb	Statistical theories and models
	47.27.ed	Dynamical systems approaches
	47.27.ef	Field-theoretic formulations and renormalization
	47.27.ek	Direct numerical simulations
	47.27.em	Eddy-viscosity closures; Reynolds stress modeling
	47.27.ep	Large-eddy simulations
	47.27.er	Spectral methods
	47.27.Gs	Isotropic turbulence; homogeneous turbulence
	47.27.Jv	High-Reynolds-number turbulence
	47.27.N-	Wall-bounded shear flow turbulence
	47.27.nb	Boundary layer turbulence
	47.27.nd	Channel flow
	47.27.nf	Flows in pipes and nozzles
	47.27.Rc	Turbulence control
	47.27.Sd	Turbulence generated noise
	47.27.T-	Turbulent transport processes
	47.27.tb	Turbulent diffusion
	47.27.te	Turbulent convective heat transfer
	47.27.W-	Boundary-free shear flow turbulence
	47.27.wb	Turbulent wakes
	47.27.wg	Turbulent jets
	47.27.wj	Turbulent mixing layers
	47.32.-y	Vortex dynamics; rotating fluids
	47.32.C-	Vortex dynamics
	47.32.cb	Vortex interactions
	47.32.cd	Vortex stability and breakdown
	47.32.cf	Vortex reconnection and rings
	47.32.ck	Vortex streets
	47.32.Ef	Rotating and swirling flows
	47.32.Ff	Separated flows
	47.35.-i	Hydrodynamic waves
	47.35.Bb	Gravity waves
	47.35.De	Shear waves
	47.35.Fg	Solitary waves
	47.35.Jk	Wave breaking
	47.35.Lf	Wave-structure interactions
	47.35.Pq	Capillary waves
	47.35.Rs	Sound waves
	47.35.Tv	Magnetohydrodynamic waves
	47.37.+q	Hydrodynamic aspects of superfluidity; quantum fluids
	47.40.-x	Compressible flows; shock waves
	47.40.Dc	General subsonic flows
	47.40.Hg	Transonic flows
	47.40.Ki	Supersonic and hypersonic flows
	47.40.Nm	Shock wave interactions and shock effects
	47.40.Rs	Detonation waves
	47.45.-n	Rarefied gas dynamics
	47.45.Ab	Kinetic theory of gases
	47.45.Dt	Free molecular flows
	47.45.Gx	Slip flows and accommodation
	47.50.-d	Non-Newtonian fluid flows
	47.50.Cd	Modeling
	47.50.Ef	Measurements
	47.50.Gj	Instabilities
	47.51.+a	Mixing
	47.52.+j	Chaos in fluid dynamics
	47.53.+n	Fractals in fluid dynamics
	47.54.Bd	Theoretical aspects
	47.54.De	Experimental aspects
	47.54.Fj	Chemical and biological applications
	47.54.Jk	Materials science applications
	47.55.-t	Multiphase and stratified flows
	47.55.Ca	Gasliquid flows
	47.55.D-	Drops and bubbles
	47.55.db	Drop and bubble formation
	47.55.dd	Bubble dynamics

	47.55.df	Breakup and coalescence
	47.55.dk	Surfactant effects
	47.55.dm	Thermocapillary effects
	47.55.dp	Cavitation and boiling
	47.55.dr	Interactions with surfaces
	47.55.Hd	Stratified flows
	47.55.Iv	Core-annular flows
	47.55.Kf	Particle-laden flows
	47.55.Lm	Fluidized beds
	47.55.N-	Interfacial flows
	47.55.nb	Capillary and thermocapillary flows
	47.55.nd	Spreading films
	47.55.nk	Liquid bridges
	47.55.nm	Curtains/sheets
	47.55.np	Contact lines
	47.55.P-	Buoyancy-driven flows; convection
	47.55.pb	Thermal convection
	47.55.pd	Multidiffusive convection
	47.55.pf	Marangoni convection
	47.56.+r	Flows through porous media
	47.57.-s	Complex fluids and colloidal systems
	47.57.Bc	Foams and emulsions
	47.57.E-	Suspensions
	47.57.eb	Diffusion and aggregation
	47.57.ef	Sedimentation and migration
	47.57.Gc	Granular flow
	47.57.J-	Colloidal systems
	47.57.jb	Microemulsions
	47.57.jd	Electrokinetic effects
	47.57.Lj	Flows of liquid crystals
	47.57.Ng	Polymers and polymer solutions
	47.57.Qk	Rheological aspects
	47.60.-i	Flow phenomena in quasi-one-dimensional systems
	47.60.Dx	Flows in ducts and channels
	47.60.Kz	Flows and jets through nozzles
	47.61.-k	Micro- and nano- scale flow phenomena
	47.61.Cb	Non-continuum effects
	47.61.Fg	Flows in micro-electromechanical systems (MEMS) and nanoelectromechanical systems (NEMS)
	47.61.Jd	Multiphase flows
	47.61.Ne	Micromixing
	47.63.-b	Biological fluid dynamics
	47.63.Cb	Blood flow in cardiovascular system
	47.63.Ec	Pulmonary fluid mechanics
	47.63.Gd	Swimming microorganisms
	47.63.Jd	Microcirculation and flow through tissues
	47.63.M-	Biopropulsion in water and air
	47.63.mc	High-Reynolds-number motions
	47.63.mf	Low-Reynolds-number motions
	47.63.mh	Transport processes and drug delivery
	47.65.-d	Magnetohydrodynamics and electrohydrodynamics
	47.65.Cb	Magnetic fluids and ferrofluids
	47.65.Gx	Electrorheological fluids
	47.65.Md	Plasma dynamos
	47.70.-n	Reactive and radiative flows
	47.70.Fw	Chemically reactive flows
	47.70.Mc	Radiation gas dynamics
	47.70.Nd	Nonequilibrium gas dynamics
	47.70.Pq	Flames; combustion
	47.75.+f	Relativistic fluid dynamics
	47.80.-v	Instrumentation and measurement methods in fluid dynamics
	47.80.Cb	Velocity measurements
	47.80.Fg	Pressure and temperature measurements
	47.80.Jk	Flow visualization and imaging
	47.85.-g	Applied fluid mechanics
	47.85.Dh	Hydrodynamics, hydraulics, hydrostatics
	47.85.Gj	Aerodynamics

47.85.Kn	Hydraulic and pneumatic machinery
47.85.L-	Flow control
47.85.lb	Drag reduction
47.85.ld	Boundary layer control
47.85.lf	Flow noise reduction
47.85.lk	Mixing enhancement
47.85.M-	Material processing flows; industrial applications
47.85.mb	Coating flows
47.85.md	Polymer processing flows
47.85.mf	Lubrication flows
47.85.Np	Fluidics
47.90.+a	Other topics in fluid dynamics
50.	PHYSICS OF GASES, PLASMAS, AND ELECTRIC DISCHARGES
51.	Physics of gases
51.10.+y	Kinetic and transport theory of gases
51.20.+d	Viscosity, diffusion, and thermal conductivity
51.30.+i	Thermodynamic properties, equations of state
51.35.+a	Mechanical properties; compressibility
51.40.+p	Acoustical properties
51.50.+v	Electrical properties (ionization, breakdown, electron and ion mobility, etc.)
51.60.+a	Magnetic properties
51.70.+f	Optical and dielectric properties
51.90.+r	Other topics in the physics of gases
52.	Physics of plasmas and electric discharges
52.20.-j	Elementary processes in plasmas
52.20.Dq	Particle orbits
52.20.Fs	Electron collisions
52.20.Hv	Atomic, molecular, ion, and heavy-particle collisions
52.25.-b	Plasma properties
52.25.Dg	Plasma kinetic equations
52.25.Fi	Transport properties
52.25.Gj	Fluctuation and chaos phenomena
52.25.Jm	Ionization of plasmas
52.25.Kn	Thermodynamics of plasmas
52.25.Mq	Dielectric properties
52.25.Os	Emission, absorption, and scattering of electromagnetic radiation
52.25.Tx	Emission, absorption, and scattering of particles
52.25.Vy	Impurities in plasmas
52.25.Xz	Magnetized plasmas
52.25.Ya	Neutrals in plasmas
52.27.-h	Basic studies of specific kinds of plasmas
52.27.Aj	Single-component, electron-positive-ion plasmas
52.27.Cm	Multicomponent and negative-ion plasmas
52.27.Ep	Electron-positron plasmas
52.27.Gr	Strongly-coupled plasmas
52.27.Jt	Nonneutral plasmas
52.27.Lw	Dusty or complex plasmas; plasma crystals
52.27.Ny	Relativistic plasmas
52.30.-q	Plasma dynamics and flow
52.30.Cv	Magnetohydrodynamics (including electron magnetohydrodynamics)
52.30.Ex	Two-fluid and multi-fluid plasmas
52.30.Gz	Gyrokinetics
52.35.-g	Waves, oscillations, and instabilities in plasmasand intense beams
52.35.Bj	Magnetohydrodynamic waves (e.g., Alfven waves)
52.35.Dm	Sound waves
52.35.Fp	Electrostatic waves and oscillations (e.g., ion-acoustic waves)
52.35.Hr	Electromagnetic waves (e.g., electron-cyclotron, Whistler, Bernstein, upper hybrid, lower hybrid)
52.35.Kt	Drift waves
52.35.Lv	Other linear waves
52.35.Mw	Nonlinear phenomena: waves, wave propagation, andother interactions

52.35.Py	Macroinstabilities (hydromagnetic, e.g., kink, fire-hose, mirror, ballooning, tearing, etc.)
52.35.Qz	Microinstabilities (ion-acoustic, two-stream, loss-cone, beamplasma, drift, ion- or electron-cyclotron, etc.)
52.35.Ra	Plasma turbulence
52.35.Sb	Solitons; BGK modes
52.35.Tc	Shock waves and discontinuities
52.35.Vd	Magnetic reconnection
52.35.We	Plasma vorticity
52.38.-r	Laser-plasma interactions
52.38.Bv	Rayleigh scattering; stimulated Brillouin and Raman scattering
52.38.Dx	Laser light absorption in plasmas (collisional, parametric, etc.)
52.38.Fz	Laser-induced magnetic fields in plasmas
52.38.Hb	Self-focussing, channeling, and filamentation in plasmas
52.38.Kd	Laser-plasma acceleration of electrons and ions
52.38.Mf	Laser ablation
52.38.Ph	X-ray, Gamma-ray, and particle generation
52.40.-w	Plasma interactions (nonlaser)
52.40.Db	Electromagnetic (nonlaser) radiation interactionswith plasma
52.40.Fd	Plasma interactions with antennas; plasma-filled waveguides
52.40.Hf	Plasma-material interactions; boundary layer effects
52.40.Kh	Plasma sheaths
52.40.Mj	Particle beam interactions in plasmas
52.50.-b	Plasma production and heating
52.50.Dg	Plasma sources
52.50.Gj	Plasma heating by particle beams
52.50.Jm	Plasma production and heating by laser beams (laser-foil, lasercluster, etc.)
52.50.Lp	Plasma production and heating by shock waves and compression
52.50.Nr	Plasma heating by DC fields; ohmic heating, arcs
52.50.Qt	Plasma heating by radio-frequency fields; ICR, ICP, helicons
52.50.Sw	Plasma heating by microwaves; ECR, LH, collisionalheating
52.55.-s	Magnetic confinement and equilibrium
52.55.Dy	General theory and basic studies of plasma lifetime, particle and heat loss, energy balance, field structure, etc.
52.55.Ez	Theta pinch
52.55.Fa	Tokamaks, spherical tokamaks
52.55.Hc	Stellarators, torsatrons, heliacs, bumpy tori, andother toroidal confinement devices
52.55.Ip	Spheromaks
52.55.Jd	Magnetic mirrors, gas dynamic traps
52.55.Lf	Field-reversed configurations, rotamaks, astrons,ion rings, magnetized target fusion, and cusps
52.55.Pi	Fusion products effects (e.g., alpha-particles, etc.), fast particle effects
52.55.Rk	Power exhaust; divertors
52.55.Tn	Ideal and resistive MHD modes; kinetic modes
52.55.Wq	Current drive; helicity injection
52.57.-z	Laser inertial confinement
52.57.Bc	Target design and fabrication
52.57.Fg	Implosion symmetry and hydrodynamic instability (Rayleigh-Taylor, Richtmyer-Meshkov, imprint, etc.)
52.57.Kk	Fast ignition of compressed fusion fuels
52.58.-c	Other confinement methods
52.58.Ei	Light-ion inertial confinement
52.58.Hm	Heavy-ion inertial confinement
52.58.Lq	Z-pinches, plasma focus, and other pinch devices
52.58.Qv	Electrostatic and high-frequency confinement
52.59.-f	Intense particle beams and radiation sources
52.59.Bi	Grid- and ion-diode-accelerated beams
52.59.Dk	Magneto-plasma accelerated plasmas
52.59.Fn	Multistage accelerated heavy-ion beams
52.59.Hq	Dense plasma focus
52.59.Mv	High-voltage diodes
52.59.Px	Hard X-ray sources
52.59.Qy	Wire array Z-pinches
52.59.Rz	Free-electron devices
52.59.Sa	Space-charge-dominated beams
52.59.Tb	Moderate-intensity beams

52.59.Wd	Emittance-dominated beams
52.59.Ye	Plasma devices for generation of coherent radiation
52.65.-y	Plasma simulation
52.65.Cc	Particle orbit and trajectory
52.65.Ff	Fokker-Planck and Vlasov equation
52.65.Kj	Magnetohydrodynamic and fluid equation
52.65.Pp	Monte Carlo methods
52.65.Rr	Particle-in-cell method
52.65.Tt	Gyrofluid and gyrokinetic simulations
52.65.Vv	Perturbative methods
52.65.Ww	Hybrid methods
52.65.Yy	Molecular dynamics methods
52.70.-m	Plasma diagnostic techniques and instrumentation
52.70.Ds	Electric and magnetic measurements
52.70.Gw	Radio-frequency and microwave measurements
52.70.Kz	Optical (ultraviolet, visible, infrared) measurements
52.70.La	X-ray and Gamma-ray measurements
52.70.Nc	Particle measurements
52.72.+v	Laboratory studies of space- and astrophysical-plasma processes
52.75.-d	Plasma devices
52.75.Di	Ion and plasma propulsion
52.75.Fk	Magnetohydrodynamic generators and thermionic convertors; plasma diodes
52.75.Hn	Plasma torches
52.75.Kq	Plasma switches (e.g., spark gaps)
52.75.Xx	Thermionic and filament-based sources (e.g., Q machines, doubleand triple-plasma devices, etc.)
52.77.-j	Plasma applications
52.77.Bn	Etching and cleaning
52.77.Dq	Plasma-based ion implantation and deposition
52.77.Fv	High-pressure, high-current plasmas (plasma spray,arc welding, etc.)
52.80.-s	Electric discharges
52.80.Dy	Low-field and Townsend discharges
52.80.Hc	Glow; corona
52.80.Mg	Arcs; sparks; lightning; atmospheric electricity
52.80.Pi	High-frequency and RF discharges
52.80.Qj	Explosions; exploding wires
52.80.Sm	Magnetoactive discharges (e.g., Penning discharges)
52.80.Tn	Other gas discharges
52.80.Vp	Discharge in vacuum
52.80.Wq	Discharge in liquids and solids
52.80.Yr	Discharges for spectral sources (including inductively coupled plasma)
52.90.+z	Other topics in physics of plasmas and electric discharges
60.	CONDENSED MATTER: STRUCTURAL, MECHANICAL, AND THERMAL PROPERTIES
61.	Structure of solids and liquids; crystallography
61.05.-a	Techniques for structure determination
61.05.C-	X-ray diffraction and scattering
61.05.cc	Theories of x-ray diffraction and scattering
61.05.cf	X-ray scattering (including small-angle scattering)
61.05.cj	X-ray absorption spectroscopy: EXAFS, NEXAFS, XANES, etc.
61.05.cm	X-ray reflectometry (surfaces, interfaces, films)
61.05.cp	X-ray diffraction
61.05.F-	Neutron diffraction and scattering
61.05.fd	Theories of neutron diffraction and scattering
61.05.fg	Neutron scattering (including small-angle scattering)
61.05.fj	Neutron reflectometry
61.05.fm	Neutron diffraction
61.05.J-	Electron diffraction and scattering
61.05.jd	Theories of electron diffraction and scattering
61.05.jh	Low-energy electron diffraction (LEED) and reflection high-energy electron diffraction (RHEED)
61.05.jm	Convergent-beam electron diffraction, selected-area electron diffraction, nanodiffraction

	61.05.jp	Electron holography
	61.05.js	X-ray photoelectron diffraction
	61.05.Np	Atom, molecule, and ion scattering (for structuredetermination only)
	61.05.Qr	Magnetic resonance techniques; Mössbauer spectroscopy (for structure determination only)
	61.05.Tv	Neutron imaging; neutron tomography
	61.20.-p	Structure of liquids
	61.20.Gy	Theory and models of liquid structure
	61.20.Ja	Computer simulation of liquid structure
	61.20.Lc	Time-dependent properties; relaxation
	61.20.Ne	Structure of simple liquids
	61.20.Qg	Structure of associated liquids: electrolytes, molten salts, etc.
	61.25.-f	Studies of specific liquid structures
	61.25.Bi	Liquid noble gases
	61.25.Em	Molecular liquids
	61.25.H-	Macromolecular and polymers solutions; polymer melts
	61.25.he	Polymer solutions
	61.25.hk	Polymer melts and blends
	61.25.hp	Polymer swelling, cross linking
	61.25.Mv	Liquid metals and alloys
	61.30.-v	Liquid crystals
	61.30.Cz	Molecular and microscopic models and theories of liquid crystal structure
	61.30.Dk	Continuum models and theories of liquid crystal structure
	61.30.Eb	Experimental determinations of smectic, nematic, cholesteric, and other structures
	61.30.Gd	Orientational order of liquid crystals; electric and magnetic field effects on order
	61.30.Hn	Surface phenomena
	61.30.Jf	Defects in liquid crystals
	61.30.Mp	Blue phases and other defect-phases
	61.30.Pq	Microconfined liquid crystals:droplets, cylinders, randomly confined liquid crystals, polymer dispersed liquid crystals
	61.30.St	Lyotropic phases
	61.30.Vx	Polymer liquid crystals
	61.41.+e	Polymers, elastomers, and plastics
	61.43.-j	Disordered
	61.43.Bn	Structural modeling: serial-addition models, computer simulation
	61.43.Dq	Amorphous semiconductors, metals, and alloys
	61.43.Er	Other amorphous solids
	61.43.Fs	Glasses
	61.43.Gt	Powders, porous materials
	61.43.Hv	Fractals; macroscopic aggregates (including diffusion-limited aggregates)
	61.44.-n	Semi-periodic solids
	61.44.Br	Quasicrystals
	61.44.Fw	Incommensurate crystals
	61.46.-w	Structure of nanoscale
	61.46.Bc	Structure of clusters (metcars;not fragments of crystals;free or loosely aggregated or loosely attached to a substrate)
	61.46.Df	Structure of nanocrystals and nanoparticles ("colloidal" quantum dots but not gate-isolated embedded quantum dots)
	61.46.Fg	Nanotubes
	61.46.Hk	Nanocrystals
	61.46.Km	Structure of nanowires and nanorods
	61.46.Np	Structure of nanotubes (hollow nanowires)
	61.48.-c	Structure of fullerenes and related hollow and planar molecular structures
	61.48.De	Structure of carbon nanotubes, boron nanotubes, and other related systems
	61.48.Gh	Structure of graphene
	61.50.-f	Structure of bulk crystals
	61.50.Ah	Theory of crystal structure, crystal symmetry; calculations and modelling
	61.50.Ks	Crystallographic aspects of phase transformations;pressure effects
	61.50.Lt	Crystal binding; cohesive energy
	61.50.Nw	Crystal stoichiometry
	61.66.-f	Structure of specific crystalline solids
	61.66.Bi	Elemental solids
	61.66.Dk	Alloys
	61.66.Fn	Inorganic compounds
	61.66.Hq	Organic compounds
	61.68.+n	Crystallographic databases
	61.72.-y	Defects and impurities in crystals;

61.72.Bb	Theories and models of crystal defects
61.72.Cc	Kinetics of defect formation and annealing
61.72.Dd	Experimental determination of defects by diffraction and scattering
61.72.Ff	Direct observation of dislocations and other defects
61.72.Hh	Indirect evidence of dislocations and other
61.72.J-	Point defects and defect clusters
61.72.jd	Vacancies
61.72.jj	Interstitials
61.72.jn	Color centers
61.72.Lk	Linear defects: dislocations, disclinations
61.72.Mm	Grain and twin boundaries
61.72.Nn	Stacking faults and other planar or extended defects
61.72.Qq	Microscopic defects (voids, inclusions, etc.)
61.72.S-	Impurities in crystals
61.72.sd	Impurity concentration
61.72.sh	Impurity distribution
61.72.sm	Impurity gradients
61.72.U-	Doping and impurity implantation
61.72.uf	Ge and Si
61.72.uj	III-V and II-VI semiconductors
61.72.up	Other materials
61.72.Yx	Interaction between different crystal defects; gettering effect
61.80.-x	Physical radiation effects, radiation damage
61.80.Az	Theory and models of radiation effects
61.80.Ba	Ultraviolet, visible, and infrared radiation effects (including laser radiation)
61.80.Cb	X-ray effects
61.80.Ed	Gamma-ray effects
61.80.Fe	Electron and positron radiation effects
61.80.Hg	Neutron radiation effects
61.80.Jh	Ion radiation effects
61.80.Lj	Atom and molecule irradiation effects
61.82.-d	Radiation effects on specific materials
61.82.Bg	Metals and alloys
61.82.Fk	Semiconductors
61.82.Ms	Insulators
61.82.Pv	Polymers, organic compounds
61.82.Rx	Nanocrystalline materials
61.85.+p	Channeling phenomena (blocking, energy loss, etc.)
61.90.+d	Other topics in structure of solids and liquids; crystallography
62.	Mechanical and acoustical properties of condensed matter
62.10.+s	Mechanical properties of liquids
62.20.-x	Mechanical properties of solids
62.20.D-	Elasticity
62.20.de	Elastic moduli
62.20.dj	Poisson's ratio
62.20.dq	Other elastic constants
62.20.F-	Deformation and plasticity
62.20.fg	Shape-memory effect; yield stress; superelasticity
62.20.fk	Ductility, malleability
62.20.fq	Plasticity and superplasticity
62.20.Hg	Creep
62.20.M-	Structural failure of materials
62.20.me	Fatigue
62.20.mj	Brittleness
62.20.mm	Fracture
62.20.mq	Buckling
62.20.mt	Cracks
62.20.Qp	Friction, tribology, and hardness
62.23.-c	Structural classes of nanoscale systems
62.23.Eg	Nanodots
62.23.Hj	Nanowires
62.23.Kn	Nanosheets
62.23.Pq	Composites (nanosystems embedded in a larger structure)
62.23.St	Complex nanostructures, including patterned or assembled structures

62.25.-g	Mechanical properties of nanoscale systems
62.25.De	Low-frequency properties: response coefficients
62.25.Fg	High-frequency properties, responses to resonant or transient (timedependent) fields
62.25.Jk	Mechanical modes of vibration
62.25.Mn	Fracture/brittleness
62.30.+d	Mechanical and elastic waves
62.40.+i	Anelasticity, internal friction, stress relaxation, and mechanical
62.50.-p	High-pressure effects in solids and liquids
62.50.Ef	Shock wave effects in solids and liquids
62.60.+v	Acoustical properties of liquids
62.65.+k	Acoustical properties of solids
62.80.+f	Ultrasonic relaxation
62.90.+k	Other topics in mechanical and acoustical properties of condensed matter
63.	Lattice dynamics
63.10.+a	General theory
63.20.-e	Phonons in crystal lattices
63.20.D-	Phonon states and bands, normal modes, and phonondispersion
63.20.dd	Measurements
63.20.dh	Fitted theory
63.20.dk	First-principles theory
63.20.K-	Phonon interactions
63.20.kd	Phonon-electron interactions
63.20.kg	Phonon-phonon interactions
63.20.kk	Phonon interactions with other quasiparticles
63.20.kp	Phonon-defect interactions
63.20.Pw	Localized modes
63.20.Ry	Anharmonic lattice modes
63.22.-m	Phonons or vibrational states in low-dimensional structures and nanoscale materials
63.22.Dc	Free films
63.22.Gh	Nanotubes and nanowires
63.22.Kn	Clusters and nanocrystals
63.22.Np	Layered systems
63.22.Rc	Phonons in graphene
63.50.-x	Vibrational states in disordered systems
63.50.Gh	Disordered crystalline alloys
63.50.Lm	Glasses and amorphous solids
63.70.+h	Statistical mechanics of lattice vibrations and displacive phase transitions
63.90.+t	Other topics in lattice dynamics
64.	Equations of state, phase equilibria, and phase transitions
64.10.+h	General theory of equations of state and phase equilibria
64.30.-t	Equations of state of specific substances
64.30.Ef	Equations of state of pure metals and alloys
64.30.Jk	Equations of state of nonmetals
64.60.-i	General studies of phase transitions
64.60.A-	Specific approaches applied to studies of phase transitions
64.60.ae	Renormalization-group theory
64.60.ah	Percolation
64.60.al	Fractal and multifractal systems
64.60.an	Finite-size systems
64.60.aq	Networks
64.60.at	Convolution
64.60.av	Cracks, sandpiles, avalanches, and earthquakes
64.60.Bd	General theory of phase transitions
64.60.Cn	Order-disorder transformations
64.60.De	Statistical mechanics of model systems (Ising model, Potts model, field-theory models, Monte Carlo techniques, etc.)
64.60.Ej	Studies/theory of phase transitions of specific substances
64.60.F-	Equilibrium properties near critical points, critical exponents
64.60.fd	General theory of critical region behavior
64.60.fh	Studies of specific substances in the critical region
64.60.Ht	Dynamic critical phenomena
64.60.Kw	Multicritical points

64.60.My	Metastable phases
64.60.Q-	Nucleation
64.60.qe	General theory and computer simulations of nucleation
64.60.qj	Studies of nucleation in specific substances
64.70.-p	Specific phase transitions
64.70.D-	Solid-liquid transitions
64.70.dg	Crystallization of specific substances
64.70.dj	Melting of specific substances
64.70.dm	General theory of the solid-liquid transition
64.70.F-	Liquid-vapor transitions
64.70.fh	Boiling and bubble dynamics
64.70.fm	Thermodynamics studies of evaporation and condensation
64.70.Hz	Solid-vapor transitions
64.70.Ja	Liquid-liquid transitions
64.70.K-	Solid-solid transitions
64.70.kd	Metals and alloys
64.70.kg	Semiconductors
64.70.kj	Glasses
64.70.km	Polymers
64.70.kp	Ionic crystals
64.70.kt	Molecular crystals
64.70.M-	Transitions in liquid crystals
64.70.mf	Theory and modeling of specific liquid crystal transitions, including computer simulation
64.70.mj	Experimental studies of liquid crystal transitions
64.70.Nd	Structural transitions in nanoscale materials
64.70.P-	Glass transitions of specific systems
64.70.pe	Metallic glasses
64.70.ph	Nonmetallic glasses (silicates, oxides, selenides,etc.)
64.70.pj	Polymers
64.70.pm	Liquids
64.70.pp	Liquid crystals
64.70.ps	Granules
64.70.pv	Colloids
64.70.Q-	Theory and modeling of the glass transition
64.70.qd	Thermodynamics and statistical mechanics
64.70.qj	Dynamics and criticality
64.70.Rh	Commensurate-incommensurate transitions
64.70.Tg	Quantum phase
64.75.-g	Phase equilibria
64.75.Bc	Solubility
64.75.Cd	Phase equilibria of fluid mixtures, including gases, hydrates, etc.
64.75.Ef	Mixing
64.75.Gh	Phase separation and segregation in model systems(hard spheres, Lennard-Jones, etc.)
64.75.Jk	Phase separation and segregation in nanoscale
64.75.Lm	Phase separation and segregation in
64.75.Nx	Phase separation and segregation in solid solutions
64.75.Op	Phase separation and segregation in alloying
64.75.Qr	Phase separation and segregation in semiconductors
64.75.St	Phase separation and segregation in thin films
64.75.Va	Phase separation and segregation in polymer blends/polymeric solutions
64.75.Xc	Phase separation and segregation in colloidal systems
64.75.Yz	Self-assembly
64.90.+b	Other topics in equations of state, phase equilibria, and phase transitions
65.	Thermal properties of condensed matter
65.20.-w	Thermal properties of liquids
65.20.De	General theory of thermodynamic properties of liquids, including computer simulation
65.20.Jk	Studies of thermodynamic properties of specific liquids
65.40.-b	Thermal properties of crystalline solids
65.40.Ba	Heat capacity
65.40.De	Thermal expansion; thermomechanical effects
65.40.G-	Other thermodynamical quantities
65.40.gd	Entropy
65.40.gh	Work functions

	65.40.gk	Electrochemical properties
	65.40.gp	Surface energy
	65.60.+a	Thermal properties of amorphous solids and glasses: heat capacity, thermal expansion, etc.
	65.80.-g	Thermal properties of small particles, nanocrystals, nanotubes, and other related systems
	65.80.Ck	Thermal properties of graphene
	65.90.+i	Other topics in thermal properties of condensed matter
	66.	Nonelectronic transport properties of condensed matter
	66.10.-x	Diffusion and ionic conduction in liquids
	66.10.C-	Diffusion and thermal diffusion
	66.10.cd	Thermal diffusion and diffusive energy transport
	66.10.cg	Mass diffusion, including self-diffusion, mutual diffusion, tracer diffusion, etc.
	66.10.Ed	Ionic conduction
	66.20.-d	Viscosity of liquids; diffusive momentum transport
	66.20.Cy	Theory and modeling of viscosity and rheological properties, including computer simulation
	66.20.Ej	Studies of viscosity and rheological properties ofspecific liquids
	66.20.Gd	Diffusive momentum transport
	66.25.+g	Thermal conduction in nonmetallic liquids
	66.30.-h	Diffusion in solids
	66.30.Dn	Theory of diffusion and ionic conduction in solids
	66.30.Fq	Self-diffusion in metals, semimetals, and alloys
	66.30.H-	Self-diffusion and ionic conduction in nonmetals
	66.30.hd	Ionic crystals
	66.30.hh	Glasses
	66.30.hk	Polymers
	66.30.hp	Molecular crystals
	66.30.J-	Diffusion of impurities
	66.30.je	Diffusion of gases
	66.30.jj	Diffusion of water
	66.30.jp	Proton diffusion
	66.30.Lw	Diffusion of other defects
	66.30.Ma	Diffusion in quantum solids (supersolidity)
	66.30.Ny	Chemical interdiffusion; diffusion barriers
	66.30.Pa	Diffusion in nanoscale solids
	66.30.Qa	Electromigration
	66.30.Xj	Thermal diffusivity
	66.35.+a	Quantum tunneling of defects
	66.70.-f	Nonelectronic thermal conduction and heat-pulse propagation in solids; thermal waves
	66.70.Df	Metals, alloys, and semiconductors
	66.70.Hk	Glasses and polymers
	66.70.Lm	Other systems such as ionic crystals, molecular crystals, nanotubes, etc.
	66.90.+r	Other topics in nonelectronic transport propertiesof condensed matter
	67.	Quantum fluids and solids
	67.10.-j	Quantum fluids: general properties
	67.10.Ba	Boson degeneracy
	67.10.Db	Fermion degeneracy
	67.10.Fj	Quantum statistical theory
	67.10.Hk	Quantum effects on the structure and dynamics of non-degenerate fluids
	67.10.Jn	Transport properties and hydrodynamics
	67.25.-k	4He
	67.25.B-	Normal phase of 4He
	67.25.bd	Thermodynamic properties
	67.25.bf	Transport, hydrodynamics
	67.25.bh	Films and restricted geometries
	67.25.D-	Superfluid phase
	67.25.de	Thermodynamic properties
	67.25.dg	Transport, hydrodynamics, and superflow
	67.25.dj	Superfluid transition and critical phenomena
	67.25.dk	Vortices and turbulence
	67.25.dm	Two-fluid model; phenomenology
	67.25.dp	Films

67.25.dr	Restricted geometries
67.25.dt	Sound and excitations
67.25.du	Relaxation phenomena
67.25.dw	Superfluidity in small clusters
67.30.-n	3He
67.30.E-	Normal phase of 3He
67.30.ef	Thermodynamics
67.30.eh	Transport and hydrodynamics
67.30.ej	Films and restricted geometries
67.30.em	Excitations
67.30.ep	Spin polarized 3He
67.30.er	Magnetic properties, NMR
67.30.H-	Superfluid phase of 3He
67.30.hb	Transport, hydrodynamics, and superflow
67.30.he	Textures and vortices
67.30.hj	Spin dynamics
67.30.hm	Impurities
67.30.hp	Interfaces
67.30.hr	Films
67.30.ht	Restricted geometries
67.60.-g	Mixtures of 3He and 4He
67.60.Bc	Boson mixtures
67.60.Fp	Bose-Fermi mixtures
67.60.G-	Solutions of 3He in liquid 4He
67.60.gc	Spin polarized solutions
67.60.gf	Films
67.60.gj	Restricted geometries
67.63.-r	Hydrogen and isotopes
67.63.Cd	Molecular hydrogen and isotopes
67.63.Gh	Atomic hydrogen and isotopes
67.80.-s	Quantum solids
67.80.B-	Solid 4He
67.80.bd	Superfluidity in solid 4He, supersolid 4He
67.80.bf	Liquid-solid interfaces; growth kinetics
67.80.D-	Solid 3He
67.80.de	Structure, lattice dynamics and sound
67.80.dj	Defects, impurities, and diffusion
67.80.dk	Magnetic properties, phases, and NMR
67.80.dm	Films
67.80.F-	Solids of hydrogen and isotopes
67.80.ff	Molecular hydrogen and isotopes
67.80.fh	Atomic hydrogen and isotopes
67.80.K-	Other supersolids
67.80.kb	Supersolid phases on lattices
67.85.-d	Ultracold gases, trapped gases
67.85.Bc	Static properties of condensates
67.85.De	Dynamic properties of condensates; excitations, and superfluid flow
67.85.Fg	Multicomponent condensates; spinor condensates
67.85.Hj	Bose-Einstein condensates in optical potentials
67.85.Jk	Other Bose-Einstein condensation phenomena
67.85.Lm	Degenerate Fermi gases
67.85.Pq	Mixtures of Bose and Fermi gases
67.90.+z	Other topics in quantum fluids and solids
	Microfluidics
	Nanofluidics
	Microswimmers
	Quantum fluids of light
68.	Surfaces and interfaces; thin films and nanosystems (structure and nonelectronic properties)
68.03.-g	Gas-liquid and vacuum-liquid interfaces
68.03.Cd	Surface tension and related phenomena
68.03.Fg	Evaporation and condensation of liquids
68.03.Hj	Liquid surface structure: measurements and simulations

	68.03.Kn	Dynamics (capillary waves)
	68.05.-n	Liquid-liquid interfaces
	68.05.Cf	Liquid-liquid interface structure: measurements and simulations
	68.05.Gh	Interfacial properties of microemulsions
	68.08.-p	Liquid-solid interfaces
	68.08.Bc	Wetting
	68.08.De	Liquid-solid interface structure: measurements andsimulations
	68.15.+e	Liquid thin films
	68.18.-g	Langmuir-Blodgett films on liquids
	68.18.Fg	Liquid thin film structure: measurements and simulations
	68.18.Jk	Phase transitions in liquid thin films
	68.35.-p	Solid surfaces and solid-solid interfaces: structure and energetics
	68.35.Af	Atomic scale friction
	68.35.B-	Structure of clean surfaces (and surface reconstruction)
	68.35.bd	Metals and alloys
	68.35.bg	Semiconductors
	68.35.bj	Amorphous semiconductors, glasses
	68.35.bm	Polymers, organics
	68.35.bp	Fullerenes
	68.35.bt	Other materials
	68.35.Ct	Interface structure and roughness
	68.35.Dv	Composition, segregation; defects and impurities
	68.35.Fx	Diffusion; interface formation
	68.35.Gy	Mechanical properties; surface strains
	68.35.Iv	Acoustical properties
	68.35.Ja	Surface and interface dynamics and vibrations
	68.35.Md	Surface thermodynamics, surface energies
	68.35.Np	Adhesion
	68.35.Rh	Phase transitions and critical phenomena
	68.37.-d	Microscopy of surfaces, interfaces, and thin films
	68.37.Ef	Scanning tunneling microscopy (including chemistryinduced with STM)
	68.37.Hk	Scanning electron microscopy (SEM) (including EBIC)
	68.37.Lp	Transmission electron microscopy (TEM)
	68.37.Ma	Scanning transmission electron microscopy (STEM)
	68.37.Nq	Low energy electron microscopy (LEEM)
	68.37.Og	High-resolution transmission electron microscopy (HRTEM)
	68.37.Ps	Atomic force microscopy (AFM)
	68.37.Rt	Magnetic force microscopy (MFM)
	68.37.Tj	Acoustic force microscopy
	68.37.Uv	Near-field scanning microscopy and spectroscopy
	68.37.Vj	Field emission and field-ion microscopy
	68.37.Xy	Scanning Auger microscopy, photoelectron microscopy
	68.37.Yz	X-ray microscopy
	68.43.-h	Chemisorption/physisorption: adsorbates on surfaces
	68.43.Bc	Ab initio calculations of adsorbate structure andreactions
	68.43.De	Statistical mechanics of adsorbates
	68.43.Fg	Adsorbate structure (binding sites, geometry)
	68.43.Hn	Structure of assemblies of adsorbates (two- and three-dimensional clustering)
	68.43.Jk	Diffusion of adsorbates, kinetics of coarsening and aggregation
	68.43.Mn	Adsorption kinetics
	68.43.Nr	Desorption kinetics
	68.43.Pq	Adsorbate vibrations
	68.43.Rs	Electron stimulated desorption
	68.43.Tj	Photon stimulated desorption
	68.43.Vx	Thermal desorption
	68.47.-b	Solid-gas/vacuum interfaces: types of surfaces
	68.47.De	Metallic surfaces
	68.47.Fg	Semiconductor surfaces
	68.47.Gh	Oxide surfaces
	68.47.Jn	Clusters on oxide surfaces
	68.47.Mn	Polymer surfaces
	68.47.Pe	Langmuir-Blodgett films on solids; polymers on surfaces; biological molecules on surfaces
	68.49.-h	Surface characterization by particle-surface scattering
	68.49.Bc	Atom scattering from surfaces (diffraction and energy transfer)
	68.49.Df	Molecule scattering from surfaces (energy transfer, resonances, trapping)
	68.49.Jk	Electron scattering from surfaces

68.49.Sf	Ion scattering from surfaces (charge transfer, sputtering, SIMS)
68.49.Uv	X-ray standing waves
68.55.-a	Thin film structure and morphology
68.55.A-	Nucleation and growth
68.55.ag	Semiconductors
68.55.aj	Insulators
68.55.am	Polymers and organics
68.55.ap	Fullerenes
68.55.at	Other materials
68.55.J-	Morphology of films
68.55.jd	Thickness
68.55.jm	Texture
68.55.Ln	Defects and impurities: doping, implantation, distribution, concentration, etc.
68.55.Nq	Composition and phase identification
68.60.-p	Physical properties of thin films, nonelectronic
68.60.Bs	Mechanical and acoustical properties
68.60.Dv	Thermal stability; thermal effects
68.60.Wm	Other nonelectronic physical properties
68.65.-k	Low-dimensional, mesoscopic, nanoscale and other related systems: structure and nonelectronic properties
68.65.Ac	Multilayers
68.65.Cd	Superlattices
68.65.Fg	Quantum wells
68.65.Hb	Quantum dots (patterned in quantum wells)
68.65.La	Quantum wires (patterned in quantum wells)
68.65.Pq	Graphene films
68.70.+w	Whiskers and dendrites (growth, structure, and nonelectronic properties)
68.90.+g	Other topics in structure and nonelectronic properties of surfaces and interfaces; thin films and low-dimensional
70.	CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES
71.	Electronic structure of bulk materials
71.10.-w	Theories and models of many-electron systems
71.10.Ay	Fermi-liquid theory and other phenomenological models
71.10.Ca	Electron gas, Fermi gas
71.10.Fd	Lattice fermion models (Hubbard model, etc.)
71.10.Hf	Non-Fermi-liquid ground states, electron phase diagrams and phase transitions in model systems
71.10.Li	Excited states and pairing interactions in model systems
71.10.Pm	Fermions in reduced dimensions (anyons, compositefermions, Luttinger liquid, etc.)
71.15.-m	Methods of electronic structure calculations
71.15.Ap	Basis sets (LCAO, plane-wave, APW, etc.) and related methodology (scattering methods, ASA, linearized methods, etc.)
71.15.Dx	Computational methodology (Brillouin zone sampling, iterative diagonalization, pseudopotential construction)
71.15.Mb	Density functional theory, local density approximation, gradient and other corrections
71.15.Nc	Total energy and cohesive energy calculations
71.15.Pd	Molecular dynamics calculations (Car-Parrinello) and other numerical simulations
71.15.Qe	Excited states: methodology
71.15.Rf	Relativistic effects
71.18.+y	Fermi surface: calculations and measurements; effective mass, g factor
71.20.-b	Electron density of states and band structure of crystalline solids
71.20.Be	Transition metals and alloys
71.20.Dg	Alkali and alkaline earth metals
71.20.Eh	Rare earth metals and alloys
71.20.Gj	Other metals and alloys
71.20.Lp	Intermetallic compounds
71.20.Mq	Elemental semiconductors
71.20.Nr	Semiconductor compounds
71.20.Ps	Other inorganic compounds
71.20.Rv	Polymers and organic compounds
71.20.Tx	Fullerenes and related materials; intercalation compounds
71.22.+i	Electronic structure of liquid metals and semiconductors and their alloys
71.23.-k	Electronic structure of disordered solids

71.23.An	Theories and models; localized states
71.23.Cq	Amorphous semiconductors, metallic glasses, glasses
71.23.Ft	Quasicrystals
71.27.+a	Strongly correlated electron systems; heavy fermions
71.28.+d	Narrow-band systems; intermediate-valence solids
71.30.+h	Metal-insulator transitions and other electronic transitions
71.35.-y	Excitons and related phenomena
71.35.Aa	Frenkel excitons and self-trapped excitons
71.35.Cc	Intrinsic properties of excitons; optical absorption spectra
71.35.Ee	Electron-hole drops and electron-hole plasma
71.35.Gg	Exciton-mediated interactions
71.35.Ji	Excitons in magnetic fields; magnetoexcitons
71.35.Lk	Collective effects (Bose effects, phase space filling, and excitonic phase transitions)
71.35.Pq	Charged excitons (trions)
71.36.+c	Polaritons (including photon-phonon and photon-magnon interactions)
71.38.-k	Polarons and electron-phonon interactions
71.38.Cn	Mass renormalization in metals
71.38.Fp	Large or Fröhlich polarons
71.38.Ht	Self-trapped or small polarons
71.38.Mx	Bipolarons
71.45.-d	Collective effects
71.45.Gm	Exchange, correlation, dielectric and magnetic response functions, plasmons
71.45.Lr	Charge-density-wave systems
71.55.-i	Impurity and defect levels
71.55.Ak	Metals, semimetals, and alloys
71.55.Cn	Elemental semiconductors
71.55.Eq	III-V semiconductors
71.55.Gs	II-VI semiconductors
71.55.Ht	Other nonmetals
71.55.Jv	Disordered structures; amorphous and glassy solids
71.60.+z	Positron states
71.70.-d	Level splitting and interactions
71.70.Ch	Crystal and ligand fields
71.70.Di	Landau levels
71.70.Ej	Spin-orbit coupling, Zeeman and Stark splitting, Jahn-Teller effect
71.70.Fk	Strain-induced splitting
71.70.Gm	Exchange interactions
71.70.Jp	Nuclear states and interactions
71.90.+q	Other topics in electronic structure
	Topological phases of matter
	Metamaterials
	Orbitronics
	Many-body localization

72. Electronic transport in condensed matter

72.10.-d	Theory of electronic transport; scattering mechanisms
72.10.Bg	General formulation of transport theory
72.10.Di	Scattering by phonons, magnons, and other nonlocalized excitations
72.10.Fk	Scattering by point defects, dislocations, surfaces, and other imperfections (including Kondo effect)
72.15.-v	Electronic conduction in metals and alloys
72.15.Cz	Electrical and thermal conduction in amorphous andliquid metals and alloys
72.15.Eb	Electrical and thermal conduction in crystalline metals and alloys
72.15.Gd	Galvanomagnetic and other magnetotransport effects
75.47.-m	Magnetotransport phenomena; materials for magnetotransport)
72.15.Jf	Thermoelectric and thermomagnetic effects
72.15.Lh	Relaxation times and mean free paths
72.15.Nj	Collective modes (e.g., in one-dimensional conductors)
72.15.Qm	Scattering mechanisms and Kondo effect
72.15.Rn	Localization effects (Anderson or weak localization)
72.20.-i	Conductivity phenomena in semiconductors and insulators
72.20.Dp	General theory, scattering mechanisms
72.20.Ee	Mobility edges; hopping transport
72.20.Fr	Low-field transport and mobility; piezoresistance
72.20.Ht	High-field and nonlinear effects
72.20.Jv	Charge carriers: generation, recombination, lifetime, and trapping

72.20.My	Galvanomagnetic and other magnetotransport effects
72.20.Pa	Thermoelectric and thermomagnetic effects
72.25.-b	Spin polarized transport
72.25.Ba	Spin polarized transport in metals
72.25.Dc	Spin polarized transport in semiconductors
72.25.Fe	Optical creation of spin polarized carriers
72.25.Hg	Electrical injection of spin polarized carriers
72.25.Mk	Spin transport through interfaces
72.25.Pn	Current-driven spin pumping
72.25.Rb	Spin relaxation and scattering
72.30.+q	High-frequency effects; plasma effects
72.40.+w	Photoconduction and photovoltaic effects
72.50.+b	Acoustoelectric effects
72.55.+s	Magnetoacoustic effects
72.60.+g	Mixed conductivity and conductivity transitions
72.70.+m	Noise processes and phenomena
72.80.-r	Conductivity of specific materials
72.80.Ey	III-V and II-VI semiconductors
72.80.Ga	Transition-metal compounds
72.80.Jc	Other crystalline inorganic semiconductors
72.80.Le	Polymers; organic compounds (including organic semiconductors)
72.80.Ng	Disordered solids
72.80.Ph	Liquid semiconductors
72.80.Rj	Fullerenes and related materials
72.80.Sk	Insulators
72.80.Tm	Composite materials
72.80.Vp	Electronic transport in graphene
72.90.+y	Other topics in electronic transport in condensedmatter
73.	Electronic structure and electrical properties of surfaces, interfaces, thin films, and low-dimensional systems
73.20.-r	Electron states at surfaces and interfaces
73.20.At	Surface states, band structure, electron density of states
73.20.Fz	Weak or Anderson localization
73.20.Hb	Impurity and defect levels; energy states of adsorbed species
73.20.Jc	Delocalization processes
73.20.Mf	Collective excitations (including excitons, polarons, plasmons and other charge-density excitations)
73.20.Qt	Electron solids
73.21.-b	Electron states and collective excitations in multilayers, quantum wells, mesoscopic, and nanoscale
73.21.Ac	Multilayers
73.21.Cd	Superlattices
73.21.Fg	Quantum wells
73.21.Hb	Quantum wires
73.21.La	Quantum dots
73.22.-f	Electronic structure of nanoscale materials and related systems
73.22.Dj	Single particle states
73.22.Gk	Broken symmetry phases
73.22.Lp	Collective excitations
73.22.Pr	Electronic structure of graphene
73.23.-b	Electronic transport in mesoscopic systems
73.23.Ad	Ballistic transport
73.23.Hk	Coulomb blockade; single-electron tunneling
73.23.Ra	Persistent currents
73.25.+i	Surface conductivity and carrier phenomena
73.30.+y	Surface double layers, Schottky barriers, and workfunctions
73.40.-c	Electronic transport in interface structures
73.40.Cg	Contact resistance, contact potential
73.40.Ei	Rectification
73.40.Gk	Tunneling
73.40.Jn	Metal-to-metal contacts
73.40.Kp	III-V semiconductor-to-semiconductor contacts, /p/-/n/ junctions, and heterojunctions
73.40.Lq	Other semiconductor-to-semiconductor contacts, /p/-/n/ junctions, and heterojunctions

73.40.Mr	Semiconductor-electrolyte contacts
73.40.Ns	Metal-nonmetal contacts
73.40.Qv	Metal-insulator-semiconductor structures (including semiconductorto-insulator)
73.40.Rw	Metal-insulator-metal structures
73.40.Sx	Metal-semiconductor-metal structures
73.40.Ty	Semiconductor-insulator-semiconductor structures
73.40.Vz	Semiconductor-metal-semiconductor structures
73.43.-f	Quantum Hall effects
73.43.Cd	Theory and modeling
73.43.Fj	Novel experimental methods; measurements
73.43.Jn	Tunneling
73.43.Lp	Collective excitations
73.43.Nq	Quantum phase transitions
73.43.Qt	Magnetoresistance
73.50.-h	Electronic transport phenomena in thin films
73.50.Bk	General theory, scattering mechanisms
73.50.Dn	Low-field transport and mobility; piezoresistance
73.50.Fq	High-field and nonlinear effects
73.50.Gr	Charge carriers: generation, recombination, lifetime, trapping, mean free paths
73.50.Jt	Galvanomagnetic and other magnetotransport effects(including thermomagnetic effects)
73.50.Lw	Thermoelectric effects
73.50.Mx	High-frequency effects; plasma effects
73.50.Pz	Photoconduction and photovoltaic effects
73.50.Rb	Acoustoelectric and magnetoacoustic effects
73.50.Td	Noise processes and phenomena
73.61.-r	Electrical properties of specific thin films
73.61.At	Metal and metallic alloys
73.61.Cw	Elemental semiconductors
73.61.Ey	III-V semiconductors
73.61.Ga	II-VI semiconductors
73.61.Jc	Amorphous semiconductors; glasses
73.61.Le	Other inorganic semiconductors
73.61.Ng	Insulators
73.61.Ph	Polymers; organic compounds
73.61.Wp	Fullerenes and related materials
73.63.-b	Electronic transport in nanoscale materials and structures
73.63.Bd	Nanocrystalline materials
73.63.Fg	Nanotubes
73.63.Hs	Quantum wells
73.63.Kv	Quantum dots
73.63.Nm	Quantum wires
73.63.Rt	Nanoscale contacts
73.90.+f	Other topics in electronic structure and electrical properties of surfaces, interfaces, thin films
74.	Superconductivity
74.10.+v	Occurrence, potential candidates
74.20.-z	Theories and models of superconducting state
74.20.De	Phenomenological theories (two-fluid, Ginzburg-Landau, etc.)
74.20.Fg	BCS theory and its development
74.20.Mn	Nonconventional mechanisms
74.20.Pq	Electronic structure calculations
74.20.Rp	Pairing symmetries (other than s-wave)
74.25.-q	Properties of superconductors
74.25.Bt	Thermodynamic properties
74.25.Dw	Superconductivity phase diagrams
74.25.F-	Transport properties
74.25.fc	Electric and thermal conductivity
74.25.fg	Thermoelectric effects
74.25.Gz	Optical properties
74.25.Ha	Magnetic properties including vortex structures and related phenomena
74.25.Jb	Electronic structure (photoemission, etc.)
74.25.Kc	Phonons
74.25.Ld	Mechanical and acoustical properties, elasticity,and ultrasonic attenuation
74.25.N-	Response to electromagnetic fields

74.25.nd	Raman and optical spectroscopy
74.25.nj	Nuclear magnetic resonance
74.25.nn	Surface impedance
74.25.Op	Mixed states, critical fields, and surface sheaths
74.25.Sv	Critical currents
74.25.Uv	Vortex phases (includes vortex lattices, vortex liquids, and vortex glasses)
74.25.Wx	Vortex pinning (includes mechanisms and flux creep)
74.40.-n	Fluctuation phenomena
74.40.De	Noise and chaos
74.40.Gh	Nonequilibrium superconductivity
74.40.Kb	Quantum critical phenomena
74.45.+c	Proximity effects; Andreev reflection; SN and SNSjunctions
74.50.+r	Tunneling phenomena; Josephson effects
74.55.+v	Tunneling phenomena: single particle tunneling andSTM
74.62.-c	Transition temperature variations, phase diagrams
74.62.Bf	Effects of material synthesis, crystal structure,and chemical composition
74.62.Dh	Effects of crystal defects, doping and substitution
74.62.Fj	Effects of pressure
74.62.Yb	Other effects
74.70.-b	Superconducting materials other than
74.70.Ad	Metals; alloys and binary compounds (including A15, MgB_2 , etc.)
74.70.Dd	Ternary, quaternary, and multinary compounds (including Chevrel phases, borocarbides, etc.)
74.70.Kn	Organic superconductors
74.70.Pq	Ruthenates
74.70.Tx	Heavy-fermion superconductors
74.70.Wz	Carbon-based superconductors
74.70.Xa	Pnictides and chalcogenides
74.72.-h	Cuprate superconductors
74.72.Cj	Insulating parent compounds
74.72.Ek	Electron-doped
74.72.Gh	Hole-doped
74.72.Kf	Pseudogap regime
74.78.-w	Superconducting films and low-dimensional structures
74.78.Fk	Multilayers, superlattices, heterostructures
74.78.Na	Mesoscopic and nanoscale systems
74.81.-g	Inhomogeneous superconductors and superconductingsystems, including electronic inhomogeneities
74.81.Bd	Granular, melt-textured, amorphous, and compositesuperconductors
74.81.Fa	Josephson junction arrays and wire networks
74.90.+n	Other topics in superconductivity
75.	Magnetic properties and materials
75.10.-b	General theory and models of magnetic ordering
75.10.Dg	Crystal-field theory and spin Hamiltonians
75.10.Hk	Classical spin models
75.10.Jm	Quantized spin models, including quantum spin frustration
75.10.Kt	Quantum spin liquids, valence bond phases and related phenomena
75.10.Lp	Band and itinerant models
75.10.Nr	Spin-glass and other random models
75.10.Pq	Spin chain models
75.20.-g	Diamagnetism, paramagnetism, and superparamagnetism
75.20.Ck	Nonmetals
75.20.En	Metals and alloys
75.20.Hr	Local moment in compounds and alloys; Kondo effect, valence fluctuations, heavy fermions
75.25.-j	Spin arrangements in magnetically ordered materials
75.25.Dk	Orbital, charge, and other orders, including coupling of these orders
75.30.-m	Intrinsic properties of magnetically ordered materials
75.30.Cr	Saturation moments and magnetic susceptibilities
75.30.Ds	Spin waves
75.30.Et	Exchange and superexchange interactions
75.30.Fv	Spin-density waves
75.30.Gw	Magnetic anisotropy
75.30.Hx	Magnetic impurity interactions

75.30.Kz	Magnetic phase boundaries
75.30.Mb	Valence fluctuation, Kondo lattice, and heavy-fermion phenomena
75.30.Sg	Magnetocaloric effect, magnetic cooling
75.30.Wx	Spin crossover
75.40.-s	Critical-point effects, specific heats, short-range order
75.40.Cx	Static properties (order parameter, static susceptibility, heat capacities, critical exponents, etc.)
75.40.Gb	Dynamic properties (dynamic susceptibility, spin waves, spin diffusion, dynamic scaling, etc.)
75.40.Mg	Numerical simulation studies
75.45.+j	Macroscopic quantum phenomena in magnetic systems
75.47.-m	Magnetotransport phenomena; materials for magnetotransport
75.47.De	Giant magnetoresistance
75.47.Gk	Colossal magnetoresistance
75.47.Lx	Magnetic oxides
75.47.Np	Metals and alloys
75.47.Pq	Other materials
75.50.-y	Studies of specific magnetic materials
75.50.Bb	Fe and its alloys
75.50.Cc	Other ferromagnetic metals and alloys
75.50.Dd	Nonmetallic ferromagnetic materials
75.50.Ee	Antiferromagnetics
75.50.Gg	Ferrimagnetics
75.50.Kj	Amorphous and quasicrystalline magnetic materials
75.50.Lk	Spin glasses and other random magnets
75.50.Mm	Magnetic liquids
75.50.Pp	Magnetic semiconductors
75.50.Ss	Magnetic recording materials
75.50.Tt	Fine-particle systems; nanocrystalline materials
75.50.Vv	High coercivity materials
75.50.Ww	Permanent magnets
75.50.Xx	Molecular magnets
75.60.-d	Domain effects, magnetization curves, and hysteresis
75.60.Ch	Domain walls and domain structure
75.60.Ej	Magnetization curves, hysteresis, Barkhausen and related effects
75.60.Jk	Magnetization reversal mechanisms
75.60.Lr	Magnetic aftereffects
75.60.Nt	Magnetic annealing and temperature-hysteresis effects
75.70.-i	Magnetic properties of thin films, surfaces, and interfaces
75.70.Ak	Magnetic properties of monolayers and thin films
75.70.Cn	Magnetic properties of interfaces (multilayers, superlattices, heterostructures)
75.70.Kw	Domain structure (including magnetic bubbles and vortices)
75.70.Rf	Surface magnetism
75.70.Tj	Spin-orbit effects
75.75.-c	Magnetic properties of nanostructures
75.75.Cd	Fabrication of magnetic nanostructures
75.75.Fk	Domain structures in nanoparticles
75.75.Jn	Dynamics of magnetic nanoparticles
75.75.Lf	Electronic structure of magnetic nanoparticles
75.76.+j	Spin transport effects
75.78.-n	Magnetization dynamics
75.78.Cd	Micromagnetic simulations
75.78.Fg	Dynamics of domain structures
75.78.Jp	Ultrafast magnetization dynamics and switching
75.80.+q	Magnetomechanical effects, magnetostriction
75.85.+t	Magnetoelectric effects, multiferroics
75.90.+w	Other topics in magnetic properties and materials
76.	Magnetic resonances and relaxations in condensed matter, Mössbauer effect
76.20.+q	General theory of resonances and relaxations
76.30.-v	Electron paramagnetic resonance and relaxation
76.30.Da	Ions and impurities: general
76.30.Fc	Iron group (3d) ions and impurities (Ti-Cu)
76.30.He	Platinum and palladium group (4d and 5d) ions andimpurities (ZrAg and Hf-Au)
76.30.Kg	Rare-earth ions and impurities
76.30.Lh	Other ions and impurities

	76.30.Mi	Color centers and other defects
	76.30.Pk	Conduction electrons
	76.30.Rn	Free radicals
	76.40.+b	Diamagnetic and cyclotron resonances
	76.50.+g	Ferromagnetic, antiferromagnetic, and ferromagnetic resonances; spin-wave resonance
	76.60.-k	Nuclear magnetic resonance and relaxation
	76.60.Cq	Chemical and Knight shifts
	76.60.Es	Relaxation effects
	76.60.Gv	Quadrupole resonance
	76.60.Jx	Effects of internal magnetic fields
	76.60.Lz	Spin echoes
	76.60.Pc	NMR imaging
	76.70.-r	Magnetic double resonances and cross effects
	76.70.Dx	Electron-nuclear double resonance (ENDOR), electron double resonance (ELDOR)
	76.70.Fz	Double nuclear magnetic resonance (DNMR), dynamical nuclear polarization
	76.70.Hb	Optically detected magnetic resonance (ODMR)
	76.75.+i	Muon spin rotation and relaxation
	76.80.+y	Mössbauer effect; other ?-ray spectroscopy
	76.90.+d	Other topics in magnetic resonances and relaxations
	77.	Dielectrics, piezoelectrics, and ferroelectrics and their
	77.22.-d	Dielectric properties of solids and liquids
	77.22.Ch	Permittivity (dielectric function)
	77.22.Ej	Polarization and depolarization
	77.22.Gm	Dielectric loss and relaxation
	77.22.Jp	Dielectric breakdown and space-charge
	77.55.-g	Dielectric thin films
	77.55.Bh	Low-permittivity dielectric films
	77.55.D-	High-permittivity gate dielectric films
	77.55.df	For silicon electronics
	77.55.dj	For nonsilicon electronics (Ge, III-V, II-VI, organic electronics)
	77.55.F-	High-permittivity capacitive films
	77.55.fb	Paraelectric films
	77.55.fe	BaTiO3 -based films
	77.55.fg	Pb(Zr,Ti)O3 -based films
	77.55.fj	Niobate- and tantalate-based films
	77.55.fp	Other ferroelectric films
	77.55.H-	Piezoelectric and electrostrictive films
	77.55.hd	AlN
	77.55.hf	ZnO
	77.55.hj	PZT
	77.55.hn	Other piezoelectric or electrostrictive films
	77.55.Kt	Pyroelectric films
	77.55.Nv	Multiferroic/magnetoelectric films
	77.55.Px	Epitaxial and superlattice films
	77.65.-j	Piezoelectricity and electromechanical effects
	77.65.Bn	Piezoelectric and electrostrictive constants
	77.65.Dq	Acoustoelectric effects and surface acoustic waves(SAW) in piezoelectrics
	77.65.Fs	Electromechanical resonance; quartz resonators
	77.65.Ly	Strain-induced piezoelectric fields
	77.70.+a	Pyroelectric and electrocaloric effects
	77.80.-e	Ferroelectricity and antiferroelectricity
	77.80.B-	Phase transitions and Curie point
	77.80.bg	Compositional effects
	77.80.bj	Scaling effects
	77.80.bn	Strain and interface effects
	77.80.Dj	Domain structure; hysteresis
	77.80.Fm	Switching phenomena
	77.80.Jk	Relaxor ferroelectrics
	77.84.-s	Dielectric, piezoelectric, ferroelectric, and antiferroelectric materials
	77.84.Bw	Elements, oxides, nitrides, borides, carbides, chalcogenides, etc.
	77.84.Cg	PZT ceramics and other titanates
	77.84.Ek	Niobates and tantalates
	77.84.Fa	KDP- and TGS-type crystals

77.84.Jd	Polymers; organic compounds
77.84.Lf	Composite materials
77.84.Nh	Liquids, emulsions, and suspensions; liquid crystals
77.90.+k	Other topics in dielectrics, piezoelectrics, and ferroelectrics and their properties
78.	Optical properties,condensed-matter spectroscopy - other interactions of radiation and particles with condensed matter
78.15.+e	Optical properties of fluid materials, supercritical fluids and liquid crystals
78.20.-e	Optical properties of bulk materials and thin films
78.20.Bh	Theory, models, and numerical simulation
78.20.Ci	Optical constants
78.20.Ek	Optical activity
78.20.Fm	Birefringence
78.20.H-	Piezo-, elasto-optical effects
78.20.hb	Piezo-optical, elasto-optical, acousto-optical, and photoelastic effects
78.20.hc	Laser ultrasonics
78.20.Jq	Electro-optical effects
78.20.Ls	Magneto-optical effects
78.20.Mg	Photorefractive effects
78.20.N-	Thermo-optic effects
78.20.nb	Photothermal effects
78.20.nc	Photopyroelectric effects
78.20.nd	Thermophotonic effects
78.20.Pa	Photoacoustic effects
78.30.-j	Infrared and Raman spectra
78.30.Am	Elemental semiconductors and insulators
78.30.C-	Liquids
78.30.cb	Organic liquids
78.30.cc	Inorganic liquids
78.30.cd	Solutions and ionic liquids
78.30.Er	Solid metals and alloys
78.30.Fs	III-V and II-VI semiconductors
78.30.Hv	Other nonmetallic inorganics
78.30.Jw	Organic compounds, polymers
78.30.Ly	Disordered solids
78.30.Na	Fullerenes and related materials
78.35.+c	Brillouin and Rayleigh scattering; other light scattering
78.40.-q	Absorption and reflection spectra: visible and ultraviolet
78.40.Dw	Liquids
78.40.Fy	Semiconductors
78.40.Ha	Other nonmetallic inorganics
78.40.Kc	Metals, semimetals, and alloys
78.40.Me	Organic compounds and polymers
78.40.Pg	Disordered solids
78.40.Ri	Fullerenes and related materials
78.45.+h	Stimulated emission
78.47.-p	Spectroscopy of solid state dynamics
78.47.D-	Time resolved spectroscopy (>1 psec)
78.47.da	Excited states
78.47.db	Conduction electrons
78.47.dc	Radicals
78.47.J-	Ultrafast spectroscopy (<1 psec)
78.47.jb	Transient absorption
78.47.jd	Time resolved luminescence
78.47.je	Time resolved light scattering spectroscopy
78.47.jf	Photon echoes
78.47.jg	Time resolved reflection spectroscopy
78.47.jh	Coherent nonlinear optical spectroscopy
78.47.jj	Transient grating spectroscopy
78.47.jm	Quantum beats
78.47.jp	Optical nutation
78.47.js	Free polarization decay
78.47.N-	High resolution nonlinear optical spectroscopy
78.47.nd	Hole burning spectroscopy
78.47.nj	Four-wave mixing spectroscopy

	78.55.-m	Photoluminescence, properties and materials
	78.55.Ap	Elemental semiconductors
	78.55.Bq	Liquids
	78.55.Cr	III-V semiconductors
	78.55.Et	II-VI semiconductors
	78.55.Fv	Solid alkali halides
	78.55.Hx	Other solid inorganic materials
	78.55.Kz	Solid organic materials
	78.55.Mb	Porous materials
	78.55.Qr	Amorphous materials; glasses and other disorderedsolids
	78.56.-a	Photoconduction and photovoltaic effects
	78.56.Cd	Photocarrier radiometry
	78.60.-b	Other luminescence and radiative recombination
	78.60.Fi	Electroluminescence
	78.60.Hk	Cathodoluminescence, ionoluminescence
	78.60.Kn	Thermoluminescence
	78.60.Lc	Optically stimulated luminescence
	78.60.Mq	Sonoluminescence, triboluminescence
	78.60.Ps	Chemiluminescence
	78.66.-w	Optical properties of specific thin films
	78.66.Bz	Metals and metallic alloys
	78.66.Db	Elemental semiconductors and insulators
	78.66.Fd	III-V semiconductors
	78.66.Hf	II-VI semiconductors
	78.66.Jg	Amorphous semiconductors; glasses
	78.66.Li	Other semiconductors
	78.66.Nk	Insulators
	78.66.Qn	Polymers; organic compounds
	78.66.Sq	Composite materials
	78.66.Tr	Fullerenes and related materials
	78.66.Vs	Fine-particle systems
	78.67.-n	Optical properties of low-dimensional, mesoscopic,and nanoscale materials and structures
	78.67.Bf	Nanocrystals, nanoparticles, and nanoclusters
	78.67.Ch	Nanotubes
	78.67.De	Quantum wells
	78.67.Hc	Quantum dots
	78.67.Lt	Quantum wires
	78.67.Pt	Multilayers; superlattices; photonic structures; metamaterials
	78.67.Qa	Nanorods
	78.67.Rb	Nanoporous materials
	78.67.Sc	Nanoaggregates; nanocomposites
	78.67.Tf	Nanodroplets
	78.67.Uh	Nanowires
	78.67.Ve	Nanomicelles
	78.67.Wj	Optical properties of graphene
	78.68.+m	Optical properties of surfaces
	78.70.-g	Interactions of particles and radiation with matter
	78.70.Bj	Positron annihilation
	78.70.Ck	X-ray scattering
	78.70.Dm	X-ray absorption spectra
	78.70.En	X-ray emission spectra and fluorescence
	78.70.Gq	Microwave and radio-frequency interactions
	78.70.Nx	Neutron inelastic scattering
	78.70.Ps	Scintillation
	78.90.+t	Other topics in optical properties, condensed matter spectroscopy and other interactions of particles and radiation
	79.	Electron and ion emission by liquids and solids; impactphenomena
	79.05.+c	Solvated electrons
	79.10.-n	Thermoelectronic phenomena
	79.10.Ca	Deep-level photothermal spectroscopy
	79.20.-m	Impact phenomena (including electron spectra and sputtering)
	79.20.Ap	Theory of impact phenomena; numerical simulation
	79.20.Ds	Laser-beam impact phenomena
	79.20.Eb	Laser ablation

	79.20.Fv	Electron impact: Auger emission
	79.20.Hx	Electron impact: secondary emission
	79.20.Kz	Other electron-impact emission phenomena
	79.20.La	Photon- and electron-stimulated desorption
	79.20.Mb	Positron emission
	79.20.Rf	Atomic, molecular, and ion beam impact and interactions with surfaces
	79.20.Uv	Electron energy loss spectroscopy
	79.20.Ws	Multiphoton absorption
	79.40.+z	Thermionic emission
	79.60.-i	Photoemission and photoelectron
	79.60.Bm	Clean metal, semiconductor, and insulator surfaces
	79.60.Cn	Liquids and liquid surfaces
	79.60.Dp	Adsorbed layers and thin films
	79.60.Fr	Polymers; organic compounds
	79.60.Ht	Disordered structures
	79.60.Jv	Interfaces; heterostructures; nanostructures
	79.70.+q	Field emission, ionization, evaporation, and desorption
	79.75.+g	Exoelectron emission
	79.77.+g	Coulomb explosion
	79.90.+b	Other topics in electron and ion emission by liquids and solids and impact phenomena
	80.	INTERDISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCEAND TECHNOLOGY
	81.	Materials science
	81.05.-t	Specific materials: fabrication, treatment, testing and analysis
	81.05.Bx	Metals, semimetals, and alloys
	81.05.Cy	Elemental semiconductors
	81.05.Dz	II-VI semiconductors
	81.05.Ea	III-V semiconductors
	81.05.Fb	Organic semiconductors
	81.05.Gc	Amorphous semiconductors
	81.05.Hd	Other semiconductors
	81.05.Je	Ceramics and refractories (including borides, carbides, hydrides, nitrides, oxides, and silicides)
	81.05.Kf	Glasses (including metallic glasses)
	81.05.Lg	Polymers and plastics; rubber; synthetic and natural fibers; organometallic and organic materials
	81.05.Mh	Cermets, ceramic and refractory composites
	81.05.Ni	Dispersion-, fiber-, and platelet-reinforced metal-based composites
	81.05.Pj	Glass-based composites, vitroceramics
	81.05.Qk	Reinforced polymers and polymer-based composites
	81.05.Rm	Porous materials; granular materials
	81.05.U-	Carbon/carbon-based materials
	81.05.ub	Fullerenes and related materials
	81.05.ue	Graphene
	81.05.uf	Graphite
	81.05.ug	Diamond
	81.05.uj	Diamondnanocarbon composites
	81.05.Xj	Metamaterials for chiral, bianisotropic and othercomplex media
	81.05.Zx	New materials: theory, design, and fabrication
	81.07.-b	Nanoscale materials and structures: fabrication and characterization
	81.07.Bc	Nanocrystalline materials
	81.07.De	Nanotubes
	81.07.Gf	Nanowires
	81.07.Lk	Nanocontacts
	81.07.Nb	Molecular nanostructures
	81.07.Oj	Nanoelectromechanical systems (NEMS)
	81.07.Pr	Organic-inorganic hybrid nanostructures
	81.07.St	Quantum wells
	81.07.Ta	Quantum dots
	81.07.Vb	Quantum wires
	81.07.Wx	Nanopowders
	81.10.-h	Methods of crystal growth; physics and chemistry of crystal growth, crystal morphology, and orientation

	81.10.Aj	Theory and models of crystal growth; physics and chemistry of crystal growth, crystal morphology, and orientation
	81.10.Bk	Growth from vapor
	81.10.Dn	Growth from solutions
	81.10.Fq	Growth from melts; zone melting and refining
	81.10.Jt	Growth from solid phases (including multiphase diffusion and recrystallization)
	81.10.Mx	Growth in microgravity environments
	81.10.Pq	Growth in vacuum
	81.10.St	Growth in controlled gaseous atmospheres
	81.15.-z	Methods of deposition of films and coatings; filmgrowth and epitaxy
	81.15.Aa	Theory and models of film growth
	81.15.Cd	Deposition by sputtering
	81.15.Dj	E-beam and hot filament evaporation deposition
	81.15.Fg	Pulsed laser ablation deposition
	81.15.Gh	Chemical vapor deposition (including plasma-enhanced CVD, MOCVD, ALD, etc.)
	81.15.Hi	Molecular, atomic, ion, and chemical beam epitaxy
	81.15.Jj	Ion and electron beam-assisted deposition; ion plating
	81.15.Kk	Vapor phase epitaxy; growth from vapor phase
	81.15.Lm	Liquid phase epitaxy; deposition from liquid phases (melts, solutions, and surface layers on liquids)
	81.15.Np	Solid phase epitaxy; growth from solid phases
	81.15.Pq	Electrodeposition, electroplating
	81.15.Rs	Spray coating techniques
	81.16.-c	Methods of micro- and nanofabrication and processing
	81.16.Be	Chemical synthesis methods
	81.16.Dn	Self-assembly
	81.16.Fg	Supramolecular and biochemical assembly
	81.16.Hc	Catalytic methods
	81.16.Mk	Laser-assisted deposition
	81.16.Nd	Micro- and nanolithography
	81.16.Pr	Micro- and nano-oxidation
	81.16.Rf	Micro- and nanoscale pattern formation
	81.16.Ta	Atom manipulation
	81.20.-n	Methods of materials synthesis and materials
	81.20.Ev	Powder processing: powder metallurgy, compaction,sintering, mechanical alloying, and granulation
	81.20.Fw	Sol-gel processing, precipitation
	81.20.Hy	Forming; molding, extrusion, etc.
	81.20.Ka	Chemical synthesis; combustion synthesis
	81.20.Rg	Aerosols in materials synthesis and processing
	81.20.Vj	Joining; welding
	81.20.Wk	Machining, milling
	81.20.Ym	Purification
	81.30.-t	Phase diagrams and microstructures developed by solidification and solid-solid phase transformations
	81.30.Bx	Phase diagrams of metals, alloys, and oxides
	81.30.Dz	Phase diagrams of other materials
	81.30.Fb	Solidification
	81.30.Hd	Constant-composition solid-solid phase transformations: polymorphic, massive, and order-disorder
	81.30.Kf	Martensitic transformations
	81.30.Mh	Solid-phase
	81.40.-z	Treatment of materials and its effects on microstructure, nanostructure, and properties
	81.40.Cd	Solid solution hardening, precipitation hardening,and dispersion hardening; aging
	81.40.Ef	Cold working, work hardening; annealing, post-deformation annealing, quenching, tempering recovery, and crystallization
	81.40.Gh	Other heat and thermomechanical treatments
	81.40.Jj	Elasticity and anelasticity, stress-strain relations
	81.40.Lm	Deformation, plasticity, and creep
	81.40.Np	Fatigue, corrosion fatigue, embrittlement, cracking, fracture, and failure
	81.40.Pq	Friction, lubrication, and wear
	81.40.Rs	Electrical and magnetic properties related to treatment conditions
	81.40.Tv	Optical and dielectric properties related to treatment conditions
	81.40.Vw	Pressure treatment
	81.40.Wx	Radiation treatment (particle and electromagnetic)
	81.65.-b	Surface treatments
	81.65.Cf	Surface cleaning, etching

81.65.Kn	Corrosion
81.65.Lp	Surface hardening: nitridation, carburization, carbonitridation
81.65.Mq	Oxidation
81.65.Ps	Polishing, grinding, surface finishing
81.65.Rv	Passivation
81.65.Tx	Gettering
81.70.-q	Methods of materials testing and analysis
81.70.Bt	Mechanical testing, impact tests, static and dynamic loads
81.70.Cv	Nondestructive testing: ultrasonic testing, photoacoustic testing
81.70.Ex	Nondestructive testing: electromagnetic testing, eddy-current testing
81.70.Fy	Nondestructive testing: optical methods
81.70.Ha	Testing in microgravity environments
81.70.Jb	Chemical composition analysis, chemical depth anddopant profiling
81.70.Pg	Thermal analysis, differential thermal analysis (DTA), differential thermogravimetric analysis
81.70.Tx	Computed tomography
81.90.+c	Other topics in materials science
82.	Physical chemistry and chemical physics
82.20.-w	Chemical kinetics and dynamics
82.20.Bc	State selected dynamics and product distribution
82.20.Db	Transition state theory and statistical theories of rate constants
82.20.Ej	Quantum theory of reaction cross section
82.20.Fd	Collision theories; trajectory models
82.20.Gk	Electronically non-adiabatic reactions
82.20.Hf	Product distribution
82.20.Kh	Potential energy surfaces for chemical reactions
82.20.Ln	Semiclassical theory of reactions and/or energy transfer
82.20.Nk	Classical theories of reactions and/or energy transfer
82.20.Pm	Rate constants, reaction cross sections, and activation energies
82.20.Rp	State to state energy transfer
82.20.Sb	Correlation function theory of rate constants andits applications
82.20.Tr	Kinetic isotope effects including muonium
82.20.Uv	Stochastic theories of rate constants
82.20.Wt	Computational modeling; simulation
82.20.Xr	Quantum effects in rate constants (tunneling, resonances, etc.)
82.20.Yn	Solvent effects on reactivity
82.30.-b	Specific chemical reactions; reaction mechanisms
82.30.Cf	Atom and radical reactions; chain reactions; molecule-molecule reactions
82.30.Fi	Ion-molecule, ion-ion, and charge-transfer reactions
82.30.Hk	Chemical exchanges (substitution, atom transfer, abstraction, disproportionation, and group exchange)
82.30.Lp	Decomposition reactions (pyrolysis, dissociation,and fragmentation)
82.30.Nr	Association, addition, insertion, cluster formation
82.30.Qt	Isomerization and rearrangement
82.30.Rs	Hydrogen bonding, hydrophilic effects
82.30.Vy	Homogeneous catalysis in solution, polymers and zeolites
82.33.-z	Reactions in various media
82.33.De	Reactions in supercritical fluids
82.33.Fg	Reactions in clusters
82.33.Hk	Reactions on clusters
82.33.Jx	Reactions in zeolites
82.33.Ln	Reactions in sol gels, aerogels, porous media
82.33.Nq	Reactions in micells
82.33.Pt	Solid state chemistry
82.33.Vx	Reactions in flames, combustion, and explosions
82.33.Xj	Plasma reactions (including flowing afterglow andelectric discharges)
82.33.Ya	Chemistry of MOCVD and other vapor deposition methods
82.35.-x	Polymers: properties; reactions; polymerization
82.35.Cd	Conducting polymers
82.35.Ej	Nonlinear optics with polymers
82.35.Gh	Polymers on surfaces; adhesion
82.35.Jk	Copolymers, phase transitions, structure
82.35.Lr	Physical properties of polymers
82.35.Np	Nanoparticles in polymers

	82.35.Pq	Biopolymers, biopolymerization
	82.35.Rs	Polyelectrolytes
	82.37.-j	Single molecule kinetics
	82.37.Gk	STM and AFM manipulations of a single molecule
	82.37.Np	Single molecule reaction kinetics, dissociation, etc.
	82.37.Rs	Single molecule manipulation of proteins and otherbiological molecules
	82.37.Vb	Single molecule photochemistry
	82.39.-k	Chemical kinetics in biological systems
	82.39.Fk	Enzyme kinetics
	82.39.Jn	Charge (electron, proton) transfer in biological systems
	82.39.Pj	Nucleic acids, DNA and RNA bases
	82.39.Rt	Reactions in complex biological systems
	82.39.Wj	Ion exchange, dialysis, osmosis, electro-osmosis,membrane processes
	82.40.-g	Chemical kinetics and reactions: special regimes and techniques
	82.40.Bj	Oscillations, chaos, and bifurcations
	82.40.Ck	Pattern formation in reactions with diffusion, flow and heat transfer
	82.40.Fp	Shock wave initiated reactions, high-pressure chemistry
	82.40.Np	Temporal and spatial patterns in surface reactions
	82.40.Qt	Complex chemical systems
	82.45.-h	Electrochemistry and electrophoresis
	82.45.Aa	Electrochemical synthesis
	82.45.Bb	Corrosion and passivation
	82.45.Cc	Anodic films
	82.45.Fk	Electrodes
	82.45.Gj	Electrolytes
	82.45.Hk	Electrolysis
	82.45.Jn	Surface structure, reactivity and catalysis
	82.45.Mp	Thin layers, films, monolayers, membranes
	82.45.Qr	Electrodeposition and electrodissolution
	82.45.Rr	Electroanalytical chemistry
	82.45.Tv	Bioelectrochemistry
	82.45.Un	Dielectric materials in electrochemistry
	82.45.Vp	Semiconductor materials in electrochemistry
	82.45.Wx	Polymers and organic materials in electrochemistry
	82.45.Xy	Ceramics in electrochemistry
	82.45.Yz	Nanostructured materials in electrochemistry
	82.47.-a	Applied electrochemistry
	82.47.Aa	Lithium-ion batteries
	82.47.Cb	Lead-acid, nickel-metal hydride and other batteries
	82.47.Ed	Solid-oxide fuel cells (SOFC)
	82.47.Gh	Proton exchange membrane (PEM) fuel cells
	82.47.Jk	Photoelectrochemical cells, photoelectrochromic and other hybrid electrochemical energy storage devices
	82.47.Lh	Molten-carbonate fuel cells (MCFC)
	82.47.Nj	Polymer-electrolyte fuel cells (PEFC)
	82.47.Pm	Phosphoric-acid fuel cells (PAFC); other fuel cells
	82.47.Rs	Electrochemical sensors
	82.47.Tp	Electrochemical displays
	82.47.Uv	Electrochemical capacitors; supercapacitors
	82.47.Wx	Electrochemical engineering
	82.50.-m	Photochemistry
	82.50.Bc	Processes caused by infrared radiation
	82.50.Hp	Processes caused by visible and UV light
	82.50.Kx	Processes caused by X-rays or ?-rays
	82.50.Nd	Control of photochemical reactions
	82.50.Pt	Multiphoton processes
	82.53.-k	Femtochemistry
	82.53.Eb	Pump probe studies of photodissociation
	82.53.Hn	Pump probe experiments with bound states
	82.53.Kp	Coherent spectroscopy of atoms and molecules
	82.53.Mj	Femtosecond probing of semiconductor nanostructures
	82.53.Ps	Femtosecond probing of biological molecules
	82.53.St	Femtochemistry of adsorbed molecules
	82.53.Uv	Femtosecond probes of molecules in liquids
	82.53.Xa	Femtosecond probes of molecules in solids and of molecular solids
	82.56.-b	Nuclear magnetic resonance
	82.56.Dj	High resolution NMR

82.56.Fk	Multidimensional NMR
82.56.Hg	Multinuclear NMR
82.56.Jn	Pulse sequences in NMR
82.56.Lz	Diffusion
82.56.Na	Relaxation
82.56.Pp	NMR of biomolecules
82.56.Ub	Structure determination with NMR
82.60.-s	Chemical thermodynamics
82.60.Cx	Enthalpies of combustion, reaction, and formation
82.60.Fa	Heat capacities and heats of phase transitions
82.60.Hc	Chemical equilibria and equilibrium constants
82.60.Lf	Thermodynamics of solutions
82.60.Nh	Thermodynamics of nucleation
82.60.Qr	Thermodynamics of nanoparticles
82.65.+r	Surface and interface chemistry; heterogeneous catalysis at surfaces
82.70.-y	Disperse systems; complex fluids
82.70.Dd	Colloids
82.70.Gg	Gels and sols
82.70.Kj	Emulsions and suspensions
82.70.Rr	Aerosols and foams
82.70.Uv	Surfactants, micellar solutions, vesicles, lamellae, amphiphilic systems, (hydrophilic and hydrophobic interactions)
82.75.-z	Molecular sieves, zeolites, clathrates, and othercomplex solids
82.75.Fq	Synthesis, structure determination, structure modeling
82.75.Jn	Measurements and modeling of molecule migration inzeolites
82.75.Mj	Measurements and simulation of properties (optical, structural) of molecules in zeolites
82.75.Qt	Mechanism and kinetics of catalysis in zeolites (measurements or simulations)
82.75.Vx	Clusters in zeolites
82.80.-d	Chemical analysis and related physical methods ofanalysis
82.80.Bg	Chromatography
82.80.Dx	Analytical methods involving electronic spectroscopy
82.80.Ej	X-ray, Mössbauer, and other ?-ray spectroscopic analysis methods
82.80.Fk	Electrochemical methods
82.80.Gk	Analytical methods involving vibrational spectroscopy
82.80.Ha	Analytical methods involving rotational spectroscopy
82.80.Jp	Activation analysis and other radiochemical methods
82.80.Kq	Energy-conversion spectro-analytical methods
82.80.Ms	Mass spectrometry (including SIMS, multiphoton ionization and resonance ionization mass spectrometry, MALDI)
82.80.Nj	Fourier transform mass spectrometry
82.80.Pv	Electron spectroscopy (X-ray photoelectron (XPS),Auger electron spectroscopy (AES), etc.)
82.80.Qx	Ion cyclotron resonance mass spectrometry
82.80.Rt	Time of flight mass spectrometry
82.80.Yc	Rutherford backscattering (RBS), and other methodsof chemical analysis
82.90.+j	Other topics in physical chemistry and chemical physics
83.	Rheology
83.10.-y	Fundamentals and theoretical
83.10.Bb	Kinematics of deformation and flow
83.10.Ff	Continuum mechanics
83.10.Gr	Constitutive relations
83.10.Kn	Reptation and tube theories
83.10.Mj	Molecular dynamics, Brownian dynamics
83.10.Pp	Particle dynamics
83.10.Rs	Computer simulation of molecular and particle dynamics
83.10.Tv	Structural and phase changes
83.50.-v	Deformation and flow
83.50.Ax	Steady shear flows, viscometric flow
83.50.Ha	Flow in channels
83.50.Jf	Extensional flow and combined shear and extension
83.50.Lh	Slip boundary effects (interfacial and free surface flows)
83.50.Rp	Wall slip and apparent slip
83.50.Uv	Material processing (extension, molding, etc.)

83.50.Xa	Mixing and blending
83.60.-a	Material behavior
83.60.Bc	Linear viscoelasticity
83.60.Df	Nonlinear viscoelasticity
83.60.Fg	Shear rate dependent viscosity
83.60.Hc	Normal stress differences and their effects (e.g.rod climbing)
83.60.Jk	Extrudate swell
83.60.La	Viscoplasticity; yield stress
83.60.Np	Effects of electric and magnetic fields
83.60.Pq	Time-dependent structure (thixotropy, rheopexy)
83.60.Rs	Shear rate-dependent structure (shear thinning andshear thickening)
83.60.St	Non-isothermal rheology
83.60.Uv	Wave propagation, fracture, and crack healing
83.60.Wc	Flow instabilities
83.60.Yz	Drag reduction
83.80.-k	Material type
83.80.Ab	Solids: e.g., composites, glasses, semicrystallinepolymers
83.80.Fg	Granular solids
83.80.Gv	Electro- and magnetorheological fluids
83.80.Hj	Suspensions, dispersions, pastes, slurries, colloids
83.80.Iz	Emulsions and foams
83.80.Jx	Reacting systems: thermosetting polymers, chemorheology, rheokinetics
83.80.Kn	Physical gels and microgels
83.80.Lz	Physiological materials (e.g. blood, collagen, etc.)
83.80.Mc	Other natural materials (e.g. wood and other vegetable materials)
83.80.Nb	Geological materials: Earth, magma, ice, rocks, etc.
83.80.Qr	Surfactant and micellar systems, associated polymers
83.80.Rs	Polymer solutions
83.80.Sg	Polymer melts
83.80.Tc	Polymer blends
83.80.Uv	Block copolymers
83.80.Va	Elastomeric polymers
83.80.Wx	Filled elastomers
83.80.Xz	Liquid crystals: nematic, cholesteric, smectic, discotic, etc.
83.80.Ya	Processed food
83.85.-c	Techniques and apparatus
83.85.Cg	Rheological measurements, rheometry
83.85.Ei	Optical methods; rheo-optics
83.85.Fg	NMR/magnetic resonance imaging
83.85.Hf	X-ray and neutron scattering
83.85.Jn	Viscosity measurements
83.85.Lq	Normal stress difference measurements
83.85.Ns	Data analysis (interconversion of data computationof relaxation and retardation spectra;time-temperature superposition)
83.85.Rx	Extensional flow measurement
83.85.St	Stress relaxation
83.85.Tz	Creep and/or creep recoil
83.85.Vb	Small amplitude oscillatory shear (dynamic mechanical analysis)
83.90.+s	Other topics in rheology
84.	Electronics; radiowave and microwave technology; directenergy conversion and storage
84.30.-r	Electronic circuits
84.30.Bv	Circuit theory
84.30.Jc	Power electronics; power supply circuits
84.30.Le	Amplifiers
84.30.Ng	Oscillators, pulse generators, and function generators
84.30.Qi	Modulators and demodulators; discriminators, comparators, mixers, limiters, and compressors
84.30.Sk	Pulse and digital circuits
84.30.Vn	Filters
84.32.-y	Passive circuit components
84.32.Dd	Connectors, relays, and switches
84.32.Ff	Conductors, resistors (including thermistors, varistors, and photoresistors)
84.32.Hh	Inductors and coils; wiring

84.32.Tt	Capacitors
84.32.Vv	Fuses
84.35.+i	Neural networks
84.37.+q	Measurements in electric variables
84.40.-x	Radiowave and microwave (including millimeter wave)
84.40.Az	Waveguides, transmission lines, striplines
84.40.Ba	Antennas: theory, components and accessories
84.40.Dc	Microwave circuits
84.40.Fe	Microwave tubes (e.g., klystrons, magnetrons, traveling-wave, backward-wave tubes, etc.)
84.40.Ik	Masers; gyrotrons (cyclotron-resonance masers)
84.40.Lj	Microwave integrated electronics
84.40.Ua	Telecommunications: signal transmission and processing; communication satellites
84.40.Xb	Telemetry: remote control, remote sensing; radar
84.47.+w	Vacuum tubes
84.50.+d	Electric motors
84.60.-h	Direct energy conversion and storage
84.60.Bk	Performance characteristics of energy conversion systems; figure of merit
84.60.Jt	Photoelectric conversion
84.60.Lw	Magnetohydrodynamic conversion
84.60.Ny	Thermionic conversion
84.60.Rb	Thermoelectric, electrogasdynamic and other directenergy conversion
84.60.Ve	Energy storage systems, including capacitor banks
84.70.+p	High-current and high-voltage technology: power systems; power transmission lines and cables
84.71.-b	Superconducting high-power technology
84.71.Ba	Superconducting magnets; magnetic levitation devices
84.71.Fk	Superconducting cables
84.71.Mn	Superconducting wires, fibers, and tapes
84.90.+a	Other topics in electronics, radiowave and microwave technology
85.	Electronic and magnetic devices; microelectronics
85.25.-j	Superconducting devices
85.25.Am	Superconducting device characterization, design, and modeling
85.25.Cp	Josephson devices
85.25.Dq	Superconducting quantum interference devices (SQUIDs)
85.25.Hv	Superconducting logic elements and memory devices;microelectronic circuits
85.25.Oj	Superconducting optical, X-ray, and Gamma-ray detectors (SIS, NIS, transition edge)
85.25.Pb	Superconducting infrared, submillimeter and millimetre wave detectors
85.25.Qc	Superconducting surface acoustic wave devices andother superconducting devices
85.30.-z	Semiconductor devices
85.30.De	Semiconductor-device characterization, design, andmodeling
85.30.Fg	Bulk semiconductor and conductivity oscillation devices
85.30.Hi	Surface barrier, boundary, and point contact devices
85.30.Kk	Junction diodes
85.30.Mn	Junction breakdown and tunneling devices (including resonance tunneling devices)
85.30.Pq	Bipolar transistors
85.30.Rs	Thyristors
85.30.Tv	Field effect devices
85.35.-p	Nanoelectronic devices
85.35.Be	Quantum well devices (quantum dots, quantum wires,etc.)
85.35.Ds	Quantum interference devices
85.35.Gv	Single electron devices
85.35.Kt	Nanotube devices
85.40.-e	Microelectronics: LSI, VLSI, ULSI; integrated circuit fabrication
85.40.Bh	Computer-aided design of microcircuits; layout andmodeling
85.40.Hp	Lithography, masks and pattern transfer
85.40.Ls	Metallization, contacts, interconnects; device isolation
85.40.Qx	Microcircuit quality, noise, performance, and failure analysis
85.40.Ry	Impurity doping, diffusion and ion implantation technology
85.40.Sz	Deposition technology
85.40.Xx	Hybrid microelectronics; thick films
85.45.-w	Vacuum microelectronics
85.45.Bz	Vacuum microelectronic device characterization, design, and modeling
85.45.Db	Field emitters and arrays, cold electron emitters

85.45.Fd	Field emission displays (FEDs)
85.50.-n	Dielectric, ferroelectric, and piezoelectric devices
85.50.Gk	Non-volatile ferroelectric memories
85.60.-q	Optoelectronic devices
85.60.Bt	Optoelectronic device characterization, design, and modeling
85.60.Dw	Photodiodes; phototransistors; photoresistors
85.60.Gz	Photodetectors (including infrared and CCD detectors)
85.60.Ha	Photomultipliers; phototubes and photocathodes
85.60.Jb	Light-emitting devices
85.60.Pg	Display systems
85.65.+h	Molecular electronic devices
85.70.-w	Magnetic devices
85.70.Ay	Magnetic device characterization, design, and modeling
85.70.Ec	Magnetostrictive, magnetoacoustic, and magnetostatic devices
85.70.Ge	Ferrite and garnet devices
85.70.Kh	Magnetic thin film devices: magnetic heads (magnetoresistive, inductive, etc.); domain-motion devices, etc.
85.70.Li	Other magnetic recording and storage devices (including tapes, disks, and drums)
85.70.Rp	Magnetic levitation, propulsion and control devices
85.70.Sq	Magnetooptical devices
85.75.-d	Magnetoelectronics; spintronics: devices exploiting spin polarized transport or integrated magnetic fields
85.75.Bb	Magnetic memory using giant magnetoresistance
85.75.Dd	Magnetic memory using magnetic tunnel junctions
85.75.Ff	Reprogrammable magnetic logic
85.75.Hh	Spin polarized field effect transistors
85.75.Mm	Spin polarized resonant tunnel junctions
85.75.Nn	Hybrid Hall devices
85.75.Ss	Magnetic field sensors using spin polarized transport
85.80.-b	Thermoelectromagnetic and other devices
85.80.Fi	Thermoelectric devices
85.80.Jm	Magnetoelectric devices
85.80.Lp	Magnetothermal devices
85.85.+j	Micro- and nano-electromechanical systems (MEMSNEMS) and devices
85.90.+h	Other topics in electronic and magnetic devices and microelectronics
87.	Biological and medical physics
87.10.-e	General theory and mathematical aspects
87.10.Ca	Analytical theories
87.10.Ed	Ordinary differential equations (ODE), partial differential equations (PDE), integro-differential models
87.10.Hk	Lattice models
87.10.Kn	Finite element calculations
87.10.Mn	Stochastic modeling
87.10.Pq	Elasticity theory
87.10.Rt	Monte Carlo simulations
87.10.Tf	Molecular dynamics simulation
87.10.Vg	Biological information
87.14.-g	Biomolecules: types
87.14.Cc	Lipids
87.14.Df	Carbohydrates
87.14.E-	Proteins
87.14.ef	Peptides
87.14.ej	Enzymes
87.14.em	Fibrils (amyloids, collagen, etc.)
87.14.ep	Membrane proteins
87.14.et	Generic models (lattice, HP, etc.)
87.14.G-	Nucleic acids
87.14.gf	Nucleotides
87.14.gk	DNA
87.14.gn	RNA
87.14.Lk	Hormones
87.14.Pq	Vitamins
87.15.-v	Biomolecules: structure and physical properties
87.15.A-	Theory, modeling, and computer simulation
87.15.ad	Analytical theories

	87.15.ag	Quantum calculations
	87.15.ak	Monte Carlo simulations
	87.15.ap	Molecular dynamics simulation
	87.15.B-	Structure of biomolecules
	87.15.bd	Secondary structure
	87.15.bg	Tertiary structure
	87.15.bk	Structure of aggregates
	87.15.Cc	Folding: thermodynamics, statistical mechanics, models, and pathways
	87.15.Fh	Bonding; mechanisms of bond breakage
	87.15.H-	Dynamics of biomolecules
	87.15.hg	Dynamics of intermolecular interactions
	87.15.hj	Transport dynamics
	87.15.hm	Folding dynamics
	87.15.hp	Conformational changes
	87.15.ht	Ultrafast dynamics; charge transfer
	87.15.K-	Molecular interactions; membrane-protein interactions
	87.15.kj	Protein-polynucleotide interactions
	87.15.km	Protein-protein interactions
	87.15.kp	Protein-ligand interactions
	87.15.kr	Protein-solvent interactions
	87.15.kt	Protein-membrane interactions
	87.15.La	Mechanical properties
	87.15.M-	Spectra of biomolecules
	87.15.mk	Photodissociation
	87.15.mn	Photoionization
	87.15.mq	Luminescence
	87.15.N-	Properties of solutions of macromolecules
	87.15.np	Dissolution
	87.15.nr	Aggregation
	87.15.nt	Crystallization
	87.15.Pc	Electronic and electrical properties
	87.15.Qt	Sequence analysis
	87.15.R-	Reactions and kinetics
	87.15.rp	Polymerization
	87.15.rs	Dissociation
	87.15.Tt	Electrophoresis
	87.15.Vv	Diffusion
	87.15.Ya	Fluctuations
	87.15.Zg	Phase transitions
	87.16.-b	Subcellular structure and processes
	87.16.A-	Theory, modeling, and simulations
	87.16.ad	Analytical theories
	87.16.af	Monte Carlo calculations
	87.16.aj	Lattice models
	87.16.D-	Membranes, bilayers, and vesicles
	87.16.dj	Dynamics and fluctuations
	87.16.dm	Mechanical properties and rheology
	87.16.dp	Transport, including channels, pores, and lateraldiffusion
	87.16.dr	Assembly and interactions
	87.16.dt	Structure, static correlations, domains, and rafts
	87.16.Gj	Cell walls
	87.16.Ka	Filaments, microtubules, their networks, and supramolecular assemblies
	87.16.Ln	Cytoskeleton
	87.16.Mq	Morphology of nerve cells
	87.16.Nn	Motor proteins (myosin, kinesin dynein)
	87.16.Qp	Pseudopods, lamellipods, cilia, and flagella
	87.16.Sr	Chromosomes, histones
	87.16.Tb	Mitochondria and other organelles
	87.16.Uv	Active transport processes
	87.16.Vy	Ion channels
	87.16.Wd	Intracellular trafficking
	87.16.Xa	Signal transduction and intracellular signaling
	87.16.Yc	Regulatory genetic and chemical networks
	87.16.Zg	Nuclear morphology
	87.17.-d	Cell processes
	87.17.Aa	Modeling, computer simulation of cell processes

	87.17.Ee	Growth and division
	87.17.Jj	Cell locomotion, chemotaxis
	87.17.Pq	Morphogenesis
	87.17.Rt	Cell adhesion and cell mechanics
	87.17.Uv	Biotechnology of cell processes
	87.18.-h	Biological complexity
	87.18.Cf	Genetic switches and networks
	87.18.Ed	Cell aggregation
	87.18.Fx	Multicellular phenomena, biofilms
	87.18.Gh	Cell-cell communication; collective behavior of motile cells
	87.18.Hf	Spatiotemporal pattern formation in cellular populations
	87.18.Mp	Signal transduction networks
	87.18.Nq	Large-scale biological processes and integrative biophysics
	87.18.Sn	Neural networks and synaptic communication
	87.18.Tt	Noise in biological systems
	87.18.Vf	Systems biology
	87.18.Wd	Genomics
	87.18.Xr	Proteomics
	87.18.Yt	Circadian rhythms
	87.19.-j	Properties of higher organisms
	87.19.Ff	Muscles
	87.19.Hh	Cardiac dynamics
	87.19.L-	Neuroscience
	87.19.lb	Action potential propagation and axons
	87.19.lc	Noise in the nervous system
	87.19.ld	Electrodynamics in the nervous system
	87.19.le	EEG and MEG
	87.19.lf	MRI: anatomic, functional, spectral, diffusion
	87.19.lg	Synapses: chemical and electrical (gap junctions)
	87.19.lh	Optical imaging of neuronal activity
	87.19.lj	Neuronal network dynamics
	87.19.lk	Glia
	87.19.ll	Models of single neurons and networks
	87.19.lm	Synchronization in the nervous system
	87.19.ln	Oscillations and resonance
	87.19.lo	Information theory
	87.19.lp	Pattern formation: activity and anatomic
	87.19.lq	Neuronal wave propagation
	87.19.lr	Control theory and feedback
	87.19.ls	Encoding, decoding, and transformation
	87.19.lt	Sensory systems: visual, auditory, tactile, taste,and olfaction
	87.19.lu	Motor systems: Locomotion, flight, vocalization
	87.19.lv	Learning and memory
	87.19.lw	Plasticity
	87.19.lx	Development and growth
	87.19.ly	Energetics
	87.19.Pp	Biothermics and thermal processes in biology
	87.19.R-	Mechanical and electrical properties of tissues and organs
	87.19.rd	Elastic properties
	87.19.rf	Dielectric properties
	87.19.rh	Fluid transport and rheology
	87.19.rj	Contraction
	87.19.rm	Structure
	87.19.rp	Impulse propagation
	87.19.rs	Movement
	87.19.ru	Locomotion
	87.19.U-	Hemodynamics
	87.19.ug	Heart and lung dynamics
	87.19.uj	Peripheral vascular dynamics
	87.19.um	Blood-brain barrier
	87.19.Wx	Pneumodyamics, respiration
	87.19.X-	Diseases
	87.19.xb	Bacterial diseases
	87.19.xd	Viral diseases
	87.19.xe	Parasitic diseases
	87.19.xg	Fungal diseases

	87.19.xh	Prion diseases
	87.19.xj	Cancer
	87.19.xk	Genetic diseases
	87.19.xm	Epilepsy
	87.19.xn	Musculoskeletal diseases
	87.19.xp	Motor system disease (Parkinson's, etc.)
	87.19.xq	Stroke
	87.19.xr	Degenerative diseases (Alzheimer's, ALS, etc)
	87.19.xt	Developmental diseases
	87.19.xu	Gastrointestinal diseases
	87.19.xv	Endocrine diseases
	87.19.xw	Immune system diseases
	87.23.-n	Ecology and evolution
	87.23.Cc	Population dynamics and ecological pattern formation
	87.23.Ge	Dynamics of social systems
	87.23.Kg	Dynamics of evolution
	87.50.-a	Effects of electromagnetic and acoustic fields onbiological systems
	87.50.C-	Static and low-frequency electric and magnetic fields effects
	87.50.cf	Biophysical mechanisms of interaction
	87.50.ch	Electrophoresis/dielectrophoresis and other mechanical effects
	87.50.cj	Electroporation/membrane effects
	87.50.cm	Dosimetry/exposure assessment
	87.50.ct	Therapeutic applications
	87.50.S-	Radiofrequencymicrowave fields effects
	87.50.sg	Biophysical mechanisms of interaction
	87.50.sj	Dosimetry/exposure assessment
	87.50.st	Therapeutic applications
	87.50.U-	Millimeter/terahertz fields effects
	87.50.uj	Biophysical mechanisms of interaction
	87.50.up	Dosimetry/exposure assessment
	87.50.ux	Therapeutic applications
	87.50.W-	Optical/infrared radiation effects
	87.50.wf	Biophysical mechanisms of interaction
	87.50.wj	Dosimetry/exposure assessment
	87.50.wp	Therapeutic applications
	87.50.Y-	Biological effects of acoustic and ultrasonic energy
	87.50.yg	Biophysical mechanisms of interaction
	87.50.yk	Dosimetry/exposure assessment
	87.50.yt	Therapeutic applications
	87.53.-j	Effects of ionizing radiation on biological systems
	87.53.Ay	Biophysical mechanisms of interaction
	87.53.Bn	Dosimetry/exposure assessment
	87.53.Jw	Therapeutic applications, including brachytherapy
	87.53.Kn	Conformal radiation treatment
	87.53.Ly	Stereotactic radiosurgery
	87.55.-x	Treatment strategy
	87.55.D-	Treatment planning
	87.55.de	Optimization
	87.55.dh	Tissue response
	87.55.dk	Dose-volume analysis
	87.55.Gh	Simulation
	87.55.K-	Monte Carlo methods
	87.55.kd	Algorithms
	87.55.kh	Applications
	87.55.km	Verification
	87.55.N-	Radiation monitoring, control, and safety
	87.55.ne	Therapeutic applications
	87.55.Qr	Quality assurance in radiotherapy
	87.55.T-	Record and verify systems and applications
	87.55.tg	Design
	87.55.tm	Applications
	87.56.-v	Radiation therapy equipment
	87.56.B-	Radiation sources
	87.56.bd	Accelerators
	87.56.bg	Radioactive sources
	87.56.Da	Ancillary equipment

	87.56.Fc	Quality assurance equipment
	87.56.J-	Collimation
	87.56.jf	Field size
	87.56.jk	Field shaping
	87.56.N-	Beam intensity modifications
	87.56.ng	Wedges and compensators
	87.56.nk	Collimators
	87.57.-s	Medical imaging
	87.57.C-	Image quality
	87.57.cf	Spatial resolution
	87.57.cj	Contrast
	87.57.cm	Noise
	87.57.cp	Artifacts and distortion
	87.57.N-	Image analysis
	87.57.nf	Reconstruction
	87.57.nj	Registration
	87.57.nm	Segmentation
	87.57.np	Smoothing
	87.57.nt	Edge enhancement
	87.57.Q-	Computed tomography
	87.57.qh	Single-slice
	87.57.qp	Multislice
	87.57.R-	Computer-aided diagnosis
	87.57.rh	Mammography
	87.57.U-	Nuclear medicine imaging
	87.57.ue	Conventional nuclear medicine imaging
	87.57.uh	Single photon emission computed tomography (SPECT)
	87.57.uk	Positron emission tomography (PET)
	87.57.un	Radiopharmaceuticals
	87.57.uq	Dosimetry
	87.57.Va	Neutron imaging; neutron tomography
	87.59.-e	X-ray imaging
	87.59.B-	Radiography
	87.59.bd	Computed radiography
	87.59.bf	Digital radiography
	87.59.C-	Fluoroscopy
	87.59.cf	Digital fluoroscopy
	87.59.Dj	Angiography
	87.59.E-	Mammography
	87.59.eg	Film mammography
	87.59.ej	Digital mammography
	87.61.-c	Magnetic resonance imaging
	87.61.Bj	Theory and principles
	87.61.Ff	Instrumentation
	87.61.Hk	Pulse sequences
	87.61.Jc	Anatomic imaging
	87.61.Np	Flow imaging
	87.61.Qr	Functional imaging
	87.61.Tg	Clinical applications
	87.63.-d	Non-ionizing radiation equipment and techniques
	87.63.D-	Ultrasonography
	87.63.dh	Ultrasonographic imaging
	87.63.dk	Doppler
	87.63.Hg	Thermography
	87.63.L-	Visual imaging
	87.63.lg	Principles of visualization
	87.63.lj	Image perception
	87.63.lm	Image enhancement
	87.63.lp	Transillumination
	87.63.lt	Laser imaging
	87.63.Pn	Electrical impedance tomography (EIT)
	87.63.St	Bone densitometry
	87.64.-t	Spectroscopic and microscopic techniques in biophysics and medical physics
	87.64.Aa	Computer simulation
	87.64.Bx	Electron, neutron and x-ray diffraction and scattering
	87.64.Cc	Scattering of visible, uv, and infrared radiation

	87.64.Dz	Scanning tunneling and atomic force microscopy
	87.64.Ee	Electron microscopy
	87.64.K-	Spectroscopy
	87.64.kd	X-ray and EXAFS
	87.64.kh	EPR
	87.64.kj	NMR
	87.64.km	Infrared
	87.64.kp	Raman
	87.64.ks	Electron and photoelectron
	87.64.ku	Magnetic circular dichroism
	87.64.kv	Fluorescence
	87.64.kx	Mössbauer
	87.64.M-	Optical microscopy
	87.64.mc	Bright field
	87.64.mf	Dark field
	87.64.mh	Phase contrast and DIC
	87.64.mk	Confocal
	87.64.mn	Multiphoton
	87.64.mt	Near-field scanning
	87.80.-y	Biophysical techniques (research methods)
	87.80.Cc	Optical trapping
	87.80.Dj	Spectroscopies
	87.80.Ek	Mechanical and micromechanical techniques
	87.80.Fe	Micromanipulation of biological structures
	87.80.Jg	Patch clamping and other physiological measurements
	87.80.Kc	Electrochemical techniques
	87.80.Lg	Magnetic and paramagnetic resonance
	87.80.Nj	Single-molecule techniques
	87.80.Qk	Biochemical separation processes
	87.80.St	Genomic techniques
	87.80.Un	Proteomic techniques
	87.85.-d	Biomedical engineering
	87.85.D-	Applied neuroscience
	87.85.dd	Brain-machine interfaces
	87.85.dh	Cells on a chip
	87.85.dm	Physical models of neurophysiological processes
	87.85.dq	Neural networks
	87.85.E-	Neural prosthetics
	87.85.eg	Electrode stimulation
	87.85.ej	Safe limits of charge injection
	87.85.em	Tissue damage
	87.85.F-	Smart prosthetics
	87.85.ff	Feedback
	87.85.fh	Feedforward
	87.85.fk	Biosensors
	87.85.fp	Bidirectional communication
	87.85.G-	Biomechanics
	87.85.gf	Fluid mechanics and rheology
	87.85.gj	Movement and locomotion
	87.85.gp	Mechanical systems
	87.85.J-	Biomaterials
	87.85.jc	Electrical, thermal, and mechanical properties ofbiological matter
	87.85.jf	Bio-based materials
	87.85.jj	Biocompatibility
	87.85.Lf	Tissue engineering
	87.85.M-	Biotechnology
	87.85.md	Genetic engineering
	87.85.mg	Genomics
	87.85.mk	Proteomics
	87.85.Ng	Biological signal processing
	87.85.Ox	Biomedical instrumentation and transducers, including microelectro-mechanical systems (MEMS)
	87.85.Pq	Biomedical imaging
	87.85.Qr	Nanotechnologies-design
	87.85.Rs	Nanotechnologies-applications
	87.85.St	Robotics

87.85.Tu	Modeling biomedical systems
87.85.Uv	Micromanipulators
87.85.Va	Micromachining
87.85.Wc	Neural engineering
87.85.Xd	Dynamical, regulatory, and integrative biology
87.90.+y	Other topics in biological and medical physics
	Mechanobiology
	Mechanochemistry
	Immunobiophysics
	Physics of cancer
88.	Renewable energy resources and applications
88.05.-b	Energy analysis
88.05.Bc	Energy efficiency; definitions and standards
88.05.De	Thermodynamic constraints on energy production
88.05.Ec	Renewable energy targets
88.05.Gh	Energy conservation; electricity demand reduction
88.05.Hj	Energy content issues; life cycle analysis
88.05.Jk	Policy issues; resource assessment
88.05.Lg	Economic issues; sustainability; cost trends
88.05.Np	Environmental aspects
88.05.Pq	Emissions trading and CDM
88.05.Qr	Energy use in agriculture
88.05.Rt	Energy use in appliances and electronic equipment
88.05.Sv	Energy use in heating and cooling of residential and commercial buildings
88.05.Tg	Energy use in lighting
88.05.Vx	Energy use in industry and manufacturing
88.05.Xj	Energy use in transportation
88.10.-g	Geothermal energy
88.10.C-	Ground heat
88.10.cd	Geothermal heat pumps
88.10.cf	Global geothermal flux
88.10.ch	Continental geothermal energy
88.10.cj	Oceanic geothermal energy
88.10.cn	Heating and cooling of buildings; space heating
88.10.Eb	Hot dry rock (igneous systems)
88.10.F-	Hydrothermal reservoirs
88.10.fb	Hot springs
88.10.fe	Hot water from wells
88.10.fh	Down hole pumps
88.10.G-	Reservoir engineering (enhanced geothermal systems)
88.10.gc	Simulation; prediction models
88.10.gf	Imaging fluid flow
88.10.gk	High-temperature logging tools and sensors
88.10.gn	Fracture characterization of rocks
88.10.gp	Site characterization; zonal isolation
88.10.H-	Geothermal electricity production
88.10.hd	Dry steam plants
88.10.hf	Flash steam plants
88.10.hh	Binary-cycle steam plants
88.10.J-	Brines and their dissolved matter
88.10.jj	Mineral extraction
88.10.jn	Metals extraction
88.10.jp	Combined minerals and metals extraction
88.20.-j	Biomass energy
88.20.D-	Biomass energy sources
88.20.dd	Wood
88.20.df	Food crops
88.20.dh	Grassy and woody plants
88.20.dj	Agriculture/forestry residues
88.20.dm	Aquatic/marine sources
88.20.dp	Cellolusic materials
88.20.dr	Food wastes
88.20.dt	Municipal and industrial wastes
88.20.dv	Methane from landfills

	88.20.F-	Renewable alternative fuels from biomass energy
	88.20.ff	Ethanol
	88.20.fg	Methanol
	88.20.fh	Butanol
	88.20.fj	Mixed alcohols
	88.20.fk	Biodiesel
	88.20.fn	Hydrogen
	88.20.fq	Methane
	88.20.fr	Solid pelletized fuel
	88.20.fs	Syngas
	88.20.ft	Vegetable oils
	88.20.fv	Bioethers
	88.20.fw	Bioaviation fuel
	88.20.G-	Methane production
	88.20.gc	Fischer-Tropsch (F-T) liquids (hydrocarbons)
	88.20.gf	Decaying organic matter
	88.20.gh	Anaerobic digestion
	88.20.H-	Biomass processing routes
	88.20.hh	Biochemical route
	88.20.hj	Thermochemical route
	88.20.J-	Biomass conversion methods
	88.20.jj	Combustion
	88.20.jm	Hydrolysis and fermentation
	88.20.jp	Extraction and esterification
	88.20.jr	Alternate photosynthetic pathways
	88.20.M-	Biopower systems
	88.20.mn	Direct-firing systems
	88.20.mp	Cofiring systems
	88.20.mr	Gasification systems; syngas
	88.20.mt	Pyrolysis to liquids
	88.20.mv	Paper mills
	88.20.R-	Bioproducts from biomass
	88.20.rb	Plastics
	88.20.rg	Glues
	88.20.rm	Acids
	88.20.rp	Wood adhesives
	88.20.rr	Foam insulation
	88.20.T-	Markets for renewable alternative fuels
	88.20.td	Heat
	88.20.tf	Combined heat and power
	88.20.th	Transportation fuels
	88.20.tk	Chemicals
	88.20.Y-	Social issues
	88.20.yq	Food versus fuel debate
	88.30.-k	Hydrogen and fuel cell technology
	88.30.E-	Hydrogen production with renewable energy
	88.30.ej	Thermochemical hydrogen
	88.30.em	Electrolytic hydrogen
	88.30.ep	Electrochemical photolytic hydrogen
	88.30.er	Biological photolytic hydrogen
	88.30.et	Reforming biomass and wastes
	88.30.ew	Water-gas-shift (WGS) reaction
	88.30.G-	Fuel cell systems
	88.30.gg	Design and simulation
	88.30.J-	Fuel cell components
	88.30.jn	Fuel cell stack
	88.30.jp	Fuel processor
	88.30.jr	Current converter
	88.30.jt	Heat recovery system
	88.30.M-	Fuel cell component materials
	88.30.mg	Inorganic proton conductors
	88.30.mj	Composite materials
	88.30.Nn	Corrosion protection
	88.30.P-	Types of fuel cells
	88.30.pd	Proton exchange membrane fuel cells (PEM)
	88.30.pf	Direct methanol fuel cells

	88.30.ph	Alkaline fuel cells
	88.30.pj	Phosphoric acid fuel cells
	88.30.pm	Molten carbonate fuel cells
	88.30.pn	Solid oxide fuel cells
	88.30.pp	Regenerative fuel cells
	88.30.R-	Hydrogen storage
	88.30.rd	Inorganic metal hydrides
	88.30.rf	Organics
	88.30.rh	Carbon nanotubes
	88.30.rj	Hydrocarbons and alcohols liquid systems
	88.40.-j	Solar energy
	88.40.F-	Solar concentrators
	88.40.fc	Modeling and analysis
	88.40.ff	Performance testing
	88.40.fh	Advanced materials development
	88.40.fj	Parabolic-trough mirrors
	88.40.fm	Dishengine systems
	88.40.fp	Power tower systems
	88.40.fr	Concentrating collectors
	88.40.H-	Solar cells (photovoltaics)
	88.40.hj	Efficiency and performance of solar cells
	88.40.hm	Cost of production of solar cells
	88.40.J-	Types of solar cells
	88.40.jj	Silicon solar cells
	88.40.jm	Thin film III-V and II-VI based solar cells
	88.40.jn	Thin film Cu-based I-III-VI_2 solar cells
	88.40.jp	Multijunction solar cells
	88.40.jr	Organic photovoltaics
	88.40.M-	Residential and commercial buildings
	88.40.me	Solar heating and cooling systems
	88.40.mg	Active spacewater heating
	88.40.mj	Passive spacewater heating
	88.40.mm	Pool heating systems
	88.40.mp	Grid-tied solar electric systems
	88.40.mr	Building-integrated photovoltaics
	88.40.mt	Roof top shingles
	88.40.mv	Building facades
	88.40.mx	Day lightingnatural lighting of buildings
	88.40.my	Outdoor solar lights
	88.50.-k	Wind energy
	88.50.G-	Wind turbines
	88.50.gg	Research and development
	88.50.gj	Modeling, design
	88.50.gm	Components
	88.50.gp	Testing
	88.50.J-	Wind farms
	88.50.jj	Small-scale wind farms
	88.50.jn	Large-scale wind farms
	88.50.jp	Off-shore wind farms
	88.50.Mp	Electricity generation, grid integration from wind
	88.50.Xy	Social issues regarding wind energy
	88.60.-m	Hydroelectric power
	88.60.J-	Conventional hydropower
	88.60.jb	Impoundment facilities, dams
	88.60.je	Diversion facilities
	88.60.jg	Pumped storage facilities
	88.60.K-	Hydroturbines
	88.60.kc	Cross-flow turbines
	88.60.kf	Francis hydropower turbines
	88.60.kj	Free-flow turbines
	88.60.km	Impulse turbines
	88.60.kp	Pelton hydropower turbines
	88.60.kr	Propeller turbines
	88.60.kt	Reaction turbines
	88.60.N-	Emerging hydropower technologies

88.60.nf	Energy from ocean waves
88.60.nh	Tidal energy
88.60.nj	Marine thermal gradients
88.60.nm	Energy from ocean currents
88.60.np	Natural water flow in rivers
88.60.nr	Ocean thermal energy
88.80.-q	Energy delivery and storage
88.80.Cd	Grid-connected distributed energy resources
88.80.F-	Energy storage technologies
88.80.ff	Batteries
88.80.fh	Supercapacitors
88.80.fj	Superconducting magnetic energy storage
88.80.H-	Electric power transmission
88.80.hh	Transmission grids
88.80.hj	High-voltage direct current transmission
88.80.hm	ac power transmission
88.80.hp	Radio-frequency power transmission
88.80.hr	Superconducting cables
88.80.ht	Wireless power transmission
88.80.Kg	Energy delivery infrastructure
88.85.-r	Advanced vehicles
88.85.Cd	Fuel cell vehicles (FCVs)
88.85.Fg	Plug-in hybrid vehicles (HEVs)
88.85.Hj	Electric vehicles (EVs)
88.85.J-	Vehicle energy storage
88.85.jk	Lead-acid batteries
88.85.jm	Nickel-metal hydride batteries
88.85.jp	Ultracapacitors
88.85.M-	Alternative fuels for advanced vehicles
88.85.mb	Biodiesel
88.85.md	Propane
88.85.mf	Natural gas
88.85.mh	Hydrogen
88.85.mj	Ethanol
88.85.mn	Fuel blends
88.85.Pq	Fueling stations for advanced vehicles
88.90.+t	Other topics in renewable energy and applications
89.	Other areas of applied and interdisciplinary physics
89.20.-a	Interdisciplinary applications of physics
89.20.Bb	Industrial and technological research and development
89.20.Dd	Military technology and weapons systems; arms control
89.20.Ff	Computer science and technology
89.20.Hh	World Wide Web, Internet
89.20.Kk	Engineering
89.20.Mn	Forensic science
89.30.-g	Fossil fuels and nuclear power
89.30.A-	Fossil fuels
89.30.ag	Coal
89.30.aj	Oil, petroleum
89.30.an	Natural gas
89.30.Gg	Nuclear fission power
89.30.Jj	Nuclear fusion power
89.40.-a	Transportation
89.40.Bb	Land transportation
89.40.Cc	Water transportation
89.40.Dd	Air transportation
89.60.-k	Environmental studies
89.60.Ec	Environmental safety
89.60.Fe	Environmental regulations
89.60.Gg	Impact of natural and man-made disasters
89.65.-s	Social and economic systems
89.65.Cd	Demographic studies
89.65.Ef	Social organizations; anthropology
89.65.Gh	Economics; econophysics, financial markets, business and management

89.65.Lm	Urban planning and construction
89.70.-a	Information and communication theory
89.70.Cf	Entropy and other measures of information
89.70.Eg	Computational complexity
89.70.Hj	Communication complexity
89.70.Kn	Channel capacity and error-correcting codes
89.75.-k	Complex systems
89.75.Da	Systems obeying scaling laws
89.75.Fb	Structures and organization in complex systems
89.75.Hc	Networks and genealogical trees
89.75.Kd	Patterns
89.90.+n	Other topics in areas of applied and interdisciplinary physics
	Evolutionary game theory
	Coevolutionary dynamics
	Chimera states
	Digital Epidemiology
	Computational social science
90.	GEOPHYSICS, ASTRONOMY, AND ASTROPHYSICS
91.	Solid Earth physics
91.10.-v	Geodesy and gravity
91.10.By	Mathematical geodesy; general theory
91.10.Da	Cartography
91.10.Fc	Space and satellite geodesy; applications of global positioning systems
91.10.Jf	Topography; geometric observations
91.10.Kg	Crustal movements and deformation
91.10.Lh	Photogrammetry
91.10.Nj	Rotational variations; polar wobble
91.10.Op	Gravity anomalies; time variable gravity
91.10.Pp	Geodetic techniques; gravimetric measurements andinstruments
91.10.Qm	Harmonics of the gravity potential field; geopotential theory and determination
91.10.Sp	Satellite orbits
91.10.Tq	Earth tides
91.10.Vr	Ocean/Earth/atmosphere hydrosphere/cryosphere interactions; mass balance
91.10.Ws	Reference systems
91.10.Xa	Global change from geodesy
91.25.-r	Geomagnetism and paleomagnetism; geoelectricity
91.25.Cw	Origins and models of the magnetic field; dynamo theories
91.25.Dx	Archeomagnetism
91.25.Ey	Interactions between exterior sources and interiorproperties
91.25.F-	Rock and mineral magnetism
91.25.fa	Biogenic magnetic minerals
91.25.fd	Environmental magnetism
91.25.G-	Spatial variations in geomagnetism
91.25.ga	Harmonics and anomalies
91.25.gj	Attributed to seafloor spreading
91.25.Le	Time variations in geomagnetism
91.25.Mf	Magnetic field reversals: process and timescale
91.25.Ng	Paleomagnetism
91.25.Ph	Magnetostratigraphy
91.25.Qi	Geoelectricity, electromagnetic induction, and telluric currents
91.25.Rt	Magnetic anomalies; modeling and interpretations
91.25.St	Magnetic fabrics and anisotropy
91.25.Th	Reference fields: regional; global
91.25.Ux	Remagnetization
91.25.Wb	Geomagnetic induction
91.25.Xg	Geomagnetic excursion
91.25.Za	Core processes
91.30.-f	Seismology
91.30.Ab	Theory and modeling, computational seismology
91.30.Bi	Seismic sources (mechanisms, magnitude, moment frequency spectrum)
91.30.Cd	Body wave propagation
91.30.Dk	Seismicity
91.30.Fn	Surface waves and free oscillations

	91.30.Ga	Subduction zones
	91.30.Hc	Mid-ocean ridges
	91.30.Iv	Transform faults
	91.30.Jk	Tomography in seismology
	91.30.Mv	Strong motions and shock waves
	91.30.Nw	Tsunamis
	91.30.Px	Earthquakes
	91.30.Rz	Nuclear explosion seismology
	91.30.Tb	Volcano seismology
	91.30.Uv	Core and mantle seismology
	91.30.Vc	Continental crust seismology
	91.30.Wx	Lithosphere seismology
	91.30.Ye	Oceanic crust seismology
	91.30.Za	Paleoseismology
	91.32.-m	Rheology of the Earth
	91.32.Ac	General aspects
	91.32.De	Crust and lithosphere
	91.32.Gh	Mantle
	91.32.Jk	Friction of fault zones
	91.35.-x	Earth's interior structure and properties
	91.35.Cb	Models of interior structure
	91.35.Dc	Heat flow; geothermy
	91.35.Ed	Structure of the Earth's interior below the uppermantle
	91.35.Gf	Structure of the crust and upper mantle
	91.35.Lj	Composition and state of the Earth's interior
	91.35.Pn	Tomography of the Earth's interior
	91.40.-k	Volcanology
	91.40.Ac	Geochemical modeling
	91.40.Bp	Tephrochronology; ash deposits
	91.40.Dr	Atmospheric effects
	91.40.Ft	Eruption mechanisms
	91.40.Ge	Hydrothermal systems
	91.40.Hw	Lava rheology and morphology
	91.40.Jk	Magma migration
	91.40.La	Physics and chemistry of magma bodies
	91.40.Pc	Thermodynamics in volcanology
	91.40.Qa	Reactions and phase equilibria
	91.40.Rs	Subduction zone
	91.40.St	Mid-oceanic ridge
	91.40.Ta	Intra-plate processes
	91.40.Uc	Volcanoclastic deposits
	91.40.Vg	Volcanic gases
	91.40.Wx	Calderas
	91.40.Yt	Remote sensing of volcanoes
	91.40.Zz	Volcano monitoring; volcanic hazards and risks
	91.45.-c	Tectonophysics
	91.45.Bg	Planetary interiors
	91.45.Cg	Continental tectonics
	91.45.Dh	Plate tectonics
	91.45.Fj	Convection currents and mantle plumes
	91.45.Ga	Dynamics and mechanics of tectonics
	91.45.Hc	Subduction and obduction zone processes
	91.45.Jg	Hot spots, large igneous provinces, and flood basalt volcanism
	91.45.Kn	Core processes
	91.45.Nc	Evolution of the Earth
	91.45.Qv	Tomography of plate
	91.45.Rg	Heat generation and transport
	91.45.Wa	Volcanic arcs
	91.45.Xz	Stresses in tectonophysics
	91.50.-r	Marine geology and geophysics
	91.50.Ac	Back-arc basin processes
	91.50.Bd	Continental shelf and slope processes
	91.50.Cw	Beach and coastal processes
	91.50.Ey	Seafloor morphology, geology, and geophysics
	91.50.Ga	Bathymetry, seafloor topology
	91.50.Hc	Gas and hydrate systems

	91.50.Iv	Marine magnetics and electromagnetics
	91.50.Jc	Marine sediments, turbidity currents, processes and transport
	91.50.Kx	Gravity and isostasy
	91.50.Ln	Heat flow (benthic)
	91.50.Nc	Littoral processes
	91.50.Ps	Marine hydrogeology
	91.50.Qr	Micropaleontology
	91.50.Rt	Mid-ocean ridge
	91.50.Sn	Ocean drilling
	91.50.Tb	Oceanic hotspots and intra-plate volcanism
	91.50.Uv	Oceanic plateaus and fracture zone processes
	91.50.Vx	Ophiolites
	91.50.Wy	Subduction zone processes
	91.50.Xz	Submarine landslides
	91.50.Yf	Submergence instruments, ROV, AUV, Submersibles, and ocean observatories
	91.55.-y	Structural geology
	91.55.Ax	Mechanics, theory and modeling
	91.55.Bc	Continental neotectonics
	91.55.De	Diapir and diapirism
	91.55.Fg	Dynamics and mechanics of faulting
	91.55.Hj	Folds and folding
	91.55.Jk	Fractures and faults
	91.55.Ln	Kinematics of crustal and mantle deformation
	91.55.Mb	High strain deformation zones
	91.55.Nc	Local crustal structure; regional crustal structure
	91.55.Pq	Melanges
	91.55.Qr	Mesoscopic fabrics
	91.55.Sn	Pluton emplacement
	91.55.Tt	Role of fluids
	91.55.Uv	Remote sensing in structural geology
	91.60.-x	Physical properties of rocks and minerals
	91.60.Ba	Elasticity, fracture, and flow
	91.60.Dc	Plasticity, diffusion, and creep
	91.60.Ed	Crystal structure and defects, microstructure
	91.60.Fe	Equations of state
	91.60.Gf	High-pressure behavior
	91.60.Hg	Phase changes
	91.60.Ki	Thermal properties
	91.60.Lj	Acoustic properties
	91.60.Mk	Optical properties
	91.60.Np	Permeability and porosity
	91.60.Pn	Magnetic and electrical properties
	91.60.Qr	Wave attenuation
	91.60.Tn	Transport properties
	91.62.+g	Biogeosciences
	91.65.-n	Mineralogy and petrology
	91.65.An	Mineral and crystal chemistry
	91.65.Cq	Igneous petrology
	91.65.Dt	Isotopic composition
	91.65.Ej	Extrusive structures and rocks
	91.65.Gk	Intrusive structures and rocks
	91.65.Jn	Layered magma chambers
	91.65.Kf	Metamorphic petrology
	91.65.Lc	Pressure-temperature-time paths
	91.65.My	Fluid flow
	91.65.Pj	Ultra-high pressure metamorphism
	91.65.Qr	Ultra-high temperature metamorphism
	91.65.Rg	Mineral occurrences and deposits
	91.65.Sn	Meteorite mineralogy and petrology
	91.65.Ti	Sedimentary
	91.67.-y	Geochemistry
	91.67.Bc	Geochemical modeling
	91.67.De	Reactions and phase equilibria
	91.67.Fx	Geochemical processes
	91.67.Gy	Chemical composition
	91.67.Jk	Geochemistry of hydrothermal systems

91.67.Nc	Geochemical cycles
91.67.Pq	Major and trace element geochemistry
91.67.Qr	Radiogenic isotope geochemistry
91.67.Rx	Stable isotope geochemistry
91.67.St	Fluid and melt inclusion geochemistry
91.67.Ty	Sedimentary geochemistry
91.67.Uv	Organic and biogenic geochemistry
91.67.Vf	Low-temperature geochemistry
91.70.-c	Information related to geologic time
91.70.Bf	Cenozoic
91.70.Dh	Mesozoic
91.70.Fj	Paleozoic
91.70.Hm	Precambrian
91.80.+d	Geochronology
91.90.+p	Other topics in solid Earth physics
92.	Hydrospheric and atmospheric geophysics
92.05.-x	General aspects of oceanography
92.05.Bc	Analytical modeling and laboratory experiments
92.05.Df	Climate and inter-annual variability
92.05.Ek	Long term variability; Heinrich events
92.05.Fg	Diurnal, seasonal and annual cycles
92.05.Hj	Physical and chemical properties of seawater (salinity, density, temperature)
92.05.Jn	Ocean energy extraction
92.05.Lf	Hydrothermal systems
92.10.-c	Physical oceanography
92.10.A-	Circulation and currents
92.10.ab	General circulation
92.10.ad	Deep water formation and circulation
92.10.af	Thermohaline convection
92.10.ah	Ocean currents; Eastern boundary currents, Westernboundary currents
92.10.ak	Eddies and mesoscale processes
92.10.am	El Nino Southern Oscillation
92.10.Dh	Deep ocean processes
92.10.Ei	Coriolis effects
92.10.Fj	Upper ocean and mixed layer processes
92.10.Hm	Ocean waves and oscillations
92.10.Iv	Ocean influence of Earth's rotation
92.10.Kp	Sea-air energy exchange processes
92.10.Lq	Turbulence, diffusion, and mixing processes in oceanography
92.10.Ns	Fine structure and microstructure in oceanography
92.10.Oc	Benthic boundary layers, ocean bottom processes
92.10.Rw	Sea ice (mechanics and air/sea/ice exchange processes)
92.10.Sx	Coastal, estuarine, and near shore processes
92.10.Ty	Fronts and jets
92.10.Ua	Overflows
92.10.Vz	Underwater sound
92.10.Wa	Sediment transport
92.10.Xc	Ocean fog
92.10.Yb	Hydrography
92.10.Zf	Upwelling and
92.20.-h	Chemical and biological oceanography
92.20.Bk	Aerosols
92.20.Cm	Chemistry of the ocean
92.20.Hs	Anoxic environments
92.20.Iv	Benthic processes, sea-bottom processes
92.20.Jt	Biology of the ocean
92.20.Ny	Marine pollution
92.20.Ox	Hypoxic environment
92.20.Sg	Biogeochemical cycles
92.20.Td	Radioactivity and radioisotopes
92.20.Uv	Gases in chemical oceanography
92.20.Vn	Sedimentation
92.20.Wx	Trace elements
92.20.Xy	Carbon cycling

92.30.+m	Paleoceanography
92.40.-t	Hydrology and glaciology; cryosphere
92.40.Aa	Anthropogenic effects
92.40.Bc	Chemistry of fresh water
92.40.Cy	Modeling; general theory
92.40.De	Drought
92.40.Ea	Precipitation
92.40.Gc	Erosion and sedimentation; sediment transport
92.40.Ha	Debris flow and landslides
92.40.Iv	Desertification
92.40.Je	Evapotranspiration
92.40.Kf	Groundwater
92.40.Lg	Soil moisture and temperature
92.40.Oj	Eco-hydrology; plant ecology
92.40.Pb	Geomorphology
92.40.Qk	Surface water, water resources
92.40.Vq	Glaciology
92.40.We	Hydrologic cycles and budgets
92.40.Xx	Irrigation; dams
92.40.Yy	Wetlands
92.40.Zg	Hydrometeorology, hydroclimatology
92.60.-e	Properties and dynamics of the atmosphere; meteorology
92.60.Aa	Modeling and model calibration
92.60.Bh	General circulation
92.60.Cc	Ocean/atmosphere interactions, air/sea constituentfluxes
92.60.Fm	Boundary layer structure and processes
92.60.Gn	Winds and their effects
92.60.H-	Atmospheric composition, structure, and properties
92.60.ha	Exospheric composition and chemistry
92.60.hb	Thermospheric composition and chemistry, energy deposition
92.60.hc	Mesospheric composition, energy deposition, constituent transport and chemistry
92.60.hd	Stratospheric composition and chemistry
92.60.hf	Tropospheric composition and chemistry, constituent transport and chemistry
92.60.hg	Constituent sources and sinks
92.60.hh	Acoustic gravity waves, tides, and compressional waves
92.60.hk	Convection, turbulence, and diffusion
92.60.hn	Geochemical cycles
92.60.hv	Pressure, density, and temperature
92.60.hw	Airglow and aurorae
92.60.hx	Other upper atmospheric phenomena: red sprites; blue jets; atmospheric gamma ray and intense VHF emissions
92.60.Iv	Paleoclimatology
92.60.Jq	Water in the atmosphere
92.60.Kc	Land/atmosphere interactions
92.60.Ls	Ion chemistry of the atmosphere
92.60.Mt	Particles and aerosols
92.60.Nv	Cloud physics and chemistry
92.60.Ox	Tropical meteorology
92.60.Pw	Atmospheric electricity, lightning
92.60.Qx	Storms
92.60.Ry	Climatology, climate change and variability
92.60.Sz	Air quality and air pollution
92.60.Ta	Electromagnetic wave propagation
92.60.Uy	Polar meteorology
92.60.Vb	Radiative processes, solar radiation
92.60.Wc	Weather analysis and prediction
92.60.Xg	Stratosphere/troposphere interactions
92.60.Zc	Volcanic effects
92.70.-j	Global change
92.70.Aa	Abrupt/rapid climate change
92.70.Bc	Land/atmosphere interactions
92.70.Cp	Atmosphere
92.70.Er	Biogeochemical processes
92.70.Gt	Climate dynamics
92.70.Ha	Cryospheric change
92.70.Iv	Geomorphology and weathering
92.70.Jw	Oceans, sea level change

	92.70.Kb	Regional climate change
	92.70.Ly	Water cycles
	92.70.Mn	Impacts of global change; global warming
	92.70.Np	Global climate modeling
	92.70.Pq	Earth system modeling
	92.70.Qr	Solar variability impact
	92.70.St	Land cover change
	92.90.+x	Other topics in hydrospheric and atmospheric geophysics
	93.	Geophysical observations, instrumentation, and techniques
	93.30.-w	Information related to geographical regions
	93.30.Bz	Africa
	93.30.Ca	Antarctica
	93.30.Db	Asia
	93.30.Fd	Australia
	93.30.Ge	Europe
	93.30.Hf	North America
	93.30.Jg	South America
	93.30.Kh	Large islands (e.g., Greenland)
	93.30.Li	Arctic Ocean
	93.30.Mj	Atlantic Ocean
	93.30.Nk	Indian Ocean
	93.30.Pm	Pacific Ocean
	93.30.Qn	Southern Ocean
	93.30.Rp	Regional seas
	93.30.Sq	Polar regions
	93.30.Tr	Temperate regions
	93.30.Vs	Tropical regions
	93.55.+z	International organizations, national and international programs
	93.85.-q	Instruments and techniques for geophysical research: Exploration geophysics
	93.85.Bc	Computational methods and data processing, data acquisition and storage
	93.85.De	Exploration of continental structures
	93.85.Fg	Downhole methods
	93.85.Hj	Gravity methods
	93.85.Jk	Magnetic and electrical methods
	93.85.Ly	Exploration of oceanic structures
	93.85.Np	Radioactivity methods
	93.85.Pq	Remote sensing in exploration geophysics
	93.85.Rt	Seismic methods
	93.85.Tf	Oil prospecting, pipelines, and conduits
	93.90.+y	Other topics in geophysical observations, instrumentation, and techniques
	94.	Physics of the ionosphere and magnetosphere
	94.05.-a	Space plasma physics
	94.05.Bf	Plasma interactions with dust and aerosols
	94.05.Dd	Radiation processes
	94.05.Fg	Solitons and solitary waves
	94.05.Hk	Spacecraft/atmosphere interactions
	94.05.Jq	Spacecraft sheaths, wakes, and charging
	94.05.Lk	Turbulence
	94.05.Pt	Wave/wave, wave/particle interactions
	94.05.Rx	Experimental techniques and laboratory studies
	94.05.Sd	Space weather
	94.20.-y	Physics of the ionosphere
	94.20.Ac	Auroral ionosphere
	94.20.Bb	Wave propagation
	94.20.Cf	Ionospheric modeling and forecasting
	94.20.D-	Ionospheric structure, composition
	94.20.de	D region
	94.20.dg	E region
	94.20.dj	F region
	94.20.dk	Polar cap ionosphere
	94.20.dl	Topside region

94.20.dm	Mid-latitude ionosphere
94.20.dt	Equatorial ionosphere
94.20.dv	Ion chemistry and composition; ionization mechanisms
94.20.Fg	Plasma temperature and density
94.20.Qq	Particle precipitation
94.20.Tt	Ionospheric soundings; active experiments
94.20.Vv	Ionospheric disturbances, irregularities, and storms
94.20.W-	Ionospheric dynamics and interactions
94.20.wc	Plasma motion; plasma convection; particle acceleration
94.20.wf	Plasma waves and instabilities
94.20.wg	Ionosphere/atmospheric interactions
94.20.wh	Ionosphere/magnetosphere interactions
94.20.wj	Wave/particle interactions
94.20.wl	Plasma interactions with dust and aerosols
94.20.wq	Solar radiation and cosmic ray effects
94.20.ws	Electromagnetic wave propagation
94.20.Xa	Meteor-trail physics
94.30.-d	Physics of the magnetosphere
94.30.Aa	Auroral phenomena in magnetosphere
94.30.Bg	Magnetospheric modeling and forecasting
94.30.C-	Magnetospheric configuration and dynamics
94.30.cb	Inner magnetosphere
94.30.cf	Outer magnetosphere
94.30.cg	Magnetospheric cusp
94.30.ch	Magnetopause
94.30.cj	Magnetosheath
94.30.cl	Magnetotail
94.30.cp	Magnetic reconnection
94.30.cq	MHD waves, plasma waves, and instabilities
94.30.cs	Plasma motion; plasma convection
94.30.ct	Plasma sheet
94.30.cv	Plasmasphere
94.30.cx	Polar cap phenomena
94.30.Hn	Energetic trapped particles
94.30.Kq	Electric fields, field-aligned currents and current systems, and ring currents
94.30.Lr	Magnetic storms, substorms
94.30.Ms	Magnetic pulsations
94.30.Ny	Energetic particle precipitation
94.30.Tz	Electromagnetic wave propagation
94.30.Va	Magnetosphere interactions
94.30.Xy	Radiation belts
94.80.+g	Instrumentation for space plasma physics, ionosphere, and magnetosphere
94.90.+m	Other topics in space plasma physics, physics of the ionosphere and magnetosphere
95.	Fundamental astronomy and astrophysics; instrumentation, techniques, and astronomical observations
95.10.-a	Fundamental astronomy
95.10.Ce	Celestial mechanics (including n-body problems)
95.10.Eg	Orbit determination and improvement
95.10.Fh	Chaotic dynamics
95.10.Gi	Eclipses, transits, and occultations
95.10.Jk	Astrometry and reference systems
95.10.Km	Ephemerides, almanacs, and calendars
95.30.-k	Fundamental aspects of astrophysics
95.30.Cq	Elementary particle processes
95.30.Dr	Atomic processes and interactions
95.30.Ft	Molecular and chemical processes and interactions
95.30.Gv	Radiation mechanisms; polarization
95.30.Jx	Radiative transfer; scattering
95.30.Ky	Atomic and molecular data, spectra, and spectral parameters
95.30.Lz	Hydrodynamics
95.30.Qd	Magnetohydrodynamics and plasmas
95.30.Sf	Relativity and gravitation
95.30.Tg	Thermodynamic processes, conduction, convection, equations of state
95.30.Wi	Dust processes (condensation, evaporation, sputtering, mantle growth, etc.)

95.35.+d	Dark matter (stellar, interstellar, galactic, andcosmological)
95.36.+x	Dark energy
95.40.+s	Artificial Earth satellites
95.45.+i	Observatories and site testing
95.55.-n	Astronomical and space-research instrumentation
95.55.Aq	Charge-coupled devices, image detectors, and IR detector arrays
95.55.Br	Astrometric and interferometric instruments
95.55.Cs	Ground-based ultraviolet, optical and infrared telescopes
95.55.Ev	Solar instruments
95.55.Fw	Space-based ultraviolet, optical, and infrared telescopes
95.55.Jz	Radio telescopes and instrumentation; heterodyne receivers
95.55.Ka	X- and ?-ray telescopes and instrumentation
95.55.Pe	Lunar, planetary, and deep-space probes
95.55.Qf	Photometric, polarimetric, and spectroscopic instrumentation
95.55.Rg	Photoconductors and bolometers
95.55.Sh	Auxiliary and recording instruments; clocks and frequency standards
95.55.Vj	Neutrino, muon, pion, and other elementary particle detectors; cosmic ray detectors
95.55.Ym	Gravitational radiation detectors; mass spectrometers; and other instrumentation and techniques
95.75.-z	Observation and data reduction techniques; computer modelling and simulation
95.75.De	Photography and photometry (including microlensingtechniques)
95.75.Fg	Spectroscopy and spectrophotometry
95.75.Hi	Polarimetry
95.75.Kk	Interferometry
95.75.Mn	Image processing (including source extraction)
95.75.Pq	Mathematical procedures and computer techniques
95.75.Qr	Adaptive and segmented optics
95.75.Rs	Remote observing techniques
95.75.Tv	Digitization techniques
95.75.Wx	Time series analysis, time variability
95.80.+p	Astronomical catalogs, atlases, sky surveys, databases, retrieval systems, archives, etc.
95.85.-e	Astronomical observations
95.85.Bh	Radio, microwave (>1 mm)
95.85.Fm	Submillimeter (300 ?m-1 mm)
95.85.Gn	Far infrared (10-300 ?m)
95.85.Hp	Infrared (3-10 ?m)
95.85.Jq	Near infrared (0.75-3 ?m)
95.85.Kr	Visible (390-750 nm)
95.85.Ls	Near ultraviolet (300-390 nm)
95.85.Mt	Ultraviolet (10-300 nm)
95.85.Nv	X-ray
95.85.Pw	Gamma-ray
95.85.Ry	Neutrino, muon, pion, and other elementary particles; cosmic rays
95.85.Sz	Gravitational radiation, magnetic fields, and other observations
95.90.+v	Historical astronomy and archaeoastronomy; and other topics in fundamental astronomy and astrophysics
96.	Solar system; planetology
96.10.+i	General; solar nebula; cosmogony
96.12.-a	Planetology of solid surface planets
96.12.Bc	Origin and evolution
96.12.De	Orbital and rotational dynamics
96.12.Fe	Gravitational fields
96.12.Hg	Magnetic field and magnetism
96.12.Jt	Atmospheres
96.12.Kz	Surfaces
96.12.Ma	Composition
96.12.Pc	Interiors
96.12.Qr	Polar regions
96.12.St	Heat flow
96.12.Uv	Rings and dust
96.12.Wx	Interactions with particles and fields
96.12.Xy	Tectonics, volcanism
96.15.-g	Planetology of fluid planets
96.15.De	Orbital and rotational dynamics

	96.15.Ef	Gravitational fields
	96.15.Gh	Magnetic field and magnetism
	96.15.Hy	Atmospheres
	96.15.Kc	Composition
	96.15.Lb	Surfaces
	96.15.Nd	Interiors
	96.15.Pf	Physical properties of materials
	96.15.Qr	Impact phenomena
	96.15.St	Tori and exospheres
	96.15.Uv	Rings and dust
	96.15.Vx	Interactions with particles and fields
	96.15.Wx	Tidal forces
	96.15.Xy	Polar regions
	96.20.-n	Moon
	96.20.Br	Origin and evolution
	96.20.Dt	Features, landmarks, mineralogy, and petrology
	96.20.Jz	Gravitational field, selenodesy, and magnetic fields
	96.20.Ka	Impacts, cratering
	96.25.-f	Planetology of comets and small bodies
	96.25.Bd	Origin and evolution
	96.25.De	Orbital and rotational dynamics
	96.25.Fx	Atmospheres
	96.25.Hs	Composition
	96.25.Jz	Ionospheres
	96.25.Ln	Magnetic fields and magnetism
	96.25.Nc	Gravitational fields
	96.25.Pq	Impact phenomena
	96.25.Qr	Interactions with solar wind plasma and fields
	96.25.St	Plasma and MHD instabilities
	96.25.Tg	Radiation and spectra
	96.25.Vt	Satellites
	96.25.Xz	Volcanism
	96.30.-t	Solar system objects
	96.30.Bc	Comparative planetology
	96.30.Cw	Comets
	96.30.Dz	Mercury
	96.30.Ea	Venus
	96.30.Gc	Mars
	96.30.Hf	Martian satellites
	96.30.Iz	Dwarf Planets
	96.30.Ja	Dwarf planet satellites
	96.30.Kf	Jupiter
	96.30.L-	Jovian satellites
	96.30.Ib	Io
	96.30.Id	Europa
	96.30.If	Ganymede
	96.30.Ih	Callisto
	96.30.Mh	Saturn
	96.30.N-	Saturnian satellites
	96.30.nd	Titan
	96.30.Pj	Uranus
	96.30.Qk	Uranian satellites
	96.30.Rm	Neptune
	96.30.Sn	Pluto
	96.30.Td	Neptunian satellites
	96.30.Up	Plutonian satellites
	96.30.Vb	Dust, extraterrestrial materials
	96.30.Wr	Planetary rings
	96.30.Xa	Kuiper belt, trans-Neptunian objects
	96.30.Ys	Asteroids, meteoroids
	96.30.Za	Meteors, meteorites and tektites
	96.50.Bh	Interplanetary magnetic fields
	96.50.Ci	Solar wind plasma; sources of solar wind
	96.50.Dj	Interplanetary dust and gas
	96.50.Ek	Heliopause and solar wind termination
	96.50.Fm	Planetary bow shocks; interplanetary shocks

96.50.Hp	Oort cloud
96.50.Pw	Particle acceleration
96.50.Qx	Corotating streams
96.50.Ry	Discontinuities
96.50.S-	Cosmic rays
96.50.sb	Composition, energy spectra and interactions
96.50.sd	Extensive air showers
96.50.sf	Interactions with terrestrial matter
96.50.sh	Interplanetary propagation and effects
96.50.Tf	MHD waves; plasma waves, turbulence
96.50.Uv	Ejecta, driver gases, and magnetic clouds
96.50.Vg	Energetic particles
96.50.Wx	Solar cycle variations
96.50.Xy	Heliosphereinterstellar medium interactions
96.50.Ya	Pickup ions
96.50.Zc	Neutral particles
96.55.+z	Astrobiology and astrochemistry of the Solar system and interplanetary space
96.60.-j	Solar physics
96.60.Bn	Diameter, rotation, and mass
96.60.Fs	Composition
96.60.Hv	Electric and magnetic fields, solar magnetism
96.60.Iv	Magnetic reconnection
96.60.Jw	Solar interior
96.60.Ly	Helioseismology, pulsations, and shock waves
96.60.Mz	Photosphere
96.60.Na	Chromosphere
96.60.P-	Corona
96.60.pc	Coronal holes
96.60.pf	Coronal loops, streamers
96.60.ph	Coronal mass ejection
96.60.Q-	Solar activity
96.60.qd	Sun spots, solar cycles
96.60.qe	Flares
96.60.qf	Prominence eruptions
96.60.Tf	Solar electromagnetic emission
96.60.Ub	Solar irradiance
96.60.Vg	Particle emission, solar wind
96.60.Xy	Transition region
96.90.+c	Other topics on the Solar system and planetology
97.	Stars
97.10.-q	Stellar characteristics and properties
97.10.Bt	Star formation
97.10.Cv	Stellar structure, interiors, evolution, nucleosynthesis, ages
97.10.Ex	Stellar atmospheres (photospheres, chromospheres,coronae, magnetospheres); radiative transfer
97.10.Fy	Circumstellar shells, clouds, and expanding envelopes; circumstellar masers
97.10.Gz	Accretion and accretion disks
97.10.Jb	Stellar activity
97.10.Kc	Stellar rotation
97.10.Ld	Magnetic and electric fields; polarization of starlight
97.10.Me	Mass loss and stellar winds
97.10.Nf	Masses
97.10.Pg	Radii
97.10.Qh	Surface features (including starspots)
97.10.Ri	Luminosities; magnitudes; effective temperatures,colors, and spectral classification
97.10.Sj	Pulsations, oscillations, and stellar seismology
97.10.Tk	Abundances, chemical composition
97.10.Vm	Distances, parallaxes
97.10.Wn	Proper motions and radial velocities (line-of-sight velocities); space motions
97.10.Xq	Luminosity and mass functions
97.10.Yp	Star counts, distribution, and statistics
97.10.Zr	Hertzsprung-Russell, color-magnitude, and color-color diagrams
97.20.-w	Normal stars (by class): general or individual
97.20.Ec	Main-sequence: early-type stars (O and B)

97.20.Ge	Main-sequence: intermediate-type stars (A and F)
97.20.Jg	Main-sequence: late-type stars (G, K, and M)
97.20.Li	Giant and subgiant stars
97.20.Pm	Supergiant stars
97.20.Rp	Faint blue stars (including blue stragglers), white dwarfs, degenerate stars, nuclei of planetary nebulae
97.20.Tr	Population II stars (horizontal branch, metal poor, etc.)
97.20.Vs	Low luminosity stars, subdwarfs, and brown dwarfs
97.20.Wt	Population III stars
97.21.+a	Pre-main sequence objects, young stellar objects (YSO's) and protostars
97.30.-b	Variable and peculiar stars (including novae)
97.30.Dg	Low-amplitude blue variables (alpha Cygni,beta Cephei, delta Scuti, delta Delphini, delta Canis Majoris, SX Phoenicius)
97.30.Eh	Emission-line stars (Of, Be, Luminous Blue Variables, Wolf-Rayet, etc.)
97.30.Fi	Chemically peculiar stars (Ap, Am, etc.)
97.30.Gj	Cepheids (delta Cephei, W Virginis)
97.30.Hk	Carbon stars, S stars, and related types (C, S, R,and N)
97.30.Jm	Long-period variables (Miras) and semiregulars
97.30.Kn	RR Lyrae stars; RV Tauri and PV Telescopii variables
97.30.Nr	Flare stars (UV Ceti, RS Canum Venaticorum, FU Orionis, R Coronae Borealis variables, etc.)
97.30.Qt	Novae, dwarf novae, recurrent novae, and other cataclysmic (eruptive) variables
97.30.Sw	Unusual and peculiar variables
97.60.-s	Late stages of stellar evolution (including blackholes)
97.60.Bw	Supernovae
97.60.Gb	Pulsars
97.60.Jd	Neutron stars
97.60.Lf	Black holes
97.80.-d	Binary and multiple stars
97.80.Af	Astrometric and interferometric binaries
97.80.Di	Visual binaries
97.80.Fk	Spectroscopic binaries; close binaries
97.80.Gm	Cataclysmic binaries (novae, dwarf novae, recurrent novae, and nova-like objects); symbiotic stars
97.80.Hn	Eclipsing binaries
97.80.Jp	X-ray binaries
97.80.Kq	Multiple stars
97.82.-j	Extrasolar planetary systems
97.82.Cp	Photometric and spectroscopic detection; coronographic detection; interferometric detection
97.82.Fs	Substellar companions; planets
97.82.Jw	Infrared excess; debris disks; protoplanetary disks; exo-zodiacal dust
97.90.+j	Other topics on stars
98.	Stellar systems; interstellar medium; galactic and extragalactic objects and systems; the Universe
98.10.+z	Stellar dynamics and kinematics
98.20.-d	Stellar clusters and associations
98.20.Af	Associations of stars (OB, T, R) in the Milky Way
98.20.Bg	Associations of stars (OB, T, R) in external galaxies
98.20.Di	Open clusters in the Milky Way
98.20.Fk	Open clusters in external galaxies
98.20.Gm	Globular clusters in the Milky Way
98.20.Jp	Globular clusters in external galaxies
98.35.-a	Characteristics and properties of the Milky Way galaxy
98.35.Ac	Origin, formation, evolution, age, and star formation
98.35.Bd	Chemical composition and chemical evolution
98.35.Ce	Mass and mass distribution
98.35.Df	Kinematics, dynamics, and rotation
98.35.Eg	Electric and magnetic fields
98.35.Gi	Galactic halo
98.35.Hj	Spiral arms and galactic disk
98.35.Jk	Galactic center, bar, circumnuclear matter, and bulge (including black hole and distance measurements)
98.35.Ln	Stellar content and populations; morphology and overall structure
98.35.Mp	Infall and accretion
98.35.Nq	Galactic winds and fountains

98.35.Pr	Solar neighborhood
98.38.-j	Interstellar medium (ISM) and nebulae in Milky Way
98.38.Am	Physical properties (abundances, electron density,magnetic fields, scintillation, scattering, kinematics, etc.)
98.38.Bn	Atomic, molecular, chemical, and grain processes
98.38.Cp	Interstellar dust grains; diffuse emission; infrared cirrus
98.38.Dq	Molecular clouds, H_2 clouds, dense clouds, and dark clouds
98.38.Er	Interstellar masers
98.38.Fs	Jets, outflows, and bipolar flows
98.38.Gt	H I regions and 21-cm lines; diffuse, translucent,and high-velocity clouds
98.38.Hv	H II regions; emission and reflection nebulae
98.38.Jw	Infrared emission
98.38.Kx	Intercloud medium (ICM); hot and highly ionized gas; bubbles
98.38.Ly	Planetary nebulae
98.38.Mz	Supernova remnants
98.52.-b	Normal galaxies; extragalactic objects and systems(by type)
98.52.Cf	Classification and classification systems
98.52.Eh	Elliptical galaxies
98.52.Lp	Lenticular (S0) galaxies
98.52.Nr	Spiral galaxies
98.52.Sw	Irregular and morphologically peculiar galaxies
98.52.Wz	Dwarf galaxies (elliptical, irregular, and spheroidal)
98.54.-h	Quasars; active or peculiar galaxies, objects, andsystems
98.54.Aj	Quasars
98.54.Cm	Active and peculiar galaxies and related systems
98.54.Ep	Starburst galaxies and infrared excess galaxies
98.54.Gr	Radio galaxies
98.54.Kt	Protogalaxies; primordial galaxies
98.56.-p	Local group; Magellanic Clouds
98.56.Ew	Elliptical galaxies
98.56.Ne	Spiral galaxies (M31 and M33)
98.56.Si	Magellanic Clouds and other irregular galaxies
98.56.Tj	Magellanic stream
98.56.Wm	Dwarf galaxies (elliptical, irregular, and spheroidal)
98.58.-w	Interstellar medium (ISM) and nebulae in externalgalaxies
98.58.Ay	Physical properties (abundances, electron density,magnetic fields, scintillation, scattering, kinematics, turbulence)
98.58.Bz	Atomic, molecular, chemical, and grain processes
98.58.Ca	Interstellar dust grains; diffuse emission; infrared cirrus
98.58.Db	Molecular clouds, H_2 clouds, dense clouds, and dark clouds
98.58.Ec	Interstellar masers
98.58.Fd	Jets, outflows and bipolar flows
98.58.Ge	H I regions and 21-cm lines; diffuse, translucent,and high-velocity clouds
98.58.Hf	H II regions; emission and reflection nebulae
98.58.Jg	Infrared emission
98.58.Kh	Intercloud medium (ICM); hot and highly ionized gas; bubbles
98.58.Li	Planetary nebulae
98.58.Mj	Supernova remnants
98.58.Nk	Tidal tails; H I shells
98.62.-g	Characteristics and properties of external galaxies and extragalactic objects
98.62.Ai	Origin, formation, evolution, age, and star formation
98.62.Bj	Chemical composition and chemical evolution
98.62.Ck	Masses and mass distribution
98.62.Dm	Kinematics, dynamics, and rotation
98.62.En	Electric and magnetic fields
98.62.Gq	Galactic halos
98.62.Hr	Spiral arms and bars; galactic disks
98.62.Js	Galactic nuclei (including black holes), circumnuclear matter, and bulges
98.62.Lv	Stellar content and populations; radii; morphologyand overall structure
98.62.Mw	Infall, accretion, and accretion disks
98.62.Nx	Jets and bursts; galactic winds and fountains
98.62.Py	Distances, redshifts, radial velocities; spatial distribution of galaxies
98.62.Qz	Magnitudes and colors; luminosities
98.62.Ra	Intergalactic matter; quasar absorption and emission-line systems; Lyman forest
98.62.Sb	Gravitational lenses and luminous arcs
98.62.Tc	Astrometry; identification

98.62.Ve	Statistical and correlative studies of properties(luminosity and mass functions; mass-to-light ratio; etc.)
98.65.-r	Galaxy groups, clusters, and superclusters; largescale structure of the Universe
98.65.At	Interacting galaxies; galaxy pairs, and triples
98.65.Bv	Small and compact galaxy groups
98.65.Cw	Galaxy clusters
98.65.Dx	Superclusters; large-scale structure of the Universe (including voids, pancakes, great wall, etc.)
98.65.Fz	Galaxy mergers, collisions, and tidal interactions
98.65.Hb	Intracluster matter; cooling flows
98.70.-f	Unidentified sources of radiation outside the Solar System
98.70.Dk	Radio sources
98.70.Lt	IR sources
98.70.Qy	X-ray sources; X-ray bursts
98.70.Rz	Gamma-ray sources; Gamma-ray bursts
98.70.Sa	Cosmic rays (including sources, origin, acceleration, and interactions)
98.70.Vc	Background radiations
98.80.-k	Cosmology
98.80.Bp	Origin and formation of the Universe
98.80.Cq	Particle-theory and field-theory models of the early Universe
98.80.Es	Observational cosmology (including Hubble constant, distance scale, cosmological constant, early Universe, etc)
98.80.Ft	Origin, formation, and abundances of the elements
98.80.Jk	Mathematical and relativistic aspects of cosmology
98.80.Qc	Quantum cosmology
98.90.+s	Other topics on stellar systems; interstellar medium; galactic and extragalactic objects and systems; the Universe