Science in general

AY1 Science & technology (in general)
* The connections of science with technology as a whole are very close, both conceptually and bibliographically. In some contexts (eg their history) the two subjects are so inextricably bound up at the general level that it is doubtfully helpful to maintain two separate classes. So this class (AY1) should take only those works which deliberately distinguish science and technology together from science alone or technology alone. When in doubt, prefer AY2/AYY.
* Works which deal with technology alone go in class U/V.
* Add to AY1 numbers and letters 2/9,A/V following AY so far as applicable; eg

29A . Social aspects of science & technology
29T Q . . Economic organization & management of science & technology
* In society in general, at national or international level.

29U . . . Standards & standardization
* Agreement on and enforcement of standards by the scientific and technological communities.
* In cases of doubr, prefer Technology U29 U.
* For the operation of evaluation in arriving at standards, see AY7 E.

29U 295 D . . . . International standards organizations
29U 295 E . . . . National standards organizations
29U 29T Q . . . . Organization & management
* Of institutions concerned with standards.

29U B . . . . . Standardization
* Process of agreeing on standards.

3AF . Research & development in science & technology
* See also R & D in science AY8 6M

Science & technology AY1
. Research & development in science & technology AY1 3AF

AY2 Science in general
* Science in its broadest sense, including the 'formal sciences' of logic and mathematics as well as empirical sciences (natural and social) and those applications often described as 'sciences' (eg medical sciences, engineering sciences, information sciences). It excludes only the Humanities (philosophy, history, religion, arts, philology).
* For general works on Science of science (formal science, abstract science, scientia narrowly), see AK.
* For works on a particular science, see the appropriate class (eg B Physics, HM Medical science).

. Common subdivisions
* Add to AY2 numbers 2/9 in Auxiliary Schedule 1, with the modifications and additions indicated.

. . *Forms of presentation*
. . . *Physical forms*
2H . . . . Graphic materials
2U . . . . . Graphs
3A . . . Dictionaries & encyclopedias
3G . . . Serials
3MC . . . Aids to study
3NK . . . Tables (general)
3NL . . . . Tables of constants
* For constants as a subject, see AY7 6C.

3NP . . . . Conversion tables
3P . . . . Technical data
4 . . Persons in science, scientists
* In the community, in society; including works on scientists & technologists together. For organization of personnel in technical operations, see Management of scientific work AY2 YQ.
* See also Biography of scientists AY2 92; Social aspects of science AY2 9A.

4C . . . Profession
* Collective body of persons in the subject.

4CD . . . . Status of scientists
. . . *Types of persons in the subject*
* For technologists, see U24.
* Add to AY2 4 letters L/R following K in KL/KR; eg

. . . . *By sex*
4NW . . . . . Women scientists
4PD . . . . *By ethnic group*
. . . . *By occupational characteristics*
4TQ . . . . . Amateurs in science
4UM . . . . . Technicians in science, auxiliaries in science
4UN . . . . . Scientific consultants
5 . . Organizations in science
5C . . . Conferences, meetings
5D . . . International bodies, intergovernmental bodies
. . . . *By name*
* Arrange A/Z; eg Unesco AY2 5DU.

Communication & information in science

Science in general AY2
Common subdivisions
Organizations in science AY2 5
. International bodies AY2 5D
. . By name

AY2 5E . National bodies
. . *By country*
* Add to AY2 5F letters D/Z from Schedule 2.
5J . . Government bodies
* For official bodies. For inter-governmental bodies, see AY2 5D.
5JQ . Learned societies
5L Communication & information in science
* Add to AY2 5L letters F/PS following KE so far as applicable (with the slight amendments indicated).
5LG L . Diffusion of scientific information
5LI . Audience (scientific communication)
5LK . Semiology in science, signs & symbols in science
* See also Constants & units (measurement) AY7 6C
5LK O . . Codes, notations
* For metric system, see Metrology AY7 7E.
5LO . . Language of science, terminology, nomenclature
* Add details from Language & linguistics XA so far as applicable; notation is provisional.
5LO T . . . Scientific terms, technical terms
5LO V . . . Abbreviations
5LP . Media (scientific communication)
5LP Q . . Mass media (scientific communication)
5LP W . . Meetings (scientific communication)
5MB . Science writing, scientific authorship
* For creativity, see AY2 9XB.
5MC . . Publishing scientific writings
5ME . . Translation (science writing)
5MG . . Reporting scientific work
5MH . . . Scientific papers
5MJ . . . Scientific journals
* Treated as a subject. For the journals themselves, see AY2 3G.
5MK . . . Science books
5MN . . . Correspondence in science
5MP . . The Press (scientific communication)
5MR . Pictorial matter (scientific communication), graphic material (scientific communication)
5MS . . Illustration in science
5MT . . Cartoons in science
5MV . Telecommunications (scientific information)
* For electronic information systems, see AY2 5VB.
5NR . . Broadcasting (scientific communication)
* Add to AY2 5N letters R/Y following KE; eg
5NR V . . . Radio (scientific communication)
5NS . . . Television (scientific communication)
. *Other elements in scientific communication*
5NW Y . . Popularization in scientific communication
5NX H . . Publicity
5NX KJ . . Public image of science

Science in general AY2
Common subdivisions
Communication & information in science AY2 5L
. Other elements in scientific communication
. . Public image of science AY2 5NX KJ

AY2 5P . Information science in science, documentation in science
* Details are taken from Classes 3/9 (not yet published). Notation is provisional.
5PP . . Data processing
5Q . . . Computers in science
. . *Operations on information records*
5R . . . Information handling & processing
* Selecting, storing, indexing, retrieval.
5S . . . . Bibliography
. . *Types of records*
* Add to AY2 5T letters E/X following 2 in Auxiliary Schedule 1.
* Add to AY2 5U numbers & letters 3/9,A/X following 3 in Auxiliary Schedule 1.
5VA . . Information services, information collections
5VB . . . Computerized information services
5VD . . . . International information services
5VE . . . . National information services
5VF . . . . Regional information services
5VG . . . . Local information services
5VJ . . . . Publicly-owned information services
5VM . . . . Academic information services
5VP . . . . Private information services, profit-making information services
5VS . . . . Special information services
* Restricted as to subject. General works only; services for a specific subject go with the subject.
5W . . . Libraries
* Add to AY2 5W letters D/S following AY2 5V; eg National science libraries AY2 5WE.
6A Education of scientists, study & teaching of science
* Alternative (not recommended) is to locate in Class J Education.
* Add to AY2 6A numbers & letters 2/9, A/Z following J.
6AJ LO . Laboratory demonstrations (science education)
6C Research
* By definition, all activity in a pure science is implicitly research, or investigation with a large research element. Theory is closely allied to practical and experimental work and the two activities have been integrated at AY3/AY8 below.
* This general class for research is retained here primarily to allow qualification, if necessary, of classes preceding AY3 in filing order.
* For scientific methodology broadly, see Science as a discipline AY2 9X; for the operations involved in practical research, see AY36/AY7.

History of science

Science in general AY2
Common subdivisions
. Research AY2 6C

AY2 6QT . Exhibitions, museums
* See also Physical models AY7 FYS
6R . . *Science museums by place*
* For special types of collections (eg of minerals) see subject concerned.
* Add to AK6 R letters C/Z from Schedule 2.
6SV . Curiosities in science, mysteries in science
6SW . . Natural wonders of the world
* Works restricted to the earth sciences go in D.
6SX . Frauds, deceptions, hoaxes
6SY . Scientific recreations, popular science
6Y History & philosophy of science
7 . History of science
* Including works which consider technology as well but only insofar as it is contributory to, or inseparable from science. For history of technology alone, see U27.
* See also scientific revolutions AY2 9XQ
77 . . Historiography of science
* History of writings & studies in history of science.
* Notation provisonal; this class is taken from L History (not yet published 1998).
. . . *History of science as a discipline*
78 . . . . Sources and methodology
* As a subject itself. Early scientific works (up to 1800) are classed under the period in which they were contemporary. If limited to a specific subject, they go under the history of that subject.
79 . . Ancilliary studies in history of science
. . *By period and place*
* The universality of science is such that period is much more significant characteristic than place. So the preferred arrangemnt here is to cite period before place.
* Citing period first raises serious problems in that the literature can (and does) select any of an infinite number of different periods within which it considers the history of science.
* The solution below attempts an arrangement of optimum usefulness and clarity by following the citation order: Broad period- -Place- -Specific period. The broad periods are enumerated; the places follow Auxiliary Schedule 2; the specific periods may be taken from one of the three options in Auxiliary Schedule 4 (but 4A is the recommended one).
* In addition to the above basic provision, it may be noted that any broad period, or any place, or any broad period qualified by place, may be further divided using 7 to introduce specific periods or 8 to introduce specific places. Examples (using Auxiliary 4A Periods) are AY2 8C7 EPN Ancient science 600/300 BC; AY2 8CR 7EP N Ancient Greek science 500/000 BC: AY2 8J7 KKV 17th century science, 1640/1680; AY2 8J8 E7K KV Science in Britain 1640/1680.

Science in general AY2
History & philosophy of science AY2 6Y
History of science AY2 7
By period and place

* An alternative (not recommended) is provided at AY2 7B, allowing period to be cited after place at AY2 7D.
AY2 7A . Early works (on history of science)
* For works published before 1800 AD.
7B . *By period*
* Alternative (not recommended) for libraries citing place before period (see note above). If this option is taken, proceed as follows:
* Add to AY2 7B letters from Auxiliary Schedule 4B (for Time); eg 18th century AY2 7BK.
* These periods may then be used to qualify the places in AY2 7C; eg French science in the 18th century AY2 7F7 BK.
7C . *By place*
* For general works on history of science in a given place. If confined to a particular period, cite period first (from AY2 8 onwards).
* Add to AY2 7 letters C/Z from Schedule 2.
. *By period*
8A . . *Periods from the earliest times*
* Add to AY2 8A letters D/Y following AB in Auxiliary Schedule 4B; eg
8AR . . . Prehistory science, primitive science, early science
* For works on science in contemporary non-literate societies in general, see AY2 9KS LM. Individual non-literate societies go with the nation state in which they live.
8AY . . . . Neolithic science
8B . . . Ancient & medieval science (together)
* Do not divide by specific period.
8B8 . . . . *By place*
8C . . . Ancient science (general)
8C7 . . . . *Specific periods of ancient science*
* Add to AY2 8C7 letters DF/EU from Auxiliary Schedule 4A; eg AY2 8C7 EPN is Ancient science in 600/300 BC.
. . . . *By place*
* Add to AY2 8C letters C/Y following C in Schedule 2 (for places in the ancient world); eg
8CD . . . . . Mesopotamia (Ancient world), Fertile Crescent
8CD C . . . . . Babylonian science
8CL N . . . . . Asia (ancient science)
8CL X . . . . . Americas (ancient science)
8CL ZA . . . . . Mayan science
8CM . . . . . Africa (ancient science)
8CN . . . . . Egypt (ancient science)
8CQ . . . . . Europe (ancient science)
8CQ Y . . . . . Classical antiquity (ancient science)
8CR . . . . . Greece (ancient science)
8CY S . . . . . Sicily (ancient science)

History & philosophy of science

Science in general AY2
History & philosophy of science AY2 6Y
History of science AY2 7
. . . Periods from the earliest times AY2 8A
. . . . . Sicily AY2 8CY S

AY2 8D . . . Medieval and modern science (together)
* Do not divide by specific period; for this, see the individual broad periods Medieval, Renaissance, 17th century, etc.

8D8 . . . . *By place*

8E . . . . Medieval & Renaissance science (together)
* Do not divide by specific period; see the broad periods Medieval and Renaissance.

8E8 . . . . . *By place*

8F . . . . . Medieval science (say 500/1350 AD)

8F7 . . . . . *Specific periods in medieval science*
* Add to AY2 8F7 letter F in Auxiliary Schedule 4A.

8F8 . . . . . *By place*

8G . . . . . Renaissance science (say 1350/1550)

. . . . . *Specific periods in renaissance science*
* Add to AY2 8G letters G/HM in Schedule 4A.

8G8 . . . . . *By place*

8H . . . . Modern science (1550 to date)
* Do not divide by specific period. Use the individual centuries (17th onwards) for this, adding to each the relevant block of letters for starting dates (to each of which may be added the letter for the duration of the period); eg AY2 8LP FW History of science 1820/1850.

8H8 . . . . . *By place*

8J . . . . . 17th century

8K . . . . . 18th century

8L . . . . . 19th century

8N . . . . . 20th century

8P . . . . . 21st century

8V . . . . Scientific trends, futurology in science
* Speculations on future history of science.
* For scientific forecasting, see AY2 9EF.

92 Biography of scientists

93 . Collective biography

94 . Individuals
* Arrange A/Z.

96C Scientific progress

96D . Discovery & invention in science
* When treated as a result of science. If in doubt, prefer Technology U.
* For invention, patents, etc., see Technology U26 QH.

96E . . Discovery in science
* The finding of something existing in nature but not hitherto known.
* For scientific explanation, see AY2 9XL.

9A Philosophy of science
* Alternative (not recommended) for libraries wishing to keep together the history and philosophy of science and to subordinate to it the history and philosophy of the individual sciences. If this option is taken, proceed as follows:

Science in general AY2
History & philosophy of science AY2 6Y
. Philosophy of science AY2 9A

* Add to AY2 9 letters A/L following A (for the philosophy of science);
* Add to AY2 letters A/K from the main classification (for the history & philosophy of the individual sciences);
* Add to AYL letters A/X following AY2 in the preferred order below (for social aspects of science); eg Causation in science AY2 9GQ D; AYL EP Science policy.

AY2 9E Social aspects of science, science and society
* In much of this literature, science and technology are inextricably bound up. So all classes below are assumed to include technology whenever this is considered along with science; eg AY2 9EP includes works on science & technology policy together.
* Add to AY2 9 letters E/J following K9.
* Add to AY2 9K numbers & letters 9Q,A/Y following K at K9Q/KY.
* A selection of concepts is given here for convenience.

9EF . Forecasting

9EP . Science policy
* See also Economics of science AY2 9T

. . Organizations

9EP 5 . . . Policy making bodies

9EP 5J . . . . Government

9G . . Planning and development in science
* See also Research & development in science & technology AY1 3AF

9KA . . Social system of science, science system
* Science as a subsystem of society as a whole.

9KB V . . . Scientific culture

9KC . . . Social processes in science

9KC E . . . . Science input to society
* Science as agent of change, etc.

9KF D . . . Attitudes to science
* See also Antiscience AY2 9KI G

9KH K . . . Rewards in science

9KH KM . . . . Scientific awards and medals

. Hostility

9KI G . . Antiscience

. Communities

9KL K . . Scientific community

9KL KFB . . . Institutionalization of science

. . . . Informal structures

9KL KPM . . . . . Invisible colleges
* For specific formal organizations in science, see Organizations AY2 5.

9KS LM . . Non-literate societies

9KW . Custom, folklore & mythology

Science as a discipline

Science in general AY2
Social aspects of science AY2 9E
. Custom, folklore & mythology AY2 9KW

AY2 9L . *Other aspects of society*
* Add to AY2 9 letters L/Y from the main classification; eg

9P . . Religion in science
* Religious beliefs & loyalties in scientific work. For impact of science on religion, see Class P.

9PY . . Morality in science, ethics in science
* See also Philosophy of science AY2 A

9PY MJ . . . Values in science

9PY NH . . . Responisibilities of science

9R . . Politics & science

9RA OF . . . Internationalism in science

9S . . Law & science
* The law of special subjects is preferred in Class S. Locate here only those works dealing with legal aspects as they may impinge on scientific activity.

9SB LJ . . . Intellectual property in science

9SB M . . . . Patent law & science

9T . . Economics

9TC D . . . Growth & development

9TC DQ . . . . Science needs

9TC DR . . . . . Science priorities

9TC DS . . . . Science resources

9TP G . . . Modern economic systems & science

9TP H . . . . Less developed countries (science in), LDC science

9TP K . . . . Developing countries (science in)

9TQ . . . Economic organization & management of science
* In society in general, at national or international level; for the organization of scientific work per se (of research, experiments, etc.), see AY2 YQ
* For Standards & standardization, see AY1 29U.

9V . . Technology in science
* General works on role of technology in science. For specific applications of technology in science (e.g. instrumentation) see application. For role of science in technology, see Technology (Class U).

9VN . . . Environmental technology in science

9X Science as a discipline, scientific method
* General investigation of the aims, concepts and principles of reasoning in scientific enquiry and the relationships between its subdisciplines.
* For methodology in the narrower sense of the study of the methods or procedures in science, see AY3 2C. For theory as a particular component of this, see AY8 B.

. *Attributes of scientific enquiry*

9X5 . . Autonomy of science

9X6 . . Scientific constraints, limits of science

9X8 . . Scientific criteria

Science in general AY2
Science as a discipline AY2 9X
Attributes of scientific enquiry
. Scientific criteria AY2 9X8

AY2 9XA . Non-rational elements in scientific enquiry

9XB . . Imagination in science, creativity in science

9XC . . Intuition in science

9XE . . Aesthetics in science

9XG . Interdisciplinary relations between sciences

9XJ Objectives of science

9XL . Explanation in science

9XM . . Scientific theories, hypotheses, scientific models (general)
* As a subject of study. For theory as an investigative method in scientific research, see AY3 D.

9XP . . . Paradigms

9XQ . . . . Scientific revolutions

9XS . . Scientific laws, laws of nature

A Philosophy of science
* Add to AY2 letters A/L following A in AA/AK.

BA . *Viewpoints, doctrines*

CKQ . . Evolutionism in science

GG . Metaphysics

GQD . . Causation in scientific explanation

GR . Epistemology

GSV . . Scientism

HK . *Ethics*

L Logic in science
* See also scientific method AY3 3F

M Mathematics in science, mathematical methods in science
* General applications only. For applications of mathematics to specific topics in science, see the topic.
* For mathematical models as types of theory, see AY8 B2M.
* Add to AY2 letters M/X following A in AM/AX; eg

M8L . Functions, operators

M8N . . Named functions
* Arrange A/Z.

M9L . Equations

M9N . . Named equations
* For inequalities, use 2M9 O.
* Arrange A/Z.

P2 . Named mathematicians
* For systems, principles, laws, etc. referred to by the name and connoting concepts not easily defined by a more specific subject; eg BB2 P2H Hamiltonian system.

X Statistics in science

XG . Statistical probability

XHB B . . Expected values, errors

XS . Statistical analysis, data analysis (statistical)

Y *Relations to other sciences*
* Add to AY2 Y letters B/I in the main classification; eg relations to astronomy AY2 YDA

Operational research

Science in general AY2
Science as a discipline AY2 9X
. Relations to other sciences AY2 Y

Operations & agents
. *Preliminary operations*

AY2 YMH . . Preparing research proposals
YMJ . . Planning & design of research
YMP . . Disseminating & publishing research reports
* See AY2 5MB
YQ . Organization & management of scientific work
* One subject of some importance in science (operational research) is given below, together with some major classes from the detailed schedule at TQ which gives operational research its context.
* Add to AY2 Y letters Q/V following T.
YQJ . . Management services
YQK . . . Systemology, communication & control (general), systems analysis (management)
* Its application to scientific work; as an object of study itself, see AYD.
YQR . . . Management techniques, scientific management
YQS . . . . Operational research, operations research, OR
* Improvement of efficiency of management by techniques derived from numerical analysis, q.v. (AX7 6D). Aims to increase the results/effort ratio by increasing the first or decreasing the second without altering the other.
YQT B . . . . . Problem-solving techniques
YQT L . . . . . Mathematical & statistical techniques in OR
* Add to AY2 YQT letters M/X following A in AM/AX.
YQT M . . . . . Mathematical models in OR
YQU C . . . . . Decision theory
YQU D . . . . . Decision analysis
YQU E . . . . . Decision trees
YQU F . . . . . Branch & bound analysis
YQU H . . . . . Risk analysis
YQU K . . . . . Optimization
YQU L . . . . . Mathematical programming
YQU M . . . . . Linear programming
YQU N . . . . . Simplex method
YQU P . . . . . Transportation method
YQU PW . . . . . Assignment method
YQU Q . . . . . Non-linear programming, higher order programming
YQU QV . . . . . Quadratic programming
YQU QX . . . . . Convex programming
YQU S . . . . . Static programming
YQU T . . . . . Dynamic programming, control programming
* See also Inventory problems AY2 YQW S

Organization & management of scientific work AY2 YQ
Management services AY2 YQJ
. . Operational research AY2 YQS
. . . Problem-solving techniques AY2 YQT B
. . . . Optimization AY2 YQU K
. . . . . Dynamic programming AY2 YQU T

AY2 YQU V . . . . . Integer programming
YQV B . . . . Simulation (operational research)
YQV C . . . . . Computer simulation (operational research)
YQV F . . . . Heuristic programming
YQV J . . . . Network analysis, network planning, project planning
* See also Networks (systems theory) AYJ W
YQV K . . . . . Critical path scheduling, critical path analysis
* See also Branch & bound analysis AY2 YQU F
YQV M . . . . . Critical path method, CPM
YQV P . . . . . Programme evaluation & review technique, PERT, programme evaluation procedure, PEP
YQV Q . . . . . Line of balance networks
YQV R . . . . . Other scheduling methods
* Arrange A/Z; eg WASP.
. . . . *Other special procedures*
YQV T . . . . . Action research
. . . *Operational problems*
YQW D . . . . Deterministic problems
YQW F . . . . Probabilistic problems
YQW G . . . . . Stochastic problems, randomness
YQW J . . . . . Allocation of resources
YQW L . . . . . Sequencing problems, scheduling problems
YQW N . . . . . Routing problems
YQW NUN . . . . . Linear programming
YQW NUT . . . . . Dynamic programming
YQW Q . . . . . Queuing problems, waiting time problems
. . . . . Mathematics
YQW QTM . . . . . Queuing theory
YQW QXD . . . . . Delay problems
YQW S . . . . . Inventory problems
YQW V . . . . . Replacement problems
. . . . . Statistics
YQW VTX . . . . . Renewal theory
YQW X . . . . . Search problems
YQX B . . . . . Competitive problems
YQX BUC . . . . . Decision theory
YQX BVB . . . . . Simulation
YQX BVD . . . . . Operational gaming
YRE . . Organization & methods, O & M
YRF . . Work study
YRF H . . . Method study
YRK B Management functions
YRK N . Forecasting

Science in general AY2
Organization & management of scientific work AY2 YQ
. Management functions AY2 YRK B
. . Forecasting AY2 YRK N

AY2 YRK T . . Futurology
YRK W . . . Delphi techniques
YRY . Management resources
YSO . . Office & administrative services
YTS . . Funding scientific research
YU . . Personnel management
YVE . Production management
YVJ . . Equipment & materials (production management)
* For general works only, on management of equipment & materials. For specific equipment & materials as integral elements in practical scientific work, see AY3 B.
YVP . . Production planning & control
YVT . . . Quality control
* For Standards & standardization see AY1 29U.

AY3 2 Research operations (general)
* It is often not feasible to distinguish between 'pure' and applied research or between research per se and general scientific work. So for specific methods, techniques, types of equipment, etc. only one schedule is provided, covering both research narrowly and scientific investigative procedures in general. For the latter, see AY6; for technological research in general, see U3.
* Practical work, both in its operations and the equipment used, is essentially an agent of research (a form of investigation).
* Theory per se, regarded as the exposition of the principles of the subject concerned, is intimately linked with the phenomena and concepts investigated; physics is a particularly clear example of this. For this reason, the preferred arrangement is to file theory after practice (observing the retroactive principle) thereby collocating it with the concepts making up the subject proper.
* In some sciences, it may be thought that this relationship is less significant; so an alternative is provided at AY3 4 for libraries wishing to file theory before practice (reflecting the principle of increasing concreteness in filing order).

2B . Procedures & methods (research)
* For classification, see AY8 BT; for Scientism, see see AY2 GSV; for techniques narrowly, see AY6 2.

2C . . Methodology
* The study of research methods themselves, especially as to their logical bases. For methodology in the wider sense, defining the nature of science as a discipline, see AY2 9X.
* Those concepts in this class which are special to the social sciences are given in K6/K9.
* See also Philosophy of science AY2 A
* Add to AY3 2 letters D/G following K6; eg

2D . . . Qualitative methods (general)
2E . . . Quantitative methods (general)

Science in general AY2
Research operations AY3 2
. . Methodology AY3 2C
. . . Quantitative methods AY3 2E

AY3 2F . . . Non-empirical methods
2G . . . Empirical methods
* Usually assumed. For induction, see AY8 BL; for hypothesis testing, see AY8 CJ.
2L . . . Analytical methods
2N . . . Synthetic methods
2Q . . . Comparative investigations
2R . . . . Time comparison research
2S . . . . Longitudinal research
2T . . . . Secular studies, long-term studies
4 . . Scientific theory, theoretical models
* Alternative (not recommended) to locating at AY8 B; If this option is taken proceed as follows:
* Add to AY3 4 letters B/C following AY8; eg Hypotheses AY3 4C.
4D . . . Theories particular to a subject
* Alternative (not recommended) to locating after Practical scientific work, at AY8 D.
* For works under specific classes dealing with the theories per se.
5 . . Experimental research
* Alternative (not recommended) to locating at AY8 2.
* Add to AY3 5 letters A/Y following AY8 2; eg
5D . . . Design of experiments

6 Practical scientific work, practical investigatory procedures (general)
* The classes of procedures, techniques, equipment and instrumentation given below are usually considered in the context of experimentation. So the latter is included here, as being nearly synonymous with practical scientific work. Provision is made at AY8 2 for general works on experimental research should these distinguish it from practical science.
* This location provides for truly general works on these classes and for the qualification of all other types of scientific enquiry so far as applicable; eg Field studies - Equipment & materials AY7 YF3 B.
* Note that the building of classmarks for compound subjects will sometimes entail building forward (not retroactively, as is the general rule in BC2); eg Instruments - Calibration - Testing AY4 4BW 7A (when the general class Testing AY7 A files after the general class Instrument calibration AY4 4BW).
* Building forward by direct addition is not always feasible. If the classmark added to ends in a numeral (eg Instruments AY4) direct addition may produce an ambiguous classmark since numerals may be used for its own enumerated subclasses. In such cases (which are rare) building forward is still possible, but an intercalator must introduce it; in these cases, proceed as follows (where the hyphen represents the classmark added to):
* Add to -36 numbers 3/9 following AY.

Equipment & materials

Science in general AY2
Practical scientific work AY3 6

AY3 7 Unwanted effects, hazards, accidents, safety & hygiene precautions
* For Interference, see Instrumentation AY3 48K.
* Add to AY3 7 letters A/Y following HJ; eg
7DV . Reporting systems (hazards), warning systems
7DW . Control measures (hazards)
7ER . Protective measures, monitoring & protecting (hazards)
7ES . . Protective equipment
7EU . . . Protective clothing
7EV . . . . Specific items
* Arrange A/Z; eg masks AY3 7EV M.
7EX . . . Special to a particular science
* Notation reserved for amplifying particular contexts.
7H . *Types of hazards*
7I . . Aberrations, anomalies
* For aberrations in instruments, see AY4 38Q
7J . . Pollution hazards in research
7K . . Radiation hazards in research
7KL . . . Ionizing radiation hazards
7LH . . . Elecromagnetic radiation hazards
7LM . . . Particulate radiation hazards
7MG . . Dangerous substances, dangerous materials
7N . . . Specific substances
* Add to AY3 7N letters H/U following C.
8E . . . Accidental errors, human error
* For error analysis, see Testing & evaluation AY7 DA.
8J . . Hazards special to a given context
* Eg optical aberration; interference in instrumentation AY4 38K.
Unwanted effects special to instrumentation
* See Instrumentation AY4 38K
8S Falsification of results
* See also Error analysis (evaluation) AY7 DA

Agents

Science in general AY2
Practical scientific work AY3 6

AY3 B Equipment & materials (together)
B37 . Unwanted effects
. *Operations on equipment & materials*
* Most of the literature relates specifically to equipment or to materials and the terms below will be used mainly to qualify these separately. This class (AY3B/AY3P) takes only those works covering materials, equipment and instrumentation together.
BD . . Design
BF . . Installation & use
BG . . Workshop techniques
* Welding, machining, lubricating, etc.
BGP . . . Coupling
* Of one piece of apparatus to another.
BH . . Maintenance
BK . . Testing & monitoring (equipment & materials)
* Add to AY3 BK letters A/E following AY7; eg Measuring instruments - Standards AY7 643 BKE.
BN . . Control of operations (on equipment & materials)
BR . . Performance criteria control
* For calibration, etc., see Instruments AY4 4BW.
C . . Handling techniques (general)
* For handling techniques special to a given science, see latter.
CD . . . Synchronizing
CF . . . Manipulating
* For example, by glove boxes.
CH . . . Holding, supporting
CI . . . . *By agent*
* Arrange A/Z; eg clamps, mandrels, tripods.
CJ . . . Joining, joints
CK . . . Closing
CL . . . . Materials for closing
CM . . . . . Packing materials, caulking
CP . . . . Equipment for closing
CQ . . . . . Seals
CR . . . . . Other
* Arrange A/Z.
CS . . . Fastening
CT . . . Containing
CU . . . Sequencing
CV . . . Positioning
CW . . . Lifting
D . . . *Special to materials*
* See Materials handling AY3 RC
. *Processes in equipment & materials*
F . . *Effects of physical phenomena on equipment*
* Add to AY3 F letters A/W following B; eg Effect of pressure AY3 FBJ.
G . . Deterioration

Equipment & materials

Science in general AY2
Practical scientific work AY3 6
Equipment & materials AY3 B
Processes in equipment & materials
. Deterioration AY3 G

Properties of equipment & materials

AY3 JC . Characteristics (equipment & materials)
JE . Reliability
JG . Accuracy
JI . Sensitivity
JK . Responsiveness
JL . Gain
* See Instrumentation AY4 4JL
JS . Stability (equipment & materials)
JT . Time response
* See AY4 84J T
. *Physical properties*
* Add to AY3 K letters A/W following B; eg
KGH . . Acoustic properties
KGP . . Thermal properties
KH . . Electromagnetic properties
KL . . Optical properties
L . . Chemical properties
* Add to AY3 L letters following C
M . *Properties special to a material or device*
Parts
NB . Surfaces (equipment & materials)
Types of equipment & materials
PV . Intelligent equipment & materials, smart equipment & materials
* Equipment or material which responds to external stimuli in a specific, controlled way; eg lenses reacting to sunlight. Used particularly when properties demonstrate use of artificial intelligence.
R Materials in general (in practical science)
* For materials technology in general, see Class U.
* Add to AY3 R numbers & letters 6/P following AY3; eg materials reliability AY3 RJE.
. *Operations on materials*
RC . . Materials handling
RD . . . *Special to materials*
* Add to AY3 RD letters following UF (Materials technology) so far as applicable. Notation is provisional until publication of Class U/V Technology.
RDH . . . . Bulk handling of materials
. *Processes, properties & parts of materials*
* Add to AY3 R letters F/N following AY3 (Equipment & materials); eg
RJE . . Reliability of materials
. *Types of materials*
RPV . . Intelligent materials, smart materials
* See definition at AY3 PD.
. . *By state of matter*
* Add to AY3 R letters Q/W following B (with modifications; eg
RQV . . . Films
RQX . . . Coatings

Science in general AY2
Practical scientific work AY3 6
Equipment & materials AY3 B
Materials in general AY3 R
. . By state of matter
. . . Coatings AY3 RQX

AY3 RS . . . Fluids (materials)
RV . . . Solids (materials)
. . *By chemical constitution*
* Add to AY3 S letters H/W following C; eg
SIB . . . Metals (materials)
SO . . . Organic materials (materials)
. . *Specific materials*
TF . . . Fibres
TG . . . Glass
. . *By utility*
TL . . . Fuels & explosives (practical work)
TN . . . Adhesives (practical work)
TP . . . Light sensitive materials
TR . . . Solvents (practical work)
TS . . . Insulators (practical work)

U Equipment & plant, equipment (general), apparatus (general), devices (equipment)
* Add to AY3 U letters B/M and R/T following AY3; eg
U37 . Unwanted effects
. *Operations on*
U3C K . . Closing (equipment handling)
. *Properties*
U3J E . . Reliability
U3R . *Materials of equipment*
U3T S . . Insulating materials
UU . *Parts of equipment*
* Add to AY3 UU letters A/Y following AY3 N; eg
UUB . . Surfaces
UV . *Types of equipment*
. . *By material*
* Add to AY3 UV letters RP/V following AY3 so far as applicable; eg
UVT G . . Glassware
. *Types of equipment by function*
* See function; note that this may sometimes entail building forward, rather than retroactively; eg equipment for handling AY3 C3U.
V . . Intelligent equipment, smart equipment
* For intelligent instruments specifically, see AY4 5V.
W . *Types of equipment special to a subject*
X . Laboratories, scientific stations
* Regarded as aggregates of the total resources of equipment, materials, etc. in a given operation.
. . *Personnel*
X2Y U . . . Laboratory assistants, technicians
X3B D . . Design & layout
XL . . Laboratory buildings
XM . . Mobile laboratories
XN . . Testing laboratories

Science in general AY2
Practical scientific work AY3 6
Equipment & materials AY3 B
Equipment & plant AY3 U
Laboratories AY3 X
. Testing laboratories AY3 XN

AY3 XP . Analytical laboratories
XR . Control laboratories
XV Special environments (practical work)
* Vacuums, high altitudes, space, etc.
* Alternative (not recommended) to treating as special forms of enquiry. See AY7 WB and the notes there. If this option is taken, proceed as follows:
* Add to AY3 X letters W/Y following AY7: eg Vacuums AY3 XX.
Y *Special to a context*
* For example of use, see BT3 YL Wind tunnels.

AY4 Instruments, instrumentation
* As distinct from equipment and plant generally, instruments form a class of devices which perform a particular variety of operations in investigation: measuring, counting, monitoring, scanning, indicating, imaging.
* Add to AY4 letters B/M and R/T following AY3 U; eg
37 . Unwanted effects
. . *Special to instrumentation*
38K . . . Interference
38L . . . . Self-interference, instrumental error
* Modification by the probe, etc. of the property under examination.
* See also error analysis (evaluation) AY7 DA
38M . . . . Environmental interference (instrumentation)
38N . . . . . *By form of interfering energy*
* Add to AY4 8P letters A/Q following B; e.g.
38N J . . . . . Magnetic interference
38N KJ . . . . . Ionizing radiation
38O . . . Drift (instrumentation)
38P . . . Faults (instrumentation)
* Avoidable engineering defects.
38Q . . . Aberrations (instruments)
. *Operations on instruments*
3BF . . Installation & use
3BR . . Performance criteria control (instruments)
3BR W . . . Allowances
3BS . . . Clearances
3BT . . . Tolerances
3BU . . . . Limits & fits (instrumentation)
3BV . . . . . Specific fits
* Arrange A/Z; eg sliding fits AY4 4BV S.
3BW . . . Calibrating
3BW 7T . . . . Testing
3BW 7U . . . . . Standard test objects (calibration)
3BW S . . . . Objective calibration

Equipment & materials AY3 B
Equipment & plant AY3 U
Instruments AY4
Operations on instruments
. Performance criteria control AY4 3BR
. . . Objective calibration AY4 3BW S

AY4 3C . Handling
Processes in instruments
3G . Deterioration in instruments
Properties of instruments
3JC . Characteristics (instruments)
3JE . Reliability
3JL . Gain
3JM . Attenuation
3JN . Signal-to-noise ratio
3R *Materials of instrumentation*
Parts
* Add to AY4 4 letters A/Y following AY3, with the additions shown; eg
4B . Surfaces
4H . Housings
4P . Power input sources (instrumentation)

5 Components in instrumentation
* This class takes literature on components of instruments (which are used in a variety of types of instruments) and discusses the component as such rather than the whole instrument in which the component is used.
* Documents sometimes consider a component only as it functions within (and is used to define) a particular type of instrument. Such documents are classed under AY5 Types of instruments, in the array ((By possession of a particular component)); eg AY5 HS Fluidic instruments (meaning instruments with fluidic components).
* The retroactive rule for compounding may occasionally be broken since one component may have another component of its own, filing later than itself; eg AY4 SL4 ST Input tranducers - Receivers.
* Add to AY4 5 letters UV/V following AY3; eg
5V . Intelligent instruments
6T . Information processing instruments (components)
7 . . Computers (instrument components)
8 . Control instruments, control systems
* The following is an extract from a larger schedule in U/V Technology, from which further details are obtainable. Notation is provisional.
82M . . Mathematical techniques
837 . . Unwanted effects
. . *Properties*
83J S . . . Stability (control systems)
83J T . . . Time response (control systems)
. . *Components*
847 . . . Computers
84L . . . Transducers
84L 4N . . . . Indicators
84T SW . . . Windows

Components in instrumentation

Equipment & plant AY3 U
Instruments AY4
Components in instrumentation AY4 5
Control instruments AY4 8
. Components
. . Windows AY4 84T SW

AY4 84V . . Regulators (instrumentation)
84W . . Filters
84X . . Actuators
84Y C . . Compensators
84Y E . . Energizing systems
. *Types of control systems*
. . *By form of working energy*
* Add to AY4 86 letters A/J following AY4: eg
86B . . . Electronic
. . *By input-output structure*
8B . . . Open loop control systems
8C . . . . Remote control
8E . . . Closed loop control systems, feedback control systems
8F . . . . Servomechanisms
Types of instrument components by energy system
* Add to AY4 letters following U in U/V Technology.
* Notation for the examples below is provisional until publication of Class U/V Technology.
AC . Electrical & electronic components
AD . . Electrical converters
AE . . . Rectifiers
AF . . Transformers
AG . . Capacitors
AH . . Resistors
AJ . . Switchgear
AL . . Relays
AM . . Conductors
AN . . Insulators
AP . . Circuits (instruments)
* For circuits special to a given context, see context; eg for integrated circuits, see electronic devices
AV . . Excitation systems (instrument components)
* Applying an electric signal to drive a device (eg an amplifier).
AW . . . Transmitters (instrument components)
AX . . . . Waveguides
* Completely shielded transmission lines.
B . . Electronic instrument components
BB . . . Integrated circuits
BD . . . Electron tubes
C . . . Semiconductors (instrument components)
CP . . . Superconductors
CS . . . Stimulated emission devices
CV . . . . Masers (as components)
D . . . . Lasers (as components)
DS . . . Resonators
DT . Telecommunication components (instruments)
DU . . Telemetering components (instruments)
DW . Electromagnetic components
E . Magnetic components
EG . . Magnetostrictive components

Equipment & materials AY3 B
Equipment & plant AY3 U
Instruments AY4
Components in instrumentation AY4 5
Magnetic components AY4 E
. Magnetostrictive components AY4 EG

AY4 EJ . Nuclear magnetic resonance (instruments)
F Optical components
. *Properties*
F3Q . . Scales (optical components)
* Range of brightness or density for reproduction.
. *Types of optical components*
. *By energy form*
FE . . Laser excited optical components
FH . . Photovoltaic components
FJ . . Photoconductive components
FL . . Optoelectronic components
FN . . . Photomultiplier tubes
FP . . Photonic devices
* Uses light rather than electrons to transmit signals in computers, etc.
FR . . Opto-acoustic components
. *By function*
* A detailed schedule for these components is given under Optics at BRL 4U/X.
* Add to AY4 F letters U/X following BRL; eg
FUF . . Filters (optical components)
FV . . Lenses
FWB . . Prisms
* Refracting media which deviate and/or disperse light.
FWG . . Gratings
FWM . . Mirrors
* Reflect light without significant dispersion.
G Thermal engineering components (instruments)
GH . Thermoelectric components
GJ . Thermomagnetic components
GM . Heat exchangers (instruments)
GN . Thermal insulation (instruments)
GP . Heat energy sources (instrument components)
GR . Refrigeration components (instrumentation)
H Mechanical engineering components (instruments)
HL . Linkage mechanisms (instruments)
HM . Mechanical transmission (instruments)
HN . . Couplings (instrument components)
HP . . Bearings
HQ . Damping devices (instrument components)
HS . Fluidic components, fluidics
* Fluid flow simulates electron flow in conductors; the interactions of streams of fluid is used to control instruments, etc.
HT . Piezoelectric components
HU . Acoustoelectric components
HV . Photoelastic components
HW . Acoustic domponents
HX . . Ultrasonic components
J Chemical components (instruments)
JL . Electrolytic components

Components in instrumentation

Equipment & materials AY3 B
Equipment & plant AY3 U
Instruments AY4
Components in instrumentation AY4 5
Types of instrument components by energy system
. . Electrolytic components AY4 JL

Types of components by internal function
* Acting on other parts or features of the instrument.

AY4 K . Switching devices (instrument components), conversion devices, converters
KN . . Analogue-digital converters, digitizers
KP . . Digital-analogue converters
L . . Transducers
* Converts one physical parameter (eg sound) into another (usually electrical or optical signals).
L4A V . . . Excitation
. . . *Types of transducers*
LN . . . . Non-self-exciting transducers
LP . . . . Self exciting transducers
LR . . . . Digital transducers
. . . . *By form of energy input*
* Add to AY4 M letters A/J following AY4; eg
MA . . . . . Electrical transducers
MAG . . . . . Capacitive transducers, capacitance transducers
MAH . . . . . Resistive transducers
MAI . . . . . Reductance transducers
MCW . . . . . Electromagnetic transducers
MCX . . . . . Inductive transducers, inductance transducers
MD . . . . . Magnetic transducers
MDG . . . . . Magnetostrictive transducers
MDJ . . . . . Nuclear magnetic resonance transducers
ME . . . . . Laser excited transducers
MF . . . . . Optical transducers
MFH . . . . . Photovoltaic tranducers
MFJ . . . . . Photoconductive transducers
MFL . . . . . Optoelectronic transducers
MFQ . . . . . Opto-acoustic transducers, acousto-optical transducers
MG . . . . . Thermal transducers
MGM A . . . . . Thermoelectric transducers
MGM D . . . . . Thermomagnetic transducers
MH . . . . . Mechanical transducers
MHR . . . . . Electromechanical transducers
MHS . . . . . Fluidic transducers
MHT . . . . . Piezoelectric transducers
MHU . . . . . Acousto-electric transducers
MHV . . . . . Photoelastic transducers
MHW . . . . . Acoustic transducers
MHX . . . . . Ultrasonic transducers
MJ . . . . . Chemical transducers
MJL . . . . . Electrolytic transducers

Equipment & materials AY3 B
Equipment & plant AY3 U
Instruments AY4
Components in instrumentation AY4 5
Switching devices AY4 K
. . . . . Electrolytic transducers AY4 MJL

AY4 N Indicators (instrument components), pointers (instruments)
NN . Mechanical indicators
* Needles, pointers, etc.
NR . Radiation indicators
Q . Optical indicators (instrument components)
QV . Other indication devices
* Arrange A/Z.
R Recording devices (instrument components), recorders (instrument components)
RQ . Automatic recorders
RR . Coded recording devices
RS . Graphic recording (instrument components)
S Input devices
S4A V . Excitation systems
S4A W . . Transmitters
. Transducers
SL . . Input transducers
. . . *Parts*
SL4 ST . . . . Receivers (transducers)
. . . *Types of input transducers*
. . . . *By location of environment*
SLR . . . . . Airborne transducers
SLS . . . . . Space vehicle borne transducers
SLT . . . . . Underwater transducers
SLU . . . . . Underseas transducers
SLV . . . . . Subterranean transducers
SS . Sensors, detectors, probes
SS3 V . . Intelligent sensors
SSV . . Image sensors
SSW . . Tactile sensors
ST . Receivers
* Parts in contact with the phenomena measured.
* For remote indication, see AY7 4M.
T Output devices
. Transmitters
T4A W . . Signals transmission (technical operations)
TR . Recorders
TRT . . Chart recorders
TRU . . X/Y plotters
TRV . . Oscillographs
TRW . . Digital recorders
TRW M . . . Magnetic tape recorders
TRX . . Event recorders
TRY . Viewing devices, visualization devices, display devices
* Visualization illuminates only; it doesn't necessarily form an image. For Imaging, see AY7 I.
. . *Properties*
TSC . . . Contrast

Investigative techniques

Agents
. . . . Components in instrumentation AY4 5
. . . . . Types of components by internal function
. . . . . Viewing devices AY4 TRY
. . . . . Properties
. . . . . Contrast AY4 TSC

AY4 TSD . . . . . Dials
TSS . . . . . Scales
TSW . . . . . Windows (instrument controls)
TTC . . . . . Cathode ray tube displays
TTE . . . . . Electroluminescent displays
TTL . . . . . Liquid crystal displays
TU . . . . . Intensifiers, amplifiers (intensifiers)
V . . . . . *Types of instrument components by special function*
* Used, for example, at AY4 85W Control filters.
. . . . *Types of instruments*
* Add to AY5 4 letters J/V following AY3 so far as applicable; eg
AY5 4V . . . . . Intelligent instruments
. . . . . *By possession of a particular component*
* Add to AY5 numbers & letters 5/U following AY4; eg
D . . . . . Laser-driven instruments
HS . . . . . Fluidic instruments, instruments with fluidic components
V . . . . . *Types of instruments special to a context*
. . . . . *Types of instruments by investigative function*
* The general arrangement in BC2 is to locate an instrument under the function it serves, wherever that may be in the general classification; e.g. measuring instruments AY7 64; flowmeters BS7 64; Rate flowmeters BSD C76 4.

Operations in scientific investigation
* The central operation in much practical scientific investigation is a combination of observation and measurement. This is supplemented by numerous contributory activities such as sensing, detection, indication, recording, etc. In many cases it may be unhelpful to try to draw fine distinctions between these activities, so omnibus headings are provided for when the literature is too broad in coverage to justify making such distinctions.
* Compounding of operations and agents should be done with caution. Often, one element in a potential compound is implicit in the other; e.g. measurement often implies the initial operation of observation; testing and evaluation usually implies measurement. Telemetry reflects the dual operation of indication and measurement together.

Science in general AY2
Practical scientific work AY3 6
Operations in scientific investigation

AY6 2 Investigative techniques (general)
. *Operations serving all techniques & objectives*
* For analysis, see AY7 2N.
3 . . Data handling, data processing
4C . . . Computer science
4D . . . . Programs
4E . . . . Digital techniques
4G . . . . . Analogue-digital conversion
4L . . . Data recording & display
5 . . Control operations (general)
. *Operations by scale*
6 . . High-speed techniques
* Taking a microsecond or less.
7 . . Microtechniques (general)
. . . Instruments
74V . . . . Micromachines
8 . . . Nanotechniques
* On scales approximating the size of atoms and molecules.
8I . . Semi-microtechniques (general)
8M . . Macrotechniques (general)
. *Operations by energy form*
9 . . Physical methods in investigation
* Add to AY6 numbers & letters 9,A/W following B6. A selection of major concepts is given here to show scope. More detail will be available when the technology schedules are published.
B . . . Mechanical techniques
GH . . . Sonic techniques, acoustic techniques
GP . . . Thermal techniques
HY . . . Electromagnetic & electronic techniques
IB . . . . Electronic techniques
J . . . . Magnetic techniques
K . . . . Radiation techniques (electro-magnetic)
KFT . . . . . Scatter techniques
KQ . . . . Microwave & optical techniques (together)
KQM . . . . . Stimulated emission techniques
KR . . . . . Maser techniques
KS . . . . . Laser techniques
KT . . . . Electrical engineering techniques
* Add details from U Technology (when published).
KU . . . . Telecommunications techniques
* Add details from U Technology (when published).
KV . . . . . Microwave techniques
KW . . . . . Radio & television techniques
KY . . . . . Radar techniques
L . . . . Optical techniques
LFP . . . . . Polarization (optical techniques)
LM . . . . . Colour (optical techniques)
. . . . . *Forms of light*
LPF . . . . . Coherent light techniques

Investigative techniques

Investigative techniques AY6 2
Physical methods in investigation AY6 9
. Electromagnetic & electronic techniques AY6 HY
. . Optical techniques AY6 L
. . . Forms of light
. . . . Coherent light techniques AY6 LPF

. . . *By wavelength*
AY6 LU . . . . Infra-red techniques
LW . . . . Ultra-violet techniques
LWY . . Radiological techniques
LX . . . X-ray techniques
M . . Particulate radiation techniques, particle physics techniques
MGB . . . Particle beam techniques (general)
* Add to AY6 MGB letters J/M following BM7 I.
. . . *By particle*
* Add to AY6 letters N/Q following B; eg
NGO . . . . Photonics
* Using photons instead of electrons.
NP . . . . Electron techniques
NP4 . . . . . Instrument components
NP4 FV . . . . . Electron lenses
O . . . . Nuclear reaction techniques
OFK . . . . . Radioactivity techniques
* For tracer techniques, see AY7 P.
QU . . . . Ion techniques
QX . Vacuum techniques
* For vacuums as a form of matter, see BRY.
R . Bulk matter techniques
* For sonic techniques and thermal techniques, see AY6 G.
* Add to AY6 letters R/W following B; eg
RNR . . Phase transition techniques, thermodynamic phases (techniques)
TCW . . Gas dynamics techniques
UCH . . Hydrostatic techniques
UCW . . Hydrodynamic techniques
X . . Chemical techniques
* Add to AY6 X letters A/S following C (notation is provisional); eg
XB . . . Chemical analysis (techniques)
XCE . . . Electrochemical techniques in physics
XCE L . . . . Electrolytic techniques in physics
XX . . Biological techniques in physics
Y *Operations special to a context*
* Eg AY7 76Y C Conversion (of measurement systems).

Science in general AY2
Practical scientific work AY3 6
Investigative techniques AY6 2
Operations by energy form
. Operations special to a context AY6 Y

By action on the phenomena investigated
* Many of the physical methods of investigation above (at AY6) serve several operations; eg X-ray techniques may serve detection, indication, monitoring, imaging etc. The classes below take that literature which deals primarily with the specific operations themselves, regardless of technique used.
AY7 2 . Control techniques
2B . . Hysteresis (control techniques)
2D . . Damping (control techniques)
2E . . . Isolation damping
2N . Analysis (of phenomena investigated)
* For example, analysis of sound.
2P . . Qualitative analysis
2Q . . Quantitative analysis
3 . Production techniques
* Production of the phenomena investigated; e.g. light sources in optical investigations.
3B . . Sampling (production techniques)
3C . . . Preparation of sample
3D . . Generation techniques, reproduction techniques
3F . . . Computer generation (production techniques)
3H . . . Synthesis (of phenomena investigated)
3K . . *By source, medium*
* For example, Sound - Blowing BRG H73 LB.
3L . . *Special to a context*
* For example, separation in particle production BM7 3P.
4 . Observing
4D . . Direct sensory perception of phenomena
4G . Detecting & indicating (together)
* See also detecting & counting (together) AY7 5
4J . . Detecting, sensing
4L . . Indicating
* See also Visualizing & imaging AY7 H
4M . . . Remote indication
4N . . . . Telemetry
* Presenting results at a distance.
4P . . . . Echo probing
4Q . . . . . Radar, radio echo sounding
4T . Recording
4U . . Graphic representation
4V . . Scanning
* Giving information on conditions at various positions in space, examined cyclically.
* See also Monitoring AY7 C
4W . . Identifying
5 . Counting, counting & detecting (together), calculation (counting)
* Include here works on counting techniques alone.
* See BM7 5 for a detailed schedule relating to particles.
* See also Visualization & counting (together) AY7 GY.

Systems of measurement

Science in general AY2
Practical scientific work AY3 6
Investigative techniques AY6 2
Counting AY7 5

AY7 6 Measurement, mensuration, metrology
62M . Mathematical methods in measurement
638 E . Errors in measurement
. Instrumentation
64 . . Measuring instruments, gauges, meters, probes
* For photogrammetry, see AY7 KV.
643 BKE . . . Standards
69 . Principles of measurement
* For measurement of things by a multiplicity of criteria representing desiderata in some context, see Standards AY7 E.
* See also Performance criteria AY7 EP
69B . . Summation methods, integral measurement
69D . . . Micromeasurement
6A . . Units of measurements, systems of units, standard units
* For SI units, see Systems of measurement AY7 7M.
6AD . . . Dimensions of units
6AL . . . Absolute units
6AR . . . Relative units, practical units
6C . . Constants
* For tables of constants, see AY2 3NL
6C6 YC . . . Conversion
6C6 YC2 . . . . Conversion tables
. *Techniques of measurement*
6D . . Direct measurement
6F . . Differential methods (measurement), small differences method (measurement)
6H . . Maxima & minima (measurement)
6J . . Performance characteristics in measurement
* Interaction of instrument & measurand.
6K . . . Precision, accuracy
6L . . . Signal-to-noise ratio
6M . . . Dynamic response
6N . . . Drift (measurement)
6O . . . Hysteresis (measurement techniques)
6P . . Presentation characteristics (measurements)
* For telemetry, see AY7 4N.
6Q . . . Digitalization
6R . . . Amplification
6S . . . . Magnification
* Enlargement without increasing power of signal. For microscopy, see AY7 J.
6T . . *Special to a subject*
* For example, under pyrometry BRG X76.

Science in general AY2
Practical scientific work AY3 6
Investigative techniques AY6 2
Measurement AY7 6
Techniques of measurement
. Special to a subject AY7 6T

AY7 7 Systems of measurement, units of measurement
. *Operations*
76Y C . . Conversion (measurements)
76Y C2 . . . Tables
7C . Weights & measures
* Originally consisted of four measures - mass, volume, distance, area. Now includes other parameters also (e.g. temperature, luminosity).
7E . Metric system
7G . CGS system
* Centimetre, gram, second; now largely replace by MKS and SI.
7J . MKS system
* Metre, kilogram, second
7K . MKSA system
* Amplification of, & now largely replacing, MKS systeml includes amperes, etc.
7M . Systeme Internationale d'Unitees, SI (measurement)
7P . Imperial system (measurement)
8 . Time variables measurement
84 . . Instrumentation
. . . *Components*
84V C . . . . Hands (clocks & watches)
84V E . . . . Winding mechanisms
84V G . . . . Movements (clocks & watches)
. . . *Types of time instrumentation*
85V K . . . . Clocks & watches
85V L . . . . . Electronic clocks
85V M . . . . . Atomic clocks
85V P . . . . Chronometers
85V R . . . . Timing devices
85V S . . . . . Start devices
85V T . . . . . Stop devices
85V V . . . . . Stop clocks & watches
88E . . Time standards
8B . . Frequency measurement
8D . . Calendars
* See Class D Astronomy & Earth sciences.
8J . Space variables measurement systems
8L . Scales, etc. special to a context
* For example, seismic scales in Class D.
8Q . *Systems of measurement special to a context*
* For example, BRL L78 R Visual photometry
9 . Other variables measured
* The preferred arrangement is to subordinate the measurement of a specific thing to the latter. This location is an alternative (not recommended) for libraries wishing to keep all works on measurement together.
* If this option is taken, proceed as follows: add to AY7 9 letters A/Y following B; eg Density measurement AY7 9CL.

Testing & evaluation

Science in general AY2
Practical scientific work AY3 6
Investigative techniques AY6 2
Measurement AY7 6
. . Other variables measured AY7 9

AY7 A Testing & evaluation
* Measuring something against an agreed standard which conforms to some set of desired criteria, which together define an ideal model.
* For technical testing, see Technology UE

A3U . Equipment, laboratories, facilities
A3Y . . Test chambers
AB . Inspection, examination
AE . Testing, trials
AEF . . Preliminary tests
AEH . . Working tests, operational tests, in-house tests
AEM . . Re-testing, post-modification tests
B . . Technical testing
* Add letters from UE Technical testing (technology) (not yet published).

C . . Monitoring
* Testing over time; periodic or continuous determination and/or verification of a variable.

D . Evaluation, assessment, appraisal, estimating (evaluation), valuation
DA . . Error analysis
* For errors as a source of hazards, see AY3 8E.

DC . . . Accuracy (errors)
DD . . . Correction of errors
* See also Feedback control AYP J

. . . *Types of errors*
DDE . . . . Mean error
. . . . *By source*
DDG . . . . . Observer error
DDI . . . . . Instrument error
DDK . . . . . Transmission media error
DDM . . . . . Object of measurement error
. . *Types of evaluations*
DE . . . Expert assessment
DF . . . Current assessment
DG . . . Retrospective assessment
DH . . . Prospective assessment
DK . . . Undervaluation
DO . . . Overvaluation
. . *Products of evaluation*
E . . . Standards, desiderata (standards)
* For social agreements on and administration of standards generally, see AY1 29U.

EH . . . . Quantitative standards, dimensional standards
* See also Systems of measurement AY7 7

EL . . . . Qualitative standards, performance standards
* For quality assurance and quality control, see Technology UF.

Science in general AY2
Practical scientific work AY3 6
Investigative techniques AY6 2
Testing & evaluation AY7 A
. . Products of evaluation
. . . . Qualitative standards AY7 EL

. . *Subjects of evaluation*
* The general arrangement is to subordinate evaluation to the phenomenon evaluated. Below, a number of very generalized attributes of action, too diffuse to warrant citing first, is given.

AY7 EP . . . Performance evaluation, performance criteria
EQ . . . . Efficiency evaluation
ER . . . . Reliability evaluation
ES . . . Problem evaluation
ET . . . . Risk evaluation
EV . . . Project evaluation
F Modelling (simulation), simulation
* See also Statistical models AXQ R

FAE . Testing
FG . Solving (models)
FH . Predicting (models)
. *Types of models*
FM . . Mathematical & statistical models
* Add to AY7 FM letters B/Y following AM4 Q;
* Add to AY7 FN letters A/E following AM4 R; eg AY7 FMT Abstract models.

FX . . . Probabilistic models
FYC . . Causal models
FYE . . Natural models
FYG . . Scale models
FYI . . Iconic models
FYK . . Structural models
FYL . . . Graph models
FYN . . Static models
FYP . . Dynamic models, process models
FYS . . Physical models
G Prediction, forecasting
GY Visualization & counting (together)
* See BM7 H Track visualization (particles) for a special application of this class.
* For counting (general), see AY7 5.

Imaging

Science in general AY2
Practical scientific work AY3 6
Investigative techniques AY6 2
Visualization & counting AY7 GY

AY7 H Visualizing & imaging (together)
. Instrument components
H4 . . Display devices (visualizing & imaging)
HV . Visualizing (techniques)
* Illuminates only; does not necessarily form image.

I . Imaging
. . *Operations*
IC . . . Optical transfer function
* Mathematical representation of the effects on imaging of lenses or other components.
ICP . . . . Phase transfer function
ID . . . Beam handling
* Add to AY7 ID letters A/Y following AY7 IJ;
* Add to AY7 IE letters A/Y following AY7 IK;
* Add to AY7 IF letters A/Y following AY7 IL; eg
IDP . . . . Beam defection
IE . . . . Focusing
IEE . . . . Beam trapping
IFE . . . Resolution
IFN . . . Scanning (imaging)
IFP . . . Optical projection
. . *Properties*
* Add to AY7 G letters D/Y following AY7 IM; eg
IG . . . Beam properties
IGE . . . . Beam profile
IGJ . . . Contrast
IGK . . . Divergence
. . *Types of imaging by radiation form or particle*
IHU . . . Infrared imaging, thermal imaging, thermography
IJ . . . Particle beam techniques (imaging), particle optics (imaging), particle beam handling (imaging)
* Focusing of particle beams to form images.
* The detailed schedule for this is given under particle physics BM. Details may be taken from there if needed.
* Add to AY7 I letters J/M following BM7 I; eg
. . . . *Instrument components*
IJ4 FV . . . . . Lenses (particle optics)
IJ4 FVV . . . . . Electrostatic lenses
IJ4 FVW . . . . . Magnetic lenses
IJP . . . . Defection
IK . . . . Focusing
IKG . . . . . Beam trapping
ILE . . . . Resolution
ILP . . . . Projection

Practical scientific work AY3 6
Investigative techniques AY6 2
Visualizing & imaging AY7 H
Imaging AY7 I
Types of imaging by radiation form or particle
. . Projection AY7 ILP

. . *Properties*
AY7 IME . . . Beam profile
. . *Types of particle optics*
* Add to AY7 I letters N/Q following B; eg
INP . . . Electron beams (imaging)
INV . . . Proton beams (imaging)
* For proton resonance imaging, see AY7 IO.
IO . . . Nuclear resonance imaging, magnetic resonance imaging, MRI
* Using magnetic resonance of protons.
IQU . . . Ion optics
Types by other characteristics
IST . Stereographic projection, stereograms

IX Magnification techniques, amplification techniques (images)
J . Microscopy
. . Instrumentation
. . . Components
J4F UF . . . . Filters
J4F V . . . . Lenses
J4W B . . . . Prisms
. . . *Types*
J5 . . . . Simple & compound microscopes
. . *Types of microscopy by illumination*
JED . . . Dark field microscopy, dark ground microscopy
JEF . . . Field emission microscopy
JEH . . . Field ionization microscopy
JEJ . . . Fluorescent microscopy
JEL . . . Phase contrast microscopy
. . *By direction*
JEN . . . Vertical field microscopy
JES . . . Stereoscopic microscopy
. . *By property*
* Add to AY7 JF letters B/Y following BF; eg
JFN . . . Reflecting microscopy
JFP . . . Polarizing microscopy
JFQ . . . Diffraction microscopy
JFR . . . Interference microscopy
JFR 7K . . . . Holographic microscopy, holomicrography

Microscopy

Visualizing & imaging AY7 H
Imaging AY7 I
Magnification techniques AY7 IX
Microscopy AY7 J
By property
. . Holographic microscopy AY7 JFR 7K

By wavelength
* Add to AY7 J letters G/Q following B, with the modifications indicated:

AY7 JGH . Acoustic microscopy
* Using acoustic waves at microwave frequencies.

JGN . . Ultrasonic absorption microscopy

JL . Optical microscopy
* Visible light usually assumed. Includes documents dealing with i-r and u-v light as well.

JLU . . Infrared microscopy

JLW . . Ultraviolet microscopy

JLW N . . . Flying spot microscopy

JLX . X-ray microscopy
* See also Electron microscopy AY7 JQ

JLX G . . X-ray projection microscopy

JLX L . . X-ray absorption microscopy

JLX Q . . X-ray diffraction microscopy

JM . Particle microscopy

. . Instrumentation

JM5 V . . . Ultramicroscopes

JNP . . Electron microscopy
* Use AY7 JP.
* This interrupts the division by NQ/Q, which is resumed at AY7 JS.

JP . . Electron microscopy

. . . *By characteristics of specimen*

JPM . . . . Specimen cooling electron microscopy

JPN . . . . Specimen heating electron microscopy

. . . *By component*

JPP . . . . Mirror electron microscopy

JPR . . . . Replica electron microscopy

. . . *By radiation property*
* Add to AY7 JQ letters C/U following BF, with modifications; eg

JQC . . . . Transmission electron microscopy

JQG . . . . Emission electron microscopy
* See also Field ion electron microscopy AY7 JXP

JQH . . . . . Field emission electron microscopy

JQN . . . . Reflection electron microscopy

JQQ . . . . Diffraction electron microscopy

JQQ T . . . . . Transmission diffraction electron microscopy

JQQ V . . . . . Selected diffraction electron microscopy

JQQ W . . . . . Shadow diffraction electron microscopy

. . . *By special method*

JRG . . . . Gas reaction electron microscopy
* See also Field ion electron microscopy AY7 JSU P

JRN . . . . Thin film electron microscopy

JRS . . . . Shadow electron microscopy

Imaging AY7 I
Magnification techniques AY7 IX
Microscopy AY7 J
. . Particle microscopy AY7 JM
. . . . By special method
. . . . . Shadow electron microscopy AY7 JRS

AY7 JRT . . . . . Scanning electron microscopy

JRT T . . . . . Scanning-transmission electron microscopy

JRT V . . . . . High voltage electron microscopy

. . . . *By focusing system*

JRW . . . . . Electrostatic electron microscopy

JRX . . . . . Electromagnetic microscopy

JS . . *Other particle microscopies*
* Division by BM/BQ is resumed here after its interruption at AY7 JP.
* Add to AY7 JS letters NPR/Q following B; eg

JSO . . . Nuclear magnetic resonance microscopy, nuclear magnetic resonance imaging

JSU . . . Ion microscopy

JSU N . . . . Field ion microscopy

JSU P . . . . . Field ion electron microscopy

JSU R . . . . . Field emmission ion microscopy

JSU S . . . . . Atom probe field ion electron microscopy

K Holography (techniques), wavefront reconstruction imaging
* Imaging technique without using camera or lenses. Records and reconstructs the wavefront emanating from an object illuminated by a laser beam.

K55 . Instrument components

K5F . . Holographic optical elements

K5F V . . . Holographic gratings, holographic plates

K5X . . Holograms, hologram interferometers

. Recording

K74 T . . Holographic recording

. *Processes*
* Add to AY7 KF letters B/Y following BF; eg

KFQ . . Diffraction

. . Interferometry

KFR . . . Holographic interferometry

. *Product elements*

KH . . Real image

KI . . Virtual image

. *Types*

KK . . Computer generated holography

. *Types of holography by wavelength*

KKS . . Acoustic holography

KKT . . . Holographic multiplexing

KL . . Microwave holography

KM . . Particle field holography
* Add to AY7 K letters M/Q following B if applicable.

. *Types of holography by technique*

KRF . . In-line Fraunshofer holography

KRH . . High-speed holography

Spectroscopy

Practical scientific work AY3 6
Investigative techniques AY6 2
Visualizing & imaging AY7 H
Imaging AY7 I
. . Holography AY7 K
. . . . High-speed holography AY7 KRH

AY7 KT . . Photographic techniques
KV . . . Photogrammetry
* Use of photographic records for mapping, measurement of dimensions, etc (eg by aerial surveying).
L . . Radiography
* Use of shortwave ionizing radiation to produce images.
LL . . . *By radiation source*
* Add to AY7 L letters L/Q following B; eg
LLX . . . . X-ray radiography
LLY . . . . Gamma ray radiography
LNV . . . . Proton radiography
LNW . . . . Neutron radiography
LR . . . Autoradiography
LRS . . . . Shadowradiography
LRT . . . . Colour radiography
LRX . . . Flash radiography
LS . . . Microradiography
LSQ . . . Macroradiography
LSS . . . Stereoradiography
LV . . Tomography
* Image of a selected plane in a material, etc. The material is examined by rotating a detector and the source of radiation in such a way as to blurr points outside the plane and thereby highlight the latter.
LVJ . . . Computerized tomography

M Spectroscopy, spectrography, spectrum analysis
* Terminology varies; spectrometry is often equated with spectroscopy and works which do this should be classed here, not at AY7 N.
* See also Scatter techniques AY7 KFT
. Instrumentation
M4 . . Spectroscopes
M5W . . Spectrographs
. *Operations*
MBD . . Excitation (spectroscopy)
MBE . . . Activation analysis
. *Processes measured*
MBG . . Continuous spectrum
MBH . . Line spectrum
MBJ . . Band spectrum
MC . . Radiation phenomena (spectroscopy)
* See also types of spectroscopy specified by these (at AY7 MF).
* Add to AY7 MC letters B/U following BF; eg
MCG . . . Emission
MCL . . . Absorption
MCR . . . Interference
MCT . . . Scattering

Practical scientific work AY3 6
Investigative techniques AY6 2
Visualizing & imaging AY7 H
Spectroscopy AY7 M
Processes measured
. . Scattering AY7 MCT

By exciting agent
AY7 MDC . Arc spectroscopy
MDE . Spark spectroscopy
MDF . Flame spectroscopy
MDL . Fluorescence spectroscopy
By radiation phenomenon
* Add to AY7 MF letters B/Y following BF; eg
MFF . Coherence spectroscopy
MFG . Emission spectroscopy
MFL . Absorption spectroscopy
MFN E . Reflectance spectroscopy
MFO . Resonance spectroscopy
* See also particular resonating energies or particles; eg Nuclear magnetic resonance
MFO Q . . Quadrupole resonance spectroscopy
MFR . Interference spectroscopy
MFS . Collision spectroscopy
By special wave properties
MGC . Acoustic spectroscopy
MGD . Quantum beat spectroscopy
MGF . Fourier transform spectroscopy
MGH . Hadamand transformation spectroscopy
MGJ . Magnetic resonance spectroscopy
* See also resonating particles; eg nuclear magnetic resonance AY7 MON.
By wave/particle used
* For acoustic spectroscopy, see AY7 MGC
* Add to AY7 M letters K/Q following B; eg
MKM . Radiofrequency spectroscopy
MKO . . High frequency spectroscopy
. Microwave & optical together
MKS . . Laser spectroscopy
MKS R . . . Laser Rahman spectroscopy
MKU . Microwave spectroscopy
* See also Electron spin resonance analysis AY7 MNP M
MKU L . . Electron spin resonance analysis (microwaves)
MKU M . . Atomic beam electron resonance (spectroscopy)
MKU P . . Phosphorescence microwave double resonance, PMDR
MKU Q . . . Phosphorescence microwave photoexcitation spectroscopy, PMPS
ML . Optical spectroscopy
* If confined to visible light wavebend, see AY7 MLV.
. . *By property*
MLF . . . Coherence spectroscopy
MLG . . . Emission spectroscopy
MLO . . . Optical double resonance
MLO P . . . . Microwave optical double resonance
MLP . . Light beating spectroscopy

Spectroscopy

Practical scientific work AY3 6
Investigative techniques AY6 2
Visualizing & imaging AY7 H
Spectroscopy AY7 M
Optical spectroscopy AY7 ML
. Light beating spectroscopy AY7 MLP

AY7 MLQ . Monochromatic light spectroscopy
MLR . . Raman spectroscopy
* See also Raman spectrophotometry AY7 NSL NQ
MLS . . Photoacoustic spectroscopy, optoacoustic spectroscopy
MLU . Infrared spectroscopy, IR spectroscopy
MLU GF . . Fourier transform infrared
MLV . Visible light spectroscopy
MLW . Ultraviolet spectroscopy, UV spectroscopy
MLW V . . Vacuum ultraviolet spectroscopy
MLX X-ray spectroscopy
* For Appearance potential spectroscopy, see Ion spectroscopy AY7 MUL.
MLX 7MN P . Electron probe microanalysis
* Examining X-ray spectra by electron beam.
MLY Gamma ray spectroscopy
MLY M . Mossbauer spectroscopy
MM Particulate spectra techniques
MNG . Photon spectroscopy
* For photoemission spectroscopy (result of bombardment by photons) see Electron spectroscopy AY7 MNP.
MNH . . Two photon spectroscopy
MNJ . . Photon correlation spectroscopy
* See also Photo-electron spectroscopy AY7 MNP T
MNP . Electron spectroscopy, electron emmission spectroscopy
MNP M . . Electron spin resonance analysis
MNP N . . . Electron spin magnetic resonance spectroscopy
MNP O . . . Electron spin double resonance spectroscopy
MNP P . . . Electron paramagnetic resonance spectroscopy, electron spin resonance, ESR
MNP Q . . Electron energy loss spectroscopy
MNP S . . Auger electron spectroscopy
MNP T . . Photo-electron spectroscopy, photoemsssion spectroscopy
MNT . Baryon resonance spectroscopy
MNW . Neutron capture spectroscopy
MO . Nuclear spectroscopy
MON L . . Nuclear quadrupole resonance spectroscopy
MOO . . Nuclear magnetic spin resonance spectroscopy, nuclear magnetic resonance spectroscopy, NMR spectroscopy
MOP . . . Pulse nuclear magnetic resonance

Investigative techniques AY6 2
Visualizing & imaging AY7 H
Spectroscopy AY7 M
By wave/particle used
. . Nuclear spectroscopy AY7 MO
. . . . Pulse nuclear magnetic resonance AY7 MOP

AY7 MP . . Atomic spectroscopy
* See also Atom probe field ion microscopy AY7 JXS
MPM . . . Atomic absorption spectroscopy
MQ . . Molecular spectroscopy
MQM . . . Rotation spectroscopy
MQN . . . Vibration spectroscopy
MQP B . . . Band spectroscopy
MQP D . . . Time resolved spectroscopy
MQP F . . . Beam foil spectroscopy
MQU . . Ion spectroscopy, ion beam spectroscopy
MQU L . . . Appearance potential spectroscopy
MQU M . . . Secondary ion spectroscopy
MQU P . . . Ion microprobe analysis
MQU Q . . . Ion cyclotron resonance spectroscopy
By various physical constants
N . Spectrometry
* See note under Spectroscopy B7M. Prefer latter if spectrometry is equated with spectroscopy.
. . Instrumentation
N4 . . . Spectrometers
. . *By radiation/particle*
* Add to AY7 N letters L/Q following B; eg
NLX . . . X-ray spectrometry
NLY . . . Gamma ray spectrometry
NM . . . Particle spectrometry, mass spectrometry
NMX . . . . Cherenkov spectrometry, Cerenkov spectrometry
NNP . . . . Beta particle spectrometry, beta ray spectroscopy
NNW . . . . Neutron spectrometry
NO . . . Nuclear spectrometry
NOQ . . . . Neutron capture spectroscopy
NOR . . . . . Photoneutron spectrometry
NOT . . . . Alpha particle spectrometry
NS . Spectrophotometry
* Measures intensity of wavelength in optical spectra.
. . Instrumentation
NS4 . . . Spectrophotometers
. . *By special wave properties*
* Add to AY7 NSF letters B/Y following BF; eg
NSF G . . . Emission spectrophotometry
NSF L . . . Absorption spectrophotometry, absorptiometry
NSH . . . Differential spectrophotometry
. . *By radiation/particle*
NSL . . Optical spectrophotometry
. . . Monochromatic
NSL NQ . . . . Raman spectrophotometry
NSL U . . . Infrared spectrophotometry

Practical scientific work AY3 6
Investigative techniques AY6 2
. . Visualizing & imaging AY7 H
. . . . By various physical constants
. . . . . Optical spectrophotometry AY7 NSL
. . . . . Infrared spectrophotometry AY7 NSL U

AY7 NSL W . . . . . Ultraviolet spectrophotometry
NSP . . . . . Atoms
NSP FL . . . . . Atomic absorption spectrophotometry
NX . . . . Mass spectrum analysis
O . . . . . Mass spectroscopy
* Measures atomic mass by separating beam of ions into components reflecting different mass/charge ratios.
OP . . . . . Mass spectrographs
OQ . . . . . Time of flight mass spectroscopy
OT . . . . . Tunnelling spectroscopy
OU . . . . . Quadrupole mass spectroscopy
OV . . . . . Mass spectrometry
. . . . . Instrumentation
OV4 . . . . . Mass spectrometers, velocity spectrometers
P . . Tracer techniques
P75 . . . Counting
P75 4 . . . . Counters
PE . . . Labelled compounds, tracers
PG . . . . Radioactive tracers, radioisotope tracers
PJ . . . . Tritium tracers, tritiaated tracers
Q . . *Techniques special to a subject*
S *Investigative procedures special to a subject*
* Notation AY7 S/V is reserved for such operations; eg seismological techniques in Earth sciences; Conversion of optical frequencies BLF D7T; Acceleration of particles BM7 T
Types of investigation by persons as agents
WD . Individual research
WG . Group research, team research, organized research
WJ . . Big science
WL Special environments (practical science)
* These represent quasi-laboratory conditions affecting the conducting of experiments, etc.
* For research into the environment, see Class D.
* An alternative (not recommended) is to locate these with laboratories at AY3 XV.
. *Operations*
WN . . Control of environment in practical work
WP . Hypothetical environments
* For Aether, see BAC EH.
X . Vacuums (as research environments)
* Including pressures below one atmosphere.
* For vacuum as a state of matter, see BQX
. . Equipment
X3V . . . Vacuum meters, vacuum gauges
X3W . . . Auxiliary vacuum apparatus
X73 . . Production
X73 P . . . Evacuating power (vacuums)
X73 Q . . . . Residual gas
X73 R . . . . . Degasification, degassing (vacuums)

Science in general AY2
Practical scientific work AY3 6
Special environments AY7 WL
. Vacuums AY7 X
. . . Evacuating power AY7 X73 P
. . . . . Degasification AY7 X73 R

AY7 X73 S . . . Pumping
X73 S4 . . . . Vacuum pumps
XC . High pressure techniques
XE . Subsurface (research environments)
XF . Submarine investigations, underwater investigations
XH . High altitude (research environments)
XJ . Research in space, zero-gravity research
* For research into space itself, see Class B.
XN Non-experimental research (general)
* For theoretical investigation, see AY8 B.
XO . Observational research
* Usually implies biological context. For 'natural history', see note at AYB N
XR . Descriptive research
XU . Surveys (research)
* Applies mainly to social sciences.
YB . Scientific exploration, scientific expeditions
YD . . Specific expeditions
* Usually within a particular scientific field; arrange by name A/Z.
YF . Field investigation, practical investigation
AY8 2 Experimental research (general), experimentation (general)
* Use this class only for general works which draw a clear distinction between experimental and practical work. See note at AY3 2. If in doubt, prefer AY3 6.
* For non-experimental investigation, see AY7 XN.
* An alternative (not recommended) is to locate this class at AY3 5 (where it will be collocated with general theory at AY3 4 if the alternative for that is also taken).
22X . Statistical methods
* Use AY8 2E.
2D . Design of experiments
2E . . Statistical methods
* Add to AY8 2E letters A/Y following AX; eg
2ER . . Statistical design (of experiments)
2ES V . . Factor analysis (design of experiments)
. *Organization of experiments*
2QS . . Operations research in experimentation
* Add to AY8 2 letters QS/R following AY2 Y; eg
2QU K . . . Optimization (experiments)
2QW Q . . . Queuing problems (experiments)
2T . Falsification (experiments)
2V . Replication of experiments
Types of research by broad objective
* In principle, types of enquiry defined by purpose should file after all other types. Because of its special status as a form of enquiry (see notes at AY3 2) theory files after this array in order to collocate it directly with the phenomena investigated (see AY8 A).

Practical scientific work

Science in general AY2
Practical scientific work AY3 6
Types of research by broad objective

AY8 5 . Fundamental research, basic research, free research, pure research
6 . Applied research
6M . Research & development in science, R & D in science
* Research and development (R & D) is unequivocally technological and general works on it go at U. But in social policy relating to science it is often considered alongside purely scientific research; for this conjunction, see AY1 3AF.
* See also Planning & development in science AY2 9G
7 . Oriented research
7J . . Oriented free research
7L . . Discipline oriented research
7M . . Science missions (general), mission-oriented research
* For missions reflecting specific fields, see latter; eg Space missions in Class D.
8 . Interdisciplinary research in science, multidisciplinary research
9C . Civil research
* Includes civil research which has military applications also.
9E . Exploratory research
9H . Adaptative research
B Scientific theory, theoretical models, scientific laws (scientific method)
* For the role of theory in explanation, see Science as a disipline AY2 9XM. This class is for the operations involved in theorizing.
* An alternative (not recommended) is to locate this class at AY3 4, preceding practical work.
* For scientific laws, see AY2 9XS.
B2M . Mathematical models (general)
* For particular mathematical techniques used in science, see AY2 M.
BF . Formulation of theories, construction of theories
BG . . Formulation of problem
BH . . Abstraction
BK . Hypothetico-deductive system
BL . . Induction (scientific method)
BM . . . Generalization (scientific method)
BQ . . Deduction (scientific method)
BT . . Classification, categorization
C . Hypotheses
CJ . . Testing hypotheses, validation (research), replication (research)
* See also Experimentation AY8 2
CL . . Working hypotheses, heuristic hypotheses
CM . Concept formation & meaning
CN . . Meaning, interpretation, interpretative analysis, explanation in science
* For Statistical analysis, see AY2 XS.
CS . . Causal analysis

Science in general AY2
Operations & agents
. . . Concept formation & meaning AY8 CM
. . . . Causal analysis AY8 CS

AY8 CT . . . . Levels of analysis
* Expressing functional relations between variables.
D . . . Theories particular to a subject
* For works under specific classes dealing with the theories per se; eg Particle physics - Grand unified theory BM8 KQ.
* An alternative (not recommended) is to locate this class preceding practical scientific work, at AY3 5.

General processes/properties

* Some of the concepts below, reflecting commonly occurring processes or properties (particularly the conditions affecting a phenomenon) duplicate provision made in the main schedules. Synthesis by the latter may not produce the most helpful order for these concepts and may entail long classmarks. In such cases, the concepts are better treated as here, alongside those truly common concepts which do not appear in the main schedules.

AY9 2D . Distribution
2E . . Incidence, occurrence
2F . Invariability, constancy
* For concepts of stability and instability as systemic features, see AYH U.
2G . . Constants
* For constants in measurement, see AY7 6C.
2H . Variation, change
2J . . Rate of change, gradient
2L . . Decrease
2M . . Increase
2N . . Cyclical change
2P . . Anomalies
2S . . Development
2T . . . Formation, origin
2V . . . Growth
4 . Conditions & parameters & environments of physical events
* Includes relations of influence, effect, etc.
4C . . Critical point, critical state
4E . . Volume conditions
4F . . . Constant volume
4G . . . Decreasing volume
4H . . . Increasing volume
4J . . Pressure conditions
4JC . . . Critical pressure
4K . . . Constant pressure, isobaric conditions
4L . . . Decreasing pressure
4M . . . Increasing pressure
4N . . . Other pressure conditions
* Add to AY9 4N letters P/S following BSB J if applicable.
4O . . Velocity conditions

Science in general AY2
Conditions & parameters & environments of physical events AY9 4
Velocity conditions AY9 4O

AY9 4P Thermal conditions
4PC . Critical temperature
4Q . Constant temperature, isothermal conditions
4R . Adiabatic conditions
4S . Decreasing temperature conditions
4V . Increasing temperature conditions
4Y Electric & magnetic conditions
5 . Electric field condtions
6 . Magnetic field conditions
7 . Radiation conditions
8 . Other conditions
B . Dimension (general properties)
* As a qualifying property.
* Details for AY9 B/AY9 D are taken from the substantive classes for dimensions at B9B/B9D.
* Add to AY9 letters B/D following B9 if applicable; eg
B2X . . Dimensional analysis
BG . . Degree, number
* For example: many, few, double, very, optimal.
BI . . Indexes
BK . . Similarity parameters
C . . Time (general properties)
CI . . . Life, duration
CM . . . . Mean life
CQ . . . Frequency
CU . . . Periodic
D . . Space (general properties)
DE . . . Direction
DF . . . One-dimensional space (general properties)
DG . . . Distance
DH . . . . Mean free path
DJ . . . . Width
DK . . . . Radius
DP . . . Two-dimensional space (general properties)
DQ . . . Three-dimensinal space (general properties)
DV . . . Multidimensional space, hyperspace (general properties)
G Systems characteristics (properties)
* As qualifying properties; for the substantive subject of systems, see AYG.
* Add to AY9 letters G/S following AY; eg
GE . Disturbances, perturbations
GV . Conservation
JV . Shape, configuration
KV . Continuous
KX . Discontinuous, discrete
LR . Linear
M . Non-linear

Science in general AY2
General processes/properties
. . . Non-linear AY9 M

Subjects of scientific enquiry
* In principle, the end-product of any discipline constitutes the main facet of that subject. In science, the main product consists of the great bodies of information and methods of enquiry into natural phenomena which constitute the special sciences. These will be found in B/G (the natural sciences) and to a lesser degree (since other forms of knowledge also contribute to them) in H/V (social sciences and technologies). Locate here only general studies of the products of science.

AYE . The Sciences
* The totality of the different fields of enquiry in science. This class should not be qualified by classes AY2/AYA except for works treating the different sciences as an aggregate (and usually including a comparative element). When in doubt, prefer AY2/AYA.
* For interdisciplinary relations between sciences, see AY2 9XG.
. . *Operations*
3E . . . Classification of sciences, systematics of the sciences, taxonomy of the sciences
G . . Empirical sciences (general)
* For empirical science, see AY3 2G.
H . . Fundamental sciences, pure sciences, basic sciences
L . . Natural sciences
* Usually taken to exclude the social sciences.
N . . Nature, The natural world, natural history
* In nearly all the literature using this term, Biology is implied, together with environmental factors important to living things. For this use of the term, see Biology ET.
* Locate here works which are truly general, with mineralogy, earth sciences, astronomy, etc. considered as well as biology.

AYF . . General (extra disciplinary) phenomena
* The fields of scientific enquiry are usually defined by the established sciences (physics, chemistry, etc.), each encompassing a level of organization in natural phenomena (eg energy and matter per se, molecular organization (substances) and so on). But some very general phenomena have no particular place in these, appearing in several or all of the individual sciences; eg properties like form, processes like periodicity, abstract entities like systems. One such phenomenon, that of systems, has achieved the status of an independent field of study, applicable throughout the sciences, natural and social; this is given in detail below.
* If considered completely generally (as, for example, in a work on form in nature and in art) these concepts are treated as general phenomena and located in Class 2. If regarded scientifically, they belong here.
* Add to AYF letters A/Y following 3 in Class 3 Phenomena (notation is provisional until publication of Classes 2/9); eg Complementarities AYF C.

State of system

Science in general AY2
The Sciences AYE
General (extra disciplinary) phenomena AYF

AYF X Systems & communication & control, complex phenomena (general)

AYG . Systems, systemology
* A set of interacting units with relationships between them (Miller). An organized or complex whole.
* For a prominent applications of the systems approach, see systems engineering U.

2M . . Mathematics & statistics
2M3 L . . . Models & simulation
2M8 H . . . Optimization (systemology)
2RC N8U . . . Fractals (systemology)
. . . Analytical functions
2WG 8P2 . . . . Hamiltonian systems (systemology)
3D . . General systems theory, GST
. . *Operations on systems*
9B . . . Analysis & design of systems, planning of systems
* Theoretical studies only. For practical studies, see system concerned, especially in Technology U/V.
* For systems analysis in the narrow sense of a preliminary to operational research or computerization, see latter.
9D . . . Prediction (systems approach)
. . *Properties & processes of systems*
C . . . Systems behaviour (general)
E . . . . Errors (systems behaviour), disturbance, perturbation, degradation (systems behaviour)
* For error analysis, see AY7 DA (Evaluation & testing); for error detection, see UC (Systems engineering).
F . . . . . Compensation (systems behaviour)
G . . . . . Transients, temporary disturbances
H . . . . Environment of system
* Set of elements and their properties which are not part of the system but which may affect it.
J . . . . Wholeness, holistic process
* For synergism, see AYI R.
K . . . . Teleology (systems)
L . . . . . Directiveness
M . . . . . Goals of system, objectives of system
N . . . . . Ideals of system

General (extra disciplinary) phenomena AYF
Systems & communication & control AYF X
Systems AYG
Systems behaviour AYG C
Teleology AYG K
. Ideals of system AYG N

AYG P State of system
* Set of properties relevant to the behaviour of a system at any given time.

Q . Reliability
R . Consistency
S . Sensitivity
T . Constancy, invariance
V . . Conservation (general)
* For conservbation laws, see Physics B9G V.
X . Homogeneity
Y . Heterogeneity
AYH . Variability, variance (general properties)
H . . Events in system, change of state in system
* For conflict and competition, see Biological systems E.
I . . . Transformation, phase transitions (systemology)
J . . . Periodic change
K . . . Cycles
L . . . Action & reaction (systems)
* Event caused by another event.
LM . . . . Susceptibility
MP . . . . Persistence
MR . . . . Resistance
N . . . Response (systems)
* Event is associated with another event.
NT . . . . Time response
NW . . . . . Delay
Q . . . . . Hysteresis (systems behaviour)
* Dependence of the state of a system on its previous history; usually seen in the lagging of a physical effect behind its cause.
R . . . Acts (systems), autonomous events (systems)
* Autonomous changes, self-determined.
* For self-differentiation, see Biological systems, E
S . . Variations special to a subject
T . Deterministic behaviour, determinate behaviour
TU . Probabilistic behaviour
TV . Static behaviour
TW . . Homeostasis
TY . Dynamic behaviour
U . Stability (systems behaviour)
V . . Homeostasis, self-regulation
VV . . . Compensation (systems behaviour)
VW . . . . Feedback
* See also feedback control in Cybernetics AYQ J
VX . . Asymptotic static stability

General (extra disciplinary) phenomena AYF
Systems & communication & control AYF X
Systems AYG
Properties & processes of systems
. . . Stability AYH U
. . . . Asymptotic static stability AYH VX

AYH W . . . Instability
X . . . . Chaos, catastrophe
* A state of disorder whose development in time is highly sensitive to initial conditions, which may lead to sudden and unpredictable departures from equilibrium. Implies some degree of non-linearity.
* See also Chaos theory (mathematics) AWE ME3 CC
YC . . . . . Attractors
YE . . . . . Non-attracting sets
AYI C . . . Reversibility
E . . . Irreversibility
H . . . Adaptive behaviour
* See also Goals AYG M; Adaptive systems AYN P
HK . . . . Other-other (systems behaviour)
* Adapts to external change by modifying environment.
HM . . . . Other-self (systems behaviour)
* Adapts to external change by modifying self.
HP . . . . Self-other (systems behaviour)
* Adapts to internal change by modifying environment.
HS . . . . Self-self
* Adapts to internal change by modifying self.
K . . . Growth in time (systems), systems development
L . . . . Relative growth
* Of systems components.
N . . . Finality
* Direct cause/effect relation between initial conditions and final state. Typical of physical systems.
P . . . Equifinality
* Final state may result from different initial conditions and by different processes. Typical of biological systems. In open systems, this maintains the steady state.
Q . . . Merging with other systems
R . . . . Synergy, synergism (general systems)
* Additional benefits accrue on coalescence ('the whole greater than its parts').
* See also Wholeness AYG J
T . . . . Coupling
* See also Man-machine interface, in Class 8 Computer science; Symbiosis, in Class E Biology

Subsystems

AYJ . Structure of systems, organization of systems
H . . Arrangement
J . . . Order
K . . . . Hierarchy (systems)

General (extra disciplinary) phenomena AYF
Systems & communication & control AYF X
Systems AYG
Subsystems
. Structure of systems AYJ
. . . . Hierarchy AYJ K

AYJ P . . . . Pattern
S . . . . . Symmetry
T . . . . . Parity
V . . . . Shape, configuration
W . Networks (systems)

Types of systems
. *By abstractness*
AYK B . . Abstract systems
D . . . Ideal, perfect
* Conforming to certain simplifying assumption (usually to assist analysis)
F . . . Real, non-ideal, imperfect
* Ideal assumptions are qualified by particular conditions.
J . . Concrete systems
K . . . Biological models (general systems theory)
* Use only when taken as models for non-biological systems. For biological systems per se, see E; for Equifinality, see AYI P.
. *By statistical concepts*
L . . Analytic systems
N . . Stochastic systems
O . . . Markov processes (systemology)
P . . Stationary systems
Q . . Non-stationary systems
S . . Multivariable systems
V . . Continuous systems
X . . Discontinuous systems, discrete systems
. *By composition, structure*
AYL D . . Ordered
F . . Disordered
. *By openness*
N . . Open systems, self-maintaining systems
P . . Closed systems
. *By linearity*
R . . Linear systems
AYM . . Non-linear systems
* See also Multivariable systems AYK S; Chaos AYH X
S . . . Large-scale systems, complex systems
AYN . *By behaviour*
* Add to AYN letters D/F following AY; eg Adaptive systems AYN IH.
. *By environment*
* See also open & closed systems AYL N/P
G . . Metasystems
* Systems over and beyond those of a lower logical order (e.g. the system of monetary values affecting decisions in a gambling game).

Communication & control

The Sciences AYE
General (extra disciplinary) phenomena AYF
Systems & communication & control AYF X
Systems AYG
By environment
. Metasystems AYN G

. *By state of system*
AYN J . . Reactive systems
K . . Responsive systems
L . . Autonomous systems
MN . . Deterministic systems
MP . . Probabilistic systems
MQ . . Static systems, one-state systems
MS . . Dynamic systems, multi-state systems, non-equilibrium systems
* State changes over time.
MT . . . Simple dynamic systems
* For example, clockwork systems.
NS . . Stable systems
O . . . Self-regulating systems, self-organizing systems, homeostatic systems
* Elements & environment are dynamic.
P . . Adaptive systems
* From Ackoff's categorization.
PR . . . State-maintaining systems
PS . . . . Variety-increasing systems
PT . . . Goal-setting systems, goal-seeking systems
PU . . . . Multi-goal-seeking systems
PUW . . . . . Purposive systems
PV . . . Purposeful systems
PVW . . . . Ideal seeking systems
By function
* Characterized by a special function rather than by structural or behavioural features.
* See also Natural systems (B/K), Technological systems (U/V) and other classes to which systems theory may be applied.
* An alternative (not recommended) for libraries wishing to keep together works dealing with particular fields from a systems point of view is provided here. If this option is taken, proceed as follows:

AYO . Applications of systems theory
* Alternative (not recommended) to subordinating to subject.
* Add to AYM numbers and letters 3/9,A/Z from the whole classification.

AYP . Communication & control (systems theory)
* For control systems in technology, see U7.
N . . Information theory, communication theory (information theory)
P . . . Transmission & reception (information theory)
P3J . . . . Shannon's theory
Q . . . . Transmission (information theory)
R . . . . Reception (information theory)
S . . . Signalling
T . . . . Coding
TU . . . . . Decoding
TV . . . . . Decodability
TW . . . . . Correction codes

Systems & communication & control AYF X
Systems AYG
Communication & control AYP
Information theory AYP N
. Signalling AYP S
. . . Correction codes AYP TW

AYP TX . . . Group codes
U . Channel capacity (information theory)
V . Redundancy
W . Interference (information theory)
X . . Noise

AYQ Cybernetics, control (systems theory)
* Definitions vary; in the West, it generally refers to the scientific theory of communication and control. Elsewhere, it often refers to control and information processing together (including computers).
* See also Control systems in technology U7
2M . Mathematics & statistics
2M3 L . . Modelling (cybernetics)
2M8 YT . . Transfer function
2WK . . Optimization (cybernetics)
. Theory
8F . . Control theory
. *Properties & processes*
DR . . Consistency
DS . . Sensitivity
EO . . Stability
F . *Subsystems*
. *Types of cybernetic systems*
. . *By input-ouput relation*
G . . . Open loop systems, environmental control
* No direct control.
J . . . Closed loop systems, feedback control systems, negative feedback control systems
* For automata, see Articial intelligence AYR.
. . *By general systems theory concepts*
* Add to AYR letters G/P following AY, with the additions indicated.

AYR KN . . . Stochastic control system
KO . . . . Markov processes control systems
KP . . . Stationary control systems
KQ . . . Non-stationary control systems
KS . . . Multivariable control systems
KV . . . Continuous control systems
KX . . . Discontinuous control systems, discrete control systems
LL . . . Integral control systems
LR . . . Linear control systems
LS . . . . Bilinear control systems
M . . . Non-linear control systems
MT . . . Optimal control systems
NP . . . Adaptive control systems
O . . . Self-organizing control systems
P . . . Fuzzy control systems
S . . *Other types of control systems, A/Z*
* Arrange A/Z: eg proportional, derivative, time-sharing.

The Sciences

Science in general AY2
The Sciences AYE
General (extra disciplinary) phenomena AYF
. . . . . Cybernetics AYQ
. . . . . Other types of control systems, A/Z AYR S

AYS . . . . . Artificial intelligence, machine intelligence

* Branch of computer science which assumes that computers can be programmed to behave as though they are exercising human intelligence. Embraces pattern recognition, knowledge-based systems, automata and robots.
* Alternative (not recommended) to subordinating to computer science in Class 8.

AYY Physical sciences (general)