

Table S2 Category description of DWPI Classification Code

Section	Class	Explanation
A	11	Polysaccharides; natural rubber; other natural polymers (only a restricted range of (modified) natural polymers are included. Thus starch would be excluded, but chemically modified starch included).
A	12	Of di-and higher olefins; acetylenics; nitroso compounds.
A	13	Of aromatic mono-olefins; including polystyrene.
A	14	Of other substituted mono-olefins; including PVC, PTFE.
A	17	Of unsubstituted aliphatic mono-olefins; including polyethylene.
A	18	Addition polymers in general.
A	21	Epoxides; aminoplasts; phenoplasts.
A	23	Polyamides; polyesters.(including polycarbonates, polyesteramides); alkyds; other unsaturated polymers.
A	25	Polyurethanes; polyethers.
A	26	Other condensation polymers including silicone polymers and polyimides (mineral silicates and similar materials would not usually appear in Section A).
A	28	Condensation polymers in general.
A	31	Preliminary processes.
A	32	Polymer fabrication - such as moulding, extrusion, forming, laminating, spinning.
A	35	Other processing and general - including vulcanisation, welding of plastics and adhesive processes. Testing.
A	60	ADDITIVES AND COMPOUNDING AGENTS If the usage is very restricted it may be classified under the individual polymer or process involved.
A	81	Adhesives and binders - including chipboard.
A	82	Coatings, impregnations, polishes - excluding textile finishing.
A	84	Household and office fittings - including carpets and carbon paper.
A	85	Electrical applications.
A	88	Mechanical engineering and tools eg valves, gears and conveyor belts.
A	89	Photographic, laboratory equipment, optical - including electrophotographic, thermographic uses.
A	92	Packaging and containers - including ropes and nets.
A	93	Roads, building, construction flooring.
A	96	Medical, dental, veterinary, cosmetic.
A	97	Miscellaneous goods not specified elsewhere - including papermaking, gramophone records, detergents, food and oil well applications.
B	04	Natural products and polymers. Including testing of body fluids (other than blood typing or cell counting), pharmaceuticals or veterinary compounds of unknown structure, testing of microorganisms for pathogenicity, testing of chemicals for mutagenicity or human toxicity and fermentative production of DNA or RNA. General compositions.
B	05	Other organics - aromatics, aliphatic, organo-metallics, compounds whose substituents vary such that they would be classified in several of B01 - B05.
B	06	Inorganics - including fluorides for toothpastes etc.
B	07	General - tablets, dispensers, catheters (excluding drainage and angioplasty), encapsulation etc, but not systems for administration of blood or saline or IV feeding etc.
C	01	Organophosphorus; organometallic (i.e., compounds containing other than H, C, N, O, S and halogen)
C	02	Heterocyclic.
C	03	Other organic compounds, inorganic compounds and multi-component mixtures. Polymers and proteins
C	04	Fertilisers - including urea and phosphoric acid production. Also soil modifiers and plant

		growth media. Chemical aspects of compost production.
C	05	Biological control - excluding veterinary medicine, but including use of microorganisms, predators and natural products.
C	06	Biotechnology - including plant genetics and veterinary vaccines.
C	07	Apparatus, formulation, general - including veterinary syringes, general formulations where the active compound is not central to the invention (for example, wettable powders) and analysis.
D	13	Other foodstuffs and treatment - including preservation of food, milk, milk products, butter substitutes, edible oils and fats, non-alcoholic beverages, artificial sweeteners, food additives and animal feed (A23B-L).
D	15	Treating water, industrial waste and sewage - including purification, sterilising or testing water, scale prevention, treatment of sewage sludge, regeneration of active carbon which has been used for water treatment and impregnating water with gas eg CO ₂ , but excluding marine anti-pollution devices and purification of water which will be recycled within an industrial process (C02).
D	16	Fermentation industry - including fermentation equipment, brewing, yeast production, production of pharmaceuticals and other chemicals by fermentation, microbiology, production of vaccines and antibodies, cell and tissue culture and genetic engineering.
D	18	Skins, hides, pelts, leather and chemical treatment of tobacco, but excluding drying, wetting, cutting or shaping tobacco (A24, C14).
D	21	Preparations for dental or toilet purposes - including filling alloys, compositions for dentures or dental impressions, anti-caries chewing gum, plaque disclosing compositions, toothpastes, cosmetics, shampoos, topical anti-sunburn compositions and toilet soaps (A61K).
D	22	Sterilizing, bandages, dressing and skin-protection agents - including sterilizing agents (other than for food), sutures, plaster casts, bioactive prostheses, contact lenses, diapers, animal litter, timber preservatives, disinfectants, bactericidal detergents, deodorants, insect repellent compounds, moth proofers, sheep dip, insect attractants (where for cleaning air), flysprays and compositions for relieving insect bites and stings (A61L).
D	23	Oils, fats and waxes - including fatty acids, candles, essential oils, but excluding butter (substitutes) and montan wax (C11B, C).
D	25	Detergents - other than soap and used for cleaning (C11D)
E	11	Containing P and/or Si.
E	12	Organometallics (i.e., containing other than H, C, N, O, S, halogens, Si and P)
E	13	Heterocyclics
E	14	Aromatics (i.e., containing at least one benzene ring)
E	16	Aliphatics - containing N and/or halogen
E	17	Other aliphatics
E	19	Other organic compounds general - organic compounds of unknown or indefinite structure; general mixtures of many types; organic reactions (e.g., nitration, resolution) when applied generally.
E	31	Compounds of V, Nb, Ta, Cr, Mo, W, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Pa, V and subsequent actinides.
E	32	Compounds of Ti, Zr, Hf, Cu, Ag, Au, Zn, Cd, Hg, Ga, In, Te, Ge, Sn, Pb, As, Sb, Bi.
E	33	Compounds of Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, La, Ac, Al, lanthanides (Rare-earths), Th.
E	34	Compounds of Li, Na, K, Rb, Cs, Fr.
E	35	Ammonia, cyanogen and their compounds - including HCN and cyanamide, but not hydrazine.
E	36	Non-metallic elements, semi-metals (Se, Te, B, Si) and their compounds (except for E35).
E	37	Mixtures of many components; inorganic reactions and processes of general applicability.
F	01	Threads and fibers - natural or artificial; spinning - including the production of mineral and carbon fibres (D01).
F	03	Weaving - including finished products (D03).
F	04	Braiding, knitting - including trimmings and non-woven fabrics (D04).

F	06	Chemical-type treatment of textiles (D06B, L, M, P, Q). Other textile applications - including clothing design, accessories and fasteners (D06C, F, G, H, J, L, M).
F	07	Flexible sheet materials - consisting of polymer-coated fibrous web, including end products not classified in other sections (D06N).
F	08	Paper-making production of cellulose, chemical treatment of wood - including chipboard and fibre-board (D21).
F	09	Inks, paints, polishes, polymer-based paints and inks are also classified in Section A (C09D, F, G).
G	02	Adhesives - excluding dispensers. Polymeric adhesives are also classified in Section A (C09H, J).
G	03	Miscellaneous compositions - including luminescent and tenebrescent materials, de-icing/de-misting compositions, mastics, heat transfer compositions and aerosol-can filling mixtures (C09H).
G	04	Electrography, electrophotography and magnetography (G03G).
G	08	Obtaining crude oil and natural gas - including exploration, drilling, well completion, production and treatment. General off-shore platform and drilling technology is included together with the treatment of tar sands and oil shales (C10G, E21B).
H	01	Transportation and storage - only large scale systems are included. Road tankers and retail petrol station-type applications are excluded. Treatment of pollution from marine oil tankers is included.
H	03	Petroleum processing - including treating, cracking, reforming, gasoline preparation - biosynthesis based on hydrocarbon feedstocks is included (C10G).
H	04	Gaseous and liquid fuels - including pollution control. Chemical aspects of catalytic exhaust systems for cars are included as well as liquid or gaseous fuels of non-petroleum origin eg methanol or ethanol-based fuels. Combustion improvement additives for liquid fuels are included (C10L).
H	06	Fuel products not of petroleum origin - excluding coal handling, preparation or mining, but including coking, briquetting, peat processing synthesis, gas production, coal gasification. Combustion improvement additives for coal, peat and other non-hydrocarbon based fuels are included in this Section together with coal liquefaction and desulphurisation.
H	09	Separation - including evaporation crystallizing, solvent extraction, chromatography, dialysis, osmosis including drying gases and/or vapours, and separation of solids from gases, liquids and other solids. Isotope separation, filter materials (including molecular sieves for separation), and centrifuges (except where used for analysis) (B01D, B03, B04, B07B).
J	01	Mixing, crushing, spraying - including dispersing, pulverising, disintegrating, atomising and applying liquids other than paints to surfaces (B01F, B05B, C).
J	02	Electrochemical processes and electrophoresis - including ozone production, brine electrolysis, water electrolysis, apparatus for the production of pure chemical compounds and non-metallic elements, but excluding batteries or other means of producing power and the treatment of metals (C25B).
J	03	Chemical/physical processes/ apparatus - including catalysis, catalysts (including molecular sieves where appropriate, but excluding specific eg enzymatic or polymerisation catalysts), colloid chemistry, laboratory apparatus and methods, testing, controlling, general encapsulation, detection and sampling (B01J, L).
J	04	Health physics - including radiation protection (other than against sunlight), monitoring devices, decontamination, radioactive waste disposal and protective clothing (G21F).
K	07	Refractories, ceramics, cement - includes manufacturing methods, limes, soil preparation for (road) building, magnesias and slags, cements, mortars, concretes, abrasives, thermal or acoustic insulation (non)oxide ceramics and ceramic composites, but not brick making, concrete mixers or casting or potters' wheels (C04).
L	02	Electro-(in)organic, chemical features of conductors, resistors, magnets, capacitors and switches, electric discharge lamps, semiconductor and other materials, batteries, accumulators and thermo-electric devices, including fuel cells, magnetic recording media, radiation emission devices, liquid crystals and basic electric elements. Growing of single crystals of semiconductors and their doping are included, but semiconductor devices, where the manufacture is not claimed are excluded. Electrography, electrophotography,
L	03	

		magnetography, electrolysis, electrophoresis, power plant, X-ray and plasma-techniques, ion-exchange resins, polyelectrolytes, electroplating, metal electrodeposition, electroforming, anodising, electrolytic cleaning, cathodic protection and electrolytic or electrothermic production or refining of metals are all covered elsewhere (Sections G, J, K and M).
M	14	Other chemical surface treatments - including etching, brightening, forming non-metallic layers, passivation, cathodic protection and corrosion inhibitors, but not processes specifically for semiconductor production (C23F, C25). This Section also covers multistage processes.
M	22	Casting; powder metallurgy - including foundry moulding, moulding machines, patterns, moulds, cores and metal casting (B22).
M	24	Metallurgy of iron and steel - including manufacture and processing, treatment of steel melts and changing the physical properties of iron and steel, control/testing methods, blast furnaces and converters. Metallurgical coking processes (C21, C10B).
M	25	Production and refining of metals other than iron - including ore treatment, extraction, working up scrap, obtaining specific metals, control testing methods (C22B).
M	28	Electrolytic and electrothermic production and refining of non-ferrous metals - excluding heat treatment (C25).
P	11	Soil working, planting (A01B, C).
P	12	Harvesting (A01D, F).
P	13	Plant culture, dairy products (A01G, H, J).
P	32	Dentistry, bandages, veterinary, prosthesis (A61C, D, F).
P	34	Sterilising, syringes, electrotherapy (A61L, M, N).
P	35	Life-saving, fire-fighting (A62).
P	41	Crushing: centrifuging, separating solids (B02, 3, 4).
P	42	Spraying, atomising (B05).
P	43	Sorting, cleaning, waste disposal (B06, 7, 8, 9).
P	53	Metal casting, powder metallurgy (B22).
P	62	Hand tools, cutting (B25, 6).
P	71	Presses (B30).
P	73	Layered products (B32).
P	85	Education, cryptography, adverts.(G09).
Q	15	Transporting special loads (B60P).
Q	17	Vehicle parts, fittings, servicing (B60R,S).
Q	19	Air-cushion vehicles (B60V).
Q	22	Hand, motor vehicles (B62B-D).
Q	31	Packaging, labeling (B65B, C).
Q	32	Containers (B65D01-37).
Q	33	Closures (B65D39-55).
Q	34	Packaging elements, types (B65D57-91).
Q	35	Refuse collection, conveyors (B65F, G).
Q	42	Hydraulic engineering, sewerage (E02, 3).
Q	43	General building constructions (E04B).
Q	46	Building aids, special structures (E04G, H).
Q	49	Mining (E21).
Q	55	Machines, engines for liquids (F03).
Q	57	Fluid-pressure actuators (F15).
Q	63	Couplings, clutches, brakes, springs (F16D, F).
Q	68	Other engineering elements (F16M-T).

Q	72	Steam generation (F22).
Q	73	Combustion equipment/processes (F23).
Q	74	Heating, ranges, ventilating (F24).
Q	76	Drying (F26).
Q	77	Furnaces, kilns, ovens, retorts (F27).
Q	78	Heat exchange in general (F28). Electrical Instruments (G01R, G12B) Measuring magnetic and electrical variables.Instrument panels, housings, indicating elements, screening, suspensions, damping.Cooling arrangements.
S	01	Engineering Instrumentation (G01B-H, L, M, P) Measuring dimensions, weight, flow rate, mechanical vibrations, force, acceleration, etc.Recording equipment.General testing methods.
S	02	Scientific Instrumentation (G01J, K, N, T-W) Photometry, calorimetry.Thermometers.Meteorology, geophysics, measurement of nuclear or X-radiation.Investigating chemical or physical properties.
S	03	Electrical Medical Equipment (A61, A61N) Electrotherapy.Electrosurgical apparatus.Blood cell counters.Electrical diagnostic apparatus.Tomography.Veterinary apparatus.
S	05	Digital Computers (G06C-F) Electronic data processors, interfaces and programme control.Mechanical digital computers.
T	01	Computer Peripheral Equipment (G06K) Card and tape punches and readers.Magnetic, optical and smart cards.Serial and line printers.VDUs, character and graphics generators.Pattern recognition, magnetic ink recognition, bar coders.COM equipment.
T	04	Counting, Checking, Vending, ATM and POS Systems (G06M, G07B-G) Counting systems.Ticket issuing, registering and franking apparatus.Attendance registering apparatus.Coin and paper currency handling.Point-of-sale equipment.Electronic funds transfer.
T	05	Process and Machine Control (G05B, D) General control systems.Control of non-electrical variables eg.temporal flow.Control system applications eg.machine tools, lifts.
T	06	Semiconductor Materials and Processes (C30B, H01L) Materials, substrate and layer processing, packages and mountings, assembly, testing, and handling aspects of all semiconductor devices, included in U12, U13, U14.Aspects of manufacture specific to devices such as LEDs, lasers, solar cells and especially thick film and hybrid circuits are covered in U12 and U14.
U	11	Amplifiers and Low Power Supplies (H03F, H03G, G05F, H02M) DC, LF and HF amplifiers, parametric, magnetic, dielectric amplifiers.Gain control.Volume compression or expansion.Limiters.Voltage and current stabilisation, power supplies, converters, inverters, rectifiers.Low power protection.
U	24	Resistors and Capacitors (H01C, G) Low power fixed and variable devices.Thermistors.VDRs.Electrolytic and non-electrolytic capacitors.
V	01	Switches, Relays (H01H) Low power switches and relays.Thermally or magnetically operated switches.
V	03	Printed Circuits and Connectors (H01R, H05K) PCBs and their manufacture.Low power connectors.Electronic apparatus, housings and constructional details.RFI/EMI screening.General circuit manufacture.
V	04	Valves, Discharge Tubes and CRTs (H01J, H05G) Vacuum tubes, klystrons, TWTs, magnetrons, CRTs, camera tubes, X-ray tubes and operating circuits.Photoelectric discharge tubes.Gas filled tubes.Gas discharge displays.
V	05	Electromechanical Transducers and Small Machines (H04R, H03H, H02K) Audio-communication - and measurement type transducers.Electromechanical resonators.Small electric machines and their controllers.
V	06	Fibre-optics and Light Control (G02B, F) Light guides.Connectors, couplers, mode selectors, polarisers.Switching, gating, modulating etc.
V	07	Lasers and Masers (H01S) Laser and maser devices.Pumping and mode locking circuitry
V	08	Telephone and Data Transmission Systems (H04L, M, Q) Error detection and correction.Code conversion.Synchronizing.Secret data communication.Data networks (LAN,
W	01	

		WAN, etc).ISDN.Baseband and broadband data transmission.Exchanges, call metering, test equipment, equipment racks.Subscriber equipment, cordless and cellular phones.Telephone line and cable installation.
		Broadcasting, Radio and Line Transmission Systems (H01P, Q, H04, H04K) Aerials, waveguides, resonators and other distributed constant components.Transmitters, transceivers, transponders.Communication receivers.Line transmission systems.Radio systems, including diversity, relay, mobile (including cellular).Optical and ultrasonic wave transmission systems.Spread Spectrum communication.Secret communication, jamming.Facsimile.TV systems, including color, stereoscopic, cable, subscription, satellite and high definition.Stereophonic broadcast systems.
W	02	Audio/Video Recording and Systems (G10H, G11B, H04N) Loudspeaker enclosures, cross-over networks.Audio disc recording and reproducing equipment.Audio magnetic tape recording and reproduction.Sound mixers.Electrical musical instruments.Video cameras, camera recorders, electronic still-picture cameras.Studio equipment eg video mixers, special effect apparatus.Projection TV.Video tape and disc recording and reproduction.Video games, karaoke.Electronic educational apparatus.Sports equipment.Speech coding, analysis and synthesis.Antiphase sound canceling.
W	04	Alarms, Signaling, Telemetry and Telecontrol (G08B, C) Burglar and fire alarms.Personal calling arrangements.Paging systems.Signal transmission systems.Home bus systems, vehicle remote control bus systems.Advertising arrangements (electrical aspects).
W	05	Power Generation and High Power Machines (H02K, N) Conventional power generating prime movers.Dynamo-electric machines.MHD generators.
X	11	Power Distribution/Components/Converters (H01B, H01T, H02G, H02J, H02M) High power AC, DC and HVDC distribution/control.Power and communication cables.Superconducting cables, coils and magnets.Installing power cables and lines.Power transformers, reactors.Spark gaps and circuits.Insulators.High power connectors.Power converters.Conductive, superconductive and insulating materials.
X	12	Non-Fossil Fuel Power Generating Systems (F03D, F24J) Geothermal, wind, wave and solar energy, types of power generation.
X	15	Electrochemical Storage (H01M) Primary, secondary and fuel cells and batteries.Battery chargers.Non-electrochemical storage of electric energy.
X	16	Automotive Electrics (F02P) Vehicle accessories.Vehicle lighting.IC engine ignition.IC engine controllers.Batteries and charging.Starting motors, and generators.Engine and vehicle instrumentation.Non-engine related controllers eg.transmissions, brakes.
X	22	Industrial Electric Equipment (H05B, F27) Electric furnaces and kilns.Resistance, induction, electric discharge and EM field heating.Electrostatic spraying and cleaning.Vibrating apparatus.Electrolytic processes.Electro-refining metals.Electrically powered tools.Industrial drying equipment.Ore separating magnets.Magnetic work holders.Lifting magnets.Sewing machines.Industrial components eg.pumps, fans.
X	25	Domestic Electric Appliances (A47, F24) Washing machines, dryers, irons.Vacuum cleaners.Electric cookers, microwave ovens.Kitchen equipment.Refrigerators.Water heaters.Space heating and air conditioning equipment.Personal and hygiene electrical appliances.
X	27	
