Annex B Science Technology Engineering & Mathematics Disciplines

Physical Sciences and Engineering

Primary Area: **Mathematics**	
Disciplines	Fields of Research
All areas of mathematics, pure and applied, mathematical foundations of computer science, mathematical physics and statistics	including but not limited to: Logic and foundations Algebra Number theory Algebraic and complex geometry Geometry Topology Lie groups, Lie algebras Analysis Operator algebras and functional analysis ODE and dynamical systems Theoretical aspects of partial differential equations Mathematical physics Theoretical physics Probability Statistics Discrete mathematics and combinatorics Mathematical aspects of computer science Numerical analysis Scientific computing and data processing Control theory and optimisation Application of mathematics in sciences Application of mathematics in industry and society

Primary Area: **Fundamental Constituents of Matter**	
Disciplines	Fields of Research
Particle, nuclear, plasma, atomic, molecular, gas, and optical physics	including but not limited to: Fundamental interactions and fields Particle physics Nuclear physics Nuclear astrophysics Gas and plasma physics Electromagnetism Atomic, molecular physics Ultra-cold atoms and molecules Optics, non-linear optics and nano-optics Quantum optics and quantum information Lasers, ultra-short lasers and laser physics

	Acoustics Relativity Thermodynamics Non-linear physics General physics Metrology and measurement Statistical physics (gases)

Primary Area: **Condensed Matter Physics**	
Disciplines	Fields of Research
structure, electronic properties, fluids, nanosciences, biophysics	including but not limited to: Structure of solids and liquids Mechanical and acoustical properties of condensed matter, Lattice dynamics Transport properties of condensed matter Electronic properties of materials, surfaces, interfaces, nanostructures, etc. Semiconductors and insulators: material growth, physical properties Macroscopic quantum phenomena: superconductivity, superfluidity, etc. Spintronics Magnetism and strongly correlated systems Condensed matter – beam interactions (photons, electrons, etc.) Nanophysics: nanoelectronics, nanophotonics, nanomagnetism, nanoelectromechanics, etc. Mesoscopic physics Molecular electronics Structure and dynamics of disordered systems: soft matter (gels, colloids, liquid crystals, etc.), glasses, defects, etc. Fluid dynamics (physics) Statistical physics: phase transitions, noise and fluctuations, models of complex systems, etc. Physics of biological systems

Primary Area: **Physical and Analytical Chemical Sciences**	
Disciplines	Fields of Research
Analytical chemistry Chemical theory Physical chemistry/chemical physics	including but not limited to: Physical chemistry Spectroscopic and spectrometric techniques Molecular architecture and Structure Surface science and nanostructures Analytical chemistry Chemical physics Chemical instrumentation Electrochemistry, electrodialysis, microfluidics, sensors Method development in chemistry Heterogeneous catalysis Physical chemistry of biological systems Chemical reactions: mechanisms, dynamics, kinetics and catalytic reactions Theoretical and computational chemistry Radiation and Nuclear chemistry Photochemistry Corrosion Characterisation methods of materials Environment chemistry

Primary Area: **Synthetic Chemistry and Materials**	
Disciplines	Fields of Research
Materials synthesis Structure-properties relations Functional and advanced materials Molecular architecture Organic chemistry	including but not limited to: Structural properties of materials Solid state materials Surface modification Thin films Ionic liquids New materials: oxides, alloys, composite, organic-inorganic hybrid, nanoparticles Biomaterials, biomaterials synthesis Intelligent materials – self assembled materials Coordination chemistry Colloid chemistry Nanochemistry Biological chemistry Chemistry of condensed matter Homogeneous catalysis Macromolecular chemistry Polymer chemistry Supramolecular chemistry Organic chemistry

	Molecular chemistry Combinatorial chemistry

Primary Area: **Computer Science and Informatics**	
Disciplines	Fields of Research
informatics and information systems, computer science, scientific computing, intelligent systems	including but not limited to: Computer architecture, pervasive computing, ubiquitous computing Computer systems, parallel/distributed systems, sensor networks, embedded systems, cyber-physical systems Software engineering, operating systems, computer languages Theoretical computer science, formal methods, and quantum computing Cryptology, security, privacy, quantum crypto Algorithms, distributed, parallel and network algorithms, algorithmic game theory Artificial intelligence, intelligent systems, multi agent systems Computer graphics, computer vision, multimedia, computer games Human computer interaction and interface, visualisation and natural language processing Web and information systems, database systems, information retrieval and digital libraries, data fusion Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video) Scientific computing, simulation and modelling tools Bioinformatics, biocomputing, and DNA and molecular computation

Primary Area: **Systems and Communication Engineering**	
Disciplines	Fields of Research
electrical, electronic, communication, optical and systems engineering	including but not limited to: Control engineering Electrical engineering: power components and/or systems Simulation engineering and modelling (Micro and nano) systems engineering (Micro and nano) electronic, optoelectronic and photonic components Communication technology, high-frequency technology Signal processing Networks (communication networks, sensor networks, networks of robots, etc.) Man-machine-interfaces Robotics Components and systems for applications (in e.g. medicine, biology, environment) Electrical energy production, distribution, application

Primary Area: **Products and Process Engineering**	
Disciplines	Fields of Research
product design, process design and control, construction methods, civil engineering, energy process, material engineering	including but not limited to: Aerospace engineering Chemical engineering, technical chemistry Civil engineering, architecture, maritime/hydraulic engineering, geotechnics, waste treatment Computational engineering Fluid mechanics, hydraulic-, turbo-, and piston engines Energy processes engineering Mechanical and manufacturing engineering (shaping, mounting, joining, separation) Materials engineering (biomaterials, metals, ceramics, polymers, composites, etc.) Production technology, process engineering Industrial design (product design, ergonomics, man-machine interfaces, etc.) Sustainable design (for recycling, for environment, eco-design) Lightweight construction, textile technology

	Industrial bioengineering

Primary Area: **Universe Sciences**	
Disciplines	Fields of Research
astro-physics/chemistry/biology, solar system, stellar, galactic and extragalactic astronomy, planetary systems, cosmology, space science, instrumentation	including but not limited to: Solar and interplanetary physics Planetary systems sciences Interstellar medium Formation of stars and planets Astrobiology Stars and stellar systems The Galaxy Formation and evolution of galaxies Clusters of galaxies and large scale structures High energy and particles astronomy – X-rays, cosmic rays, gamma rays, neutrinos Relativistic astrophysics Dark matter, dark energy Gravitational astronomy Cosmology Space Sciences Very large data bases: archiving, handling and analysis Instrumentation - telescopes, detectors and techniques

Primary Area: **Earth System Science**	
Disciplines	Fields of Research
physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resouces management	including but not limited to: Atmospheric chemistry, atmospheric composition, air pollution Meteorology, atmospheric physics and dynamics Climatology and climate change Terrestrial ecology, land cover change Geology, tectonics, volcanology Palaeoclimatology, palaeoecology Physics of earth's interior, seismology, volcanology Oceanography (physical, chemical, biological, geological) Biogeochemistry, biogeochemical cycles, environmental chemistry Mineralogy, petrology, igneous petrology, metamorphic petrology Geochemistry, crystal chemistry, isotope geochemistry, thermodynamics Sedimentology, soil science, palaeontology, earth evolution Physical geography Earth observations from space/remote sensing Geomagnetism, palaeomagnetism Ozone, upper atmosphere, ionosphere Hydrology, water and soil pollution Cryosphere, dynamics of snow and ice cover, sea ice, permafrosts and ice sheets

Life Sciences

Primary Area: **Molecular and Structural Biology and Biochemistry**	
Disciplines	Fields of Research
molecular synthesis, modification and interaction, biochemistry, biophysics , structural biology, metabolism, signal transduction	including but not limited to: Molecular interactions General biochemistry and metabolism DNA synthesis, modification, repair, recombination and degradation RNA synthesis, processing, modification and degradation Protein synthesis, modification and turnover Lipid synthesis, modification and turnover Carbohydrate synthesis, modification and turnover Biophysics (e.g. transport mechanisms, bioenergetics, fluorescence) Structural biology (crystallography and EM) Structural biology (NMR) Biochemistry and molecular mechanisms of signal transduction

Primary Area: **Genetics, Genomics, Bioinformatics and Systems Biology**	
Disciplines	Fields of Research
molecular and population genetics, genomics, transcriptomics, proteomics, metabolomics, bioinformatics, computational biology, biostatistics, biological modelling and simulation, systems biology, genetic epidemiology	including but not limited to: Genomics, comparative genomics, functional genomics Transcriptomics Proteomics Metabolomics Glycomics Molecular genetics, reverse genetics and RNAi Quantitative genetics Epigenetics and gene regulation Genetic epidemiology Bioinformatics Computational biology Biostatistics Systems biology Biological systems analysis, modelling and simulation

Primary Area: **Cellular and Developmental Biology**	
Disciplines	Fields of Research
cell biology, cell physiology, signal transduction, organogenesis, developmental genetics, pattern formation in plants and animals, stem cell biology	including but not limited to: Morphology and functional imaging of cells Cell biology and molecular transport mechanisms Cell cycle and division Apoptosis Cell differentiation, physiology and dynamics Organelle biology Cell signalling and cellular interactions Signal transduction Development, developmental genetics, pattern formation and embryology in animals Development, developmental genetics, pattern formation and embryology in plants Cell genetics Stem cell biology

Primary Area: **Physiology, Pathophysiology and Endocrinology**	
Disciplines	Fields of Research
organ physiology, pathophysiology, endocrinology, metabolism, ageing, tumorigenesis, cardiovascular disease, metabolic syndrome	including but not limited to: Organ physiology and pathophysiology Comparative physiology and pathophysiology Endocrinology Ageing Metabolism, biological basis of metabolism related disorders Cancer and its biological basis Cardiovascular diseases Non-communicable diseases (except for neural/psychiatric, immunity-related, metabolism-related disorders, cancer and cardiovascular diseases)

Primary Area: **Neurosciences and Neural Disorders**	
Disciplines	Fields of Research
neurobiology, neuranatomy, neurophysiology, neurochemistry, neuropharmacology, neuroimaging, systems neuroscience, neurological and psychiatric orders	including but not limited to: Neuroanatomy and neurophysiology Molecular and cellular neuroscience Neurochemistry and neuropharmacology Sensory systems (e.g. visual system, auditory system) Mechanisms of pain Developmental neurobiology Cognition (e.g. learning, memory, emotions, speech) Behavioural neuroscience (e.g. sleep, consciousness, handedness) Systems neuroscience Neuroimaging and computational neuroscience Neurological disorders (e.g. Alzheimer's disease, Huntington's disease, Parkinson's disease) Psychiatric disorders (e.g. schizophrenia, autism, Tourette's syndrome, obsessive compulsive disorder, depression, bipolar disorder, attention deficit hyperactivity disorder)

Primary Area: **Immunity and Infection**	
Disciplines	Fields of Research
the immune system and related disorders, infectious agents and diseases, prevention and treatment of infection	including but not limited to: Innate immunity and inflammation Adaptive immunity Phagocytosis and cellular immunity Immunosignalling Immunological memory and tolerance Immunogenetics Microbiology Virology Bacteriology Parasitology Prevention and treatment of infection by pathogens (e.g. vaccination, antibiotics, fungicide) Biological basis of immunity related disorders (e.g. autoimmunity) Veterinary medicine and infectious diseases in animals

Primary Area: **Diagnostics, Therapies, Applied Medical Technology and Public Health**	
Disciplines	Fields of Research
aetiology, diagnosis and treatment of disease, public health, epidemiology, pharmacology, clinical medicine, regenerative medicine, medical ethics	including but not limited to: Medical engineering and technology Imaging for medical diagnostics Pharmacology, pharmacogenomics, drug discovery and design, drug therapy Analgesia and Surgery Toxicology Gene therapy, cell therapy, regenerative medicine Radiation therapy Health services, health care research Public health and epidemiology Environment and health risks, occupational medicine Medical ethics

Primary Area: **Evolutionary, Population and Environmental Biology**	
Disciplines	Fields of Research
evolution, ecology, animal behaviour, population biology, biodiversity, biogeography, marine biology, microbial ecology	including but not limited to: Ecology (theoretical and experimental; population, species and community level) Population biology, population dynamics, population genetics Systems evolution, biological adaptation, phylogenetics, systematics, comparative biology Biodiversity, conservation biology, conservation genetics, invasion biology Evolutionary biology: evolutionary ecology and genetics, co-evolution Biogeography, macro-ecology Animal behaviour Environmental and marine biology Microbial ecology and evolution Species interactions (e.g. food-webs, symbiosis, parasitism, mutualism)

Primary Area: **Applied Life Sciences and Non-Medical Biotechnology**	
Disciplines	Fields of Research
applied plant and animal sciences, food sciences; forestry; industrial, environmental and non-medical biotechnologies, nanotechnologies, bioengineering, synthetic and chemical biology, biomimetics and bioremediation	including but not limited to: Non-medical biotechnology and genetic engineering (including transgenic organisms, recombinant proteins, biosensors, bioreactors, microbiology) Synthetic biology, chemical biology, bio-engineering and nanobiotechnology Animal sciences (including animal husbandry, aquaculture, fisheries, animal welfare) Plant sciences (including crop production, plant breeding, agroecology, soil biology) Food sciences (including food technology, nutrition) Forestry and biomass production (including biofuels) Environmental biotechnology (including bioremediation, biodegradation) Biomimetics Biohazards (including biological containment, biosafety, biosecurity)