**ANNEX 1**

# The Cosmic Vision Plan

The list below indicates the major scientific questions which are then subdivided into topics where important progress can be expected in the Cosmic Vision 2015-2025 timeframe.

## 1. What are the conditions for planet formation and the emergence of life?

### 1.1 From gas and dust to stars and planets

*Map the birth of stars and planets by peering into the highly obscured cocoons where they form*

### 1.2 From exo-planets to biomarkers

*Search for planets around stars other than the Sun, looking for biomarkers in their atmospheres, and image them*

### 1.3 Life and habitability in the Solar System

*Explore in situ the surface and subsurface of the solid bodies in the Solar System most likely to host – or have hosted – life*
*Explore the environmental conditions that make life possible*

## 2. How does the Solar System work?

### 2.1 From the Sun to the edge of the Solar System

*Study the plasma and magnetic field environment around the Earth and around Jupiter, over the Sun's poles, and out to the heliopause where the solar wind meets the interstellar medium*

### 2.2 The giant planets and their environments

*In situ studies of Jupiter, its atmosphere, internal structure and satellites*

### 2.3 Asteroids and other small bodies

*Obtain direct laboratory information by analysing samples from a Near-Earth Object*

## 3. What are the fundamental physical laws of the Universe?

### 3.1 Explore the limits of contemporary physics

*Use stable and weightless environment of space to search for tiny deviations from the standard model of fundamental interactions*

### 3.2 The gravitational wave Universe

*Make a key step toward detecting the gravitational radiation background generated at the Big Bang*

### 3.3 Matter under extreme conditions

*Probe gravity theory in the very strong field environment of black holes and other compact objects, and the state of matter at supra-nuclear energies in neutron stars*

## 4. How did the Universe originate and what is it made of?

### 4.1 The early Universe

*Define the physical processes that led to the inflationary phase in the early Universe, during which a drastic expansion supposedly took place. Investigate the nature and origin of the Dark Energy that is accelerating the expansion of the Universe*

### 4.2 The Universe taking shape

*Find the very first gravitationally-bound structures that were assembled in the Universe – precursors to today's galaxies, groups and clusters of galaxies– and trace their evolution to the current epoch*

### 4.3 The evolving violent Universe

*Trace the formation and evolution of the super-massive black holes at galaxy centres – in relation to galaxy and star formation – and trace the life cycles of matter in the Universe along its history.*

**Note:** A number of these themes have been studied in terms of a mapping to potential embryonic missions through the process of Technology Reference Studies. Details can be found in ESA BR247 as well as at: **http://sci.esa.int/science-e/www/area/index.cfm?fareaid=65**.