

HISTORY EVENTS IN AN INFLATIONARY BIG BANG COSMOLOGY

Time (s)	T_{CBR} (Kelvin)	Reference	Event
THE QUANTUM GRAVITY ERA			
1×10^{-43}	1×10^{32}	KT 72	Quantum limit of classical general relativity
THE INFLATION AND SYMMETRY BREAKING ERA			
1×10^{-38}	1×10^{29}	KT 72	Limit of perturbative interaction thermalization of universe
1×10^{-35}	1×10^{28}	KT 72	Grand unification spontaneous symmetry breaking
1×10^{-34}	1×10^{27}	KT 274	Approximate start of inflation
1×10^{-32}	1×10^{27}	KT 274	Approximate start of reheating and end of inflation
1×10^{-11}	3×10^{15}	KT 72	Electroweak unification spontaneous symmetry breaking
THE QUARK-LEPTON ERA			
2×10^{-7}	2×10^{13}	HA 353	Tauon anti-tauon annihilation
1×10^{-5}	2×10^{12}	KT 72	Formation of hadrons from quarks
7×10^{-5}	1×10^{12}	HA 353	Muon anti-muon annihilation
5×10^{-4}	4×10^{11}	KT 159, 281	By this time the universe has a baryon-antibaryon asymmetry which results from post-inflationary B,C,CP violating processes
1×10^{-1}	3×10^{10}	BS	Neutral current weak interactions become too slow and neutrinos decouple
1×10^0	1×10^{10}	BS	Charged current weak interactions become too slow and the neutron to proton ratio freezes out
1×10^1	5×10^9	BS	Electron positron annihilation
THE RADIATION ERA			
1×10^2	1×10^9	BS	Typical photon energies drop below the deuteron binding energy and nucleosynthesis begins
1×10^3	4×10^8	BS	Particle energies drop below Coulomb barrier energies and nucleosynthesis ends
4×10^{10}	6×10^4	KT 77	Matter density becomes equal to radiation density
THE MATTER ERA			
4×10^{12}	3.5×10^3	KT 78	Electrons and protons recombine into hydrogen atoms
6×10^{12}	3.0×10^3	KT 80	Photon decoupling
2×10^{16}	20	HA 349	Start of the formation of galaxies
8×10^{16}	—	—	Approximate peak epoch of quasar activity
$(X - 1.4 \times 10^{17})$	—	KT 12	Formation of the solar system
$(X - 9.9 \times 10^{16})$	—	HA 390	Emergence of life on Earth
$X \approx 4.7 \times 10^{17}$	2.726	KT 12	Today

These values are rough estimates only. I have taken $\Omega_0=1$, $\Lambda_0=0$, and $h = 1$.

BS=Boesgaard & Steigman, *Annual Reviews of Astronomy and Astrophysics*, **23**, 322

HA=Harrison, *Cosmology: The Science of the Universe*

KT=Kolb & Turner, *The Early Universe*