
RELATIVITY AND COSMOLOGY II

Theoretical Questions

Spring 2013

1) *FLRW*

Metric of a homogeneous and isotropic space.

2) *FLRW*

Friedmann equations

3) *FLRW*

Energy conservation in the expanding Universe

4) *FLRW*

Friedmann equation for a non-relativistic fluid in Newton's theory.

5) *FLRW*

Age of the Universe. Horizon

6) *FLRW*

Einstein's static universe. Universe dominated by radiation, matter and cosmological constant.

7) *Hubble's law and redshift*

Hubble's law and redshift.

8) *Evolution of the universe*

Critical density and abundances. Evolution of the Universe depending on Ω_{mat} and Ω_{Λ} .

9) *Evolution of the universe*

Experimental basis of the Big Bang theory and its predictions.

10) *Thermodynamics*

Evolution of the distribution function

11) *Thermodynamics*

Thermal equilibrium, reaction rate. Freeze out.

12) *Thermodynamics*

Decoupling of photons.

13) *Thermodynamics*

Temperature of neutrinos. Constraints on the maximum mass of neutrinos.

14) *Thermodynamics*

Nucleosynthesis.

15) *Baryogenesis*

The problem of baryon asymmetry of the Universe. Sakharov conditions

16) *Dark matter*

Evidence for dark matter. Constraints on the minimum mass of a fermionic dark matter particle.

17) *Inflation*

Problems of the Big Bang cosmological model

18) *Inflation*

Inflation as a solution for the problems of Big Bang cosmology

19) *Inflation*

Slow roll conditions

20) *Inflation*

Evolution of the modes of a massless scalar field in the inflating Universe

21) *Structure formation*

Growth of perturbations in a static Universe and Jeans mass.

22) *Structure formation*

Growth of perturbations in an expanding Universe.

23) *Beyond the Standard Model*

Beyond the Standard Model problems revealed by cosmology