Physics 102 – Spring 2011 – Recitation module 10

What are the problems with the big bang theory as a stand-alone theory of the evolution of our universe?

What is the basic concept of cosmic inflation?

How does cosmic inflation address the known issues with hot big bang cosmology?

According to the inflationary hot big bang model of the universe, from where does the large-scale structure of the universe originate?

Why is it that scientists refer to “dark matter” as dark?

If we can’t see dark matter, why to many physicists believe it is there?

What evidence exists for the fact that the expansion of the universe appears to be accelerating?

What is meant by “dark energy”?

If you have time, here are some questions from a previous final exam to discuss:

When you drop a ball it accelerates downward at 9.8 m/s^2. If you instead throw it downward, then its acceleration immediately after leaving your hand, assuming no air resistance, is

a) 9.8 m/s^2.
b) more than 9.8 m/s^2.
c) less than 9.8 m/s^2.
d) Cannot say, unless the speed of throw is given.

A moving car hits a mosquito. The evidence of the event is left on the windshield for all to appreciate.

a) The force exerted by the car on the mosquito is greater than the force exerted by the mosquito on the car.
b) The force exerted by the car on the mosquito is less than the force exerted by the mosquito on the car.
c) The force exerted by the car on the mosquito is the same as the force exerted by the mosquito on the car.
d) Nocturnal mosquitoes are made of dark matter and pass right through the windshield

Suppose you suddenly found yourself on a planet with the same mass as Earth but twice the radius. Relative to your weight on Earth, your weight on the new planet would be

a) Two times larger.
b) Two times smaller.
c) Four times larger.
d) Four times smaller.
e) The same.

All of the following are electromagnetic waves EXCEPT

a) radio waves.
b) microwaves.
c) light waves.
d) X-rays.
e) There are no exceptions. All of the above are electromagnetic waves.

The phenomenon of interference occurs for

a) sound waves.
b) light waves.
c) Both of these.
d) Neither of these.

The higgs particle

a) is an as-yet-undiscovered particle that is an important component of the Standard Model of particle physics.
b) is the virtual particle (gauge boson) that conveys the strong nuclear force.
c) is thought to be the underlying cause of the increasing expansion rate of the universe.
d) is a bound state of three quarks.
e) is a form of natural radioactivity emitted by unstable heavy nuclei.

The big bang is thought to have occurred about

a) 5000 years ago.
b) a million years ago.
c) 14 million years ago.
d) 14 billion years ago.
e) 14 trillion years ago.

The equivalence principle

a) claims that accelerated reference frames and gravitational effects are indistinguishable.
b) argues that the fact that life has evolved in our universe places strict limits on the constants of nature.
c) is the name generally given to Einstein's discovery of $E=mc^2$.
d) is the reason that neutrons and protons have almost the same mass.
e) is the name given to the idea that white dwarf stars and brown dwarf stars have masses that are almost the same.

Galaxies are thought to be made mostly of dark matter. Evidence that supports this comes from observations of

a) the redshift in the light from the explosions of distant supernovas
b) the redshift in the light from the earliest galaxies in the universe.
c) both of the above
d) distant quasars.
e) the speeds at which stars and gas clouds orbit the centers of nearby galaxies.

Most meteoroids – rocks moving through outser space – have been moving for billions of years. What, if anything, keeps them moving and why?

a) According to Newton's law of gravity, the force of gravity keeps them moving.
b) According Newton's laws, nothing is needed to keep them moving.
c) According to Newton's law of gravity, nothing is needed to keep them moving.
d) According to current theories about the creation of the universe, the expansion of the universe due to the big bang keeps them moving.
e) According to Newton's law of motion, their own acceleration keeps them moving.