The Big Bang!: Chapter 2.2

Origin of the Universe

- **Big Bang**
  - occurred _____ billion years ago
  - model for the _____

Building a Universe

- _____ _____ _____ not governed by our physical laws or time

- all _____ and _____ contained in one point

-instantaneous filling of _____ with _____ .

Edwin Hubble

- Universe is continuously _____
- Galaxy's velocity is _____ to its _____ (galaxies that are _____ as far from us move _____ as fast)
  - taken every galaxy the_____ to move from a common starting position to its _____

Hubble's Evidence

- Doppler shifting - _____ _____
- Sound of a fire truck siren - pitch of the siren is _____ as the fire truck moves _____ you, and _____ as it moves _____ from you
- Visible wavelengths emitted by objects moving _____ are shifted towards the _____ part of the visible spectrum
- The faster they move away from us, the more they are _____. Thus, _____ is a reasonable way to measure the _____ of an object (this, by the way, is the principal by which _____ measure the speed of a _____ or _____)
- When we observe the redshift of galaxies outside our _____ _____, every galaxy appears to be _____ us - universe is _____.

Evidence for Big Bang

- Red shift - as light from distant galaxies approach earth there is an _____ between _____ and the _____, which leads to _____

_____

- In 1964, _____ and _____, discovered a _____ of extraterrestrial origin that came from all directions at once - _____ _____
- In June _____, scientists detected _____ _____ in the far reaches of the universe - consistent with an important aspect of the Big Bang theory that a mixture of _____ and _____ was created at the beginning of the universe

Building a Universe

When Did the Universe Form?

- _____ to _____ billion years ago (_____)
- **How do we know?**
  - _____
  - _____
  - _____

How old is the universe?

- _____ x _____ = _____
- (_____ of a particular galaxy) / (that galaxy's _____) = (_____)
  - or
- 4.6 x 10^26 cm / 1 x 10^9 cm/sec = 4.6 x 10^17 sec
  - ~ _____ billion years