**The Big Bang Theory…**

* Scientist believe that all matter and energy in the Universe expanded from a point smaller than the period at the end of this sentence.
* Expansion from this hot, dense mass with an incredibly small volume is known as the Big Bang.
* Occurred 13.6-13.8 billion years ago.

**In the Beginning**

* At this first instant of time and space, the Universe was extremely hot, and energy was spreading outward very quickly.
* As the Universe cooled, energy began turning into matter- mainly hydrogen.
* Over hundreds of millions of years, this matter formed clumps, which eventually formed stars and galaxies.
* This is the mostly widely accepted scientific explanation of the origin of the Universe.

**Evidence for the Big Bang**

* In 1965 two scientists (Penzias & Wilson), accidentally discovered that radiation was coming from all directions in the Universe.
* This was determined to be remnants of the energy released by the initial expansion of space.
* “Background microwave radiation” measures temperature imprints of the beginning of structure in the Universe (like fossils are an imprint of past life on Earth).
* The first stars began to shine about 200 to 300 million years AFTER the Big Bang.

**Homework – pg. 397 #5, 6, 8, 9, 10**

**Challenges of space travel**

*Engineers and scientists perform the difficult job of designing space crafts that safely take humans to their celestial destinations. The following are some of the major obstacles that must be tackled*

1. Getting in to space
2. Feeling of “weightlessness”
3. Health Risks
4. Space Junk
5. **Getting into space**

* Space shuttles must be equipped with powerful rockets in order to get past Earth’s atmosphere   
  and gravitational pull.
* To maintain orbit, the shuttle must travel at precisely the right speed, and the right height based on the weight of the space craft, the duration of the mission, the distance the crew must travel- MANY calculations
* VERY EXPENSIVE

1. **Feeling of weightlessness**

* Objects and people are weightless for the duration of the voyage.
* Microgravity environment with a very weak gravity causing unsecured objects to float.

1. **Health Risks**

* The human body relies the force of gravity to assist in   
  its functions.
* **Microgravity can cause:**

- dizziness, disorientation, dehydration, and nausea

-“ A Puffy-face bird-leg syndrome”, blood pools in the upper part of the body and legs lose muscle mass.

-Muscles and bones weaken in space

-Spinal column expands in space resulting in 2-8cm extra height which can cause back pain

- Exposure to very high levels of radiation from the Sun

**4. Space Junk**

* Broken or out-dated satellites are left behind
* Astronauts sometimes lose their tools in space- OPPS!
* Space debris can fall back to Earth, may be an impact risk if the material doesn’t burn up.
* Space junk can be dangerous for space shuttle as they launch into outer space.

**The Future of Space Exploration**

**The Moon:**   
a testing ground for mars exploration

* GOAL: To send a human-occupied spacecraft to Mars to explore its surface
* In 2020 we will use the Moon (which is similar to Mars and MUCH closer), to spend extended   
  periods of time on the surface in preparation for the voyage to Mars

**Space Tourism**

* 2001 World’s first tourist launches into space
* A week-long trip into space = $30 million
* There may be more affordable 2.5 hour suborbital trips from companies in Canada, US, and England

**The space elevator**

* Elevator anchored to a ship on Earth extending 36 000 km into space
* A counterweight keeps the cable taunt and climber car will be used to move cargo, satellites or people into orbit
* Approx. $10 billion to build the proposed Space Elevator
* Not possible quite yet:

- no cable strong enough to stretch from Earth to Space

- not enough energy can be provided to the climber yet to

fight the continual pull of gravity

- could change Earth’s rotation.