Space Unit – Homework Answers

8.1 Touring Night Sky # 1-9

1	Astronomers study space, what is beyond Earth.
2	The sun is luminous. It is luminous because it produces its own light (it is a burning ball of gas). A candle is luminous too but we humans are NOT luminous. We are non-luminous just like the moon (see question #3).
3	The moon does not produce its own light and yet we see it. We see it because the sun's light REFLECTS off the moon and we see this reflected light.
4	Terrestrial planets are rocky planets. Mercury, Venus, Earth and Mars are the terrestrial (inner) planets. Gas Giants are Jupiter, Saturn, Uranus and Neptune. These are very large and made of gas only. They are the 4 outer planets.
5	Stars are different than planets in that stars are luminous and planets are non-luminous. They are similar in that they are both celestial objects. Also a star is a ball of (burning) gas and some planets are gaseous planets.
6	A celestial objects that travels around a planet (or dwarf planet) is called a satellite.
7	The circular path a celestial object takes is called an orbit. The moon circles around earth. It's path is called an 'orbit'.
8	We are in a collection of stars called the 'Milky Way'.
9	Biggest: universe → galaxy → star → planet → moon

8.3 Our Solar System p. 317 # 6, 9

3	Evidence that meteorites have hit earth include the strangely shaped round lake in Quebec (Lake Manicouagan). This meteorite was believed to be 5 km in diameter! Also the Sudbury Basin where we now mine a lot of nickel. Sometimes we find meteorites too (Fig. 4 on page 315.)
6	a) Distances are so HUGE in space that using kilometers is just not feasible. Astronomers use a bigger unit for our solar system – the astronomical unit (AU). 1 AU is the distance from our Earth to the Sun. b) 1 AU = 150,000,000 km
9	Comets orbit the sun. They are really 'dirty snowballs'; they are frozen iceballs covered with dust. Comets have 'tails'. One tail is the trail of dust left behind as it moves through space quickly. The other tail is the ice changing to gas as the comet nears the sun and it begins to melt!

9.1 – Lightyears p. 369 # 1,2,3,7,9

1 light year = 9.46×10^{15} m …or…. 1 light year = 9.46×10^{12} km

1 AU = 1.5×10^{11} m (and 1 km = 1000 m)

1	Astronomers use 'light years' to measure distance because things are SO FAR apart in the universe.
2	$600\ \cancel{ly} \times \frac{9.46 \times 10^{12}\ km}{1\ \cancel{ly}} = 5.7 \times 10^{15}$ km
3	$4.07 \times 10^{15}\ \cancel{km} \times \frac{1\ ly}{9.46 \times 10^{12}\ \cancel{km}} = 430$ ly
7	$9.18 \times 10^{12}\ \cancel{m} \times \frac{1\ AU}{1.5 \times 10^{11}\ \cancel{m}} = 61$ AU
9	A lightyear is actually a unit of distance. It is the distance that light can travel in a year through a vacuum (deep space). A lightyear is HUGE! 1 lightyear (ly) is equal to 9.46×10^{12} km. Since objects are very far apart in space, this is a helpful unit. For example, The closest star to us other than our own sun, is Proxima Centauri. It is over 4 lightyears away or 4.01×10^{13} km away!

8.5, 8.6 Motion of Stars p. 328 # 1,2,5,6,9, 13

1	Orbital radius is the distance from the planet to the sun. The planets farthest away have the greatest orbital radii (plural of radius). So the Gas Giants have the greatest orbital radii. See Fig. 2 on page 320 for an visual explanation of orbital radius.
2	A 'day' for us on Earth means one period of dark (night time) and one period of light (day time). This happens because Earth spins on its axis like a spinning top….only not so fast. When we are facing the sun, we have daylight. When we keep spinning and end up not facing the sun but deep space, it is night time and dark. This takes 24 hours to occur once.
5	a) Gravitational force keeps the moon orbiting Earth. Without gravity, the moon would fly off into deep space. b) We understand that the Earth pulls objects towards it. Anytime we drop an object, it falls towards Earth (gravity!) c) Although it is not explained in your textbook, Sir Isaac NEWTON first explained gravity. Galileo strongly put forth the heliocentric model of the solar system but he did not have an understanding of gravity.
6	Polaris is situated above Earth's axis of rotation above our north pole. Thus it is also called the 'North Star'
9	Our Earth spins on its axis but on a slight slant. In the our winter, the northern hemisphere is tipped maximally AWAY from the sun so it receives less heat energy and is colder. When it is MOST inclined AWAY from sun we have the **winter solstice** and we experience the **longest night** of the year. When the earth is MOST

	inclined TOWARDS the sun we have **summer solstice** and we experience the **longest day of the year.**
13	Eclipses happen when one celestial objects blocks or darkens the view of another from earth. A **solar eclipse** happens when the moon is directly between earth and the sun. The sun looks odd to us on earth. See Figure 13. A **lunar eclipse** happens when Earth is positioned between the sun and the moon. The moon looks odd to us on earth. The moon is in a complete shadow but because of a light phenomenon called refraction, the moon often appears red! See Fig. 15.

8.11 Satellites / orbits p. 351 # 1,2,3,9

1	An artificial satellite is one made by humans, for example, a GPS satellite. A natural satellite is NOT made by humans, for example, the moon.
2	3 ways satellites benefit humans: simply choose favourite examples from 8.11. For example: Low orbit RADARSAT satellites monitor natural events such as iceberhg flows and agricultural patterns in Africa. Medium orbit satellites include GPS systems which help us locate ourselves on earth. Higher geostationary satellites are useful for communications.
3	a) In 1957 the Soviet Union launched the first satellite: *Sputnik*. b) In 1962 Canada launched its satellite, *Alouette 1*.
9	GPS → stands for Global Positioning System and it is used for precisely finding your location on earth.

9.4 Star Life Cycle p. 382 # 3, 4

3	Our sun is in the 'main sequence' and its surface is medium hot (about 6000 C), it is medium bright (about +4) and is yellow in colour.
4	a) A black hole will form only as an EXTREMEMLY LARGE star dies. It is the size of the star (sun) that determines whether a black hole forms or not. b) Our sun is not an extremely large star, so it will NOT form a black hole when it dies. It will form a white dwarf as it is a small-medium size star.

9.7 Origin of Universe p. 397 # 1, 2, 5, 8, 10

1	Red shift from distant galaxies tells us these galaxies are moving AWAY from us. This helps support the theory that the universe is expanding and moving away from us.
2	Hubble discovered the first galaxy other than our own Milky Way: he discovered the Andromeda Galaxy. He discovered each galaxy emits its own distinctive spectrum of light and Andromeda's (and other galaxy's) were red-shifted, meaning they are moving away from us. Hubble determined the universe was expanding

	which is what Albert Einstein's equations initially predicted.
5	According to the Big Bang Theory, the universe began 13.6 to 13.8 billion years ago. Georges Lemaitre was the first to suggest this.
8	In 1965, a large antenna in New Jersey kept detecting radiation from all directions in the universe. This was annoying but it was determined that this was the remains of energy release at the 'Big Bang'. In 1989, physicists measured Cosmic Background radiation – from the Big Bang using the COBE satellite. In 2001, the WMAP satellite (by Nasa) also collected data to support Big Bang.
10	It is predicted that Dark Energy (which is pulling universe apart) will increase and pull apart all galaxies, leaving cold, empty space.

9.4, 9.7 Cool Stuff! Black holes & Dark Energy p. 397 #4, p. 382 #9

p. 397 #4	Although we have not seen Dark Energy, we feel the expansion of the universe should slow down as it expands and gravity would pull it back together. This is not happening, so it is theorized that there is a force working against gravity: Dark Energy. • Gravity pulls matter together whereas Dark Energy pulls it apart.
p. 382 #9	Mather & Smoot tried to figure out what happened in first few moments after Big Bang. Mather designed the Cosmic Background Explorer (COBE) which looked for evidence of microwave radiation, indicating a Big Bang. **Basically know that microwave radiation far far away helps support the Big Bang Theory as it was created at the moment of the Big Bang.