# 4. Astrophysics

## 8.1 (units)

- kilogram(kg)
- meter(m)
- meters per second (m/s)
- meters per second squared (m/s^2)
- Newtons (N)
- seconds (s)
- Newton per kilogram (N/kg)

## 8.2

- universe - large collection of billions of galaxies
- galaxy - large collection of billions of stars
- Milky Way galaxy - our galaxy

## 8.3

### Gravitational field strength (g) varies in different on other planets and the Moon because of the size/mass of the planets

## 8.4

### Gravitational force:

- causes moon to orbit planets
- causes the planets to orbit the sun
- causes artificial satellites to orbit the Earth
- causes comets to orbit the sun

## 8.5

### Moons and planets have a circular orbit and comets have an oval, unstable orbit

## 8.6

### orbital speed = (2 x π x orbital radius)/time period

v = (2 x π x r)/t

## 8.7

### Larger stars are brighter than smaller stars

## 8.8

### Star's color changes depending on their surface temperature

- higher temperature stars have blue color
- lower temperature stars have red color

## 8.9

### Evolution of stars of similar mass to the Sun:

- Nebula
- Protostar
- star (main sequence)
- red giant
- white dwarf

## 8.10

### Evolution of stars much large than the sun:

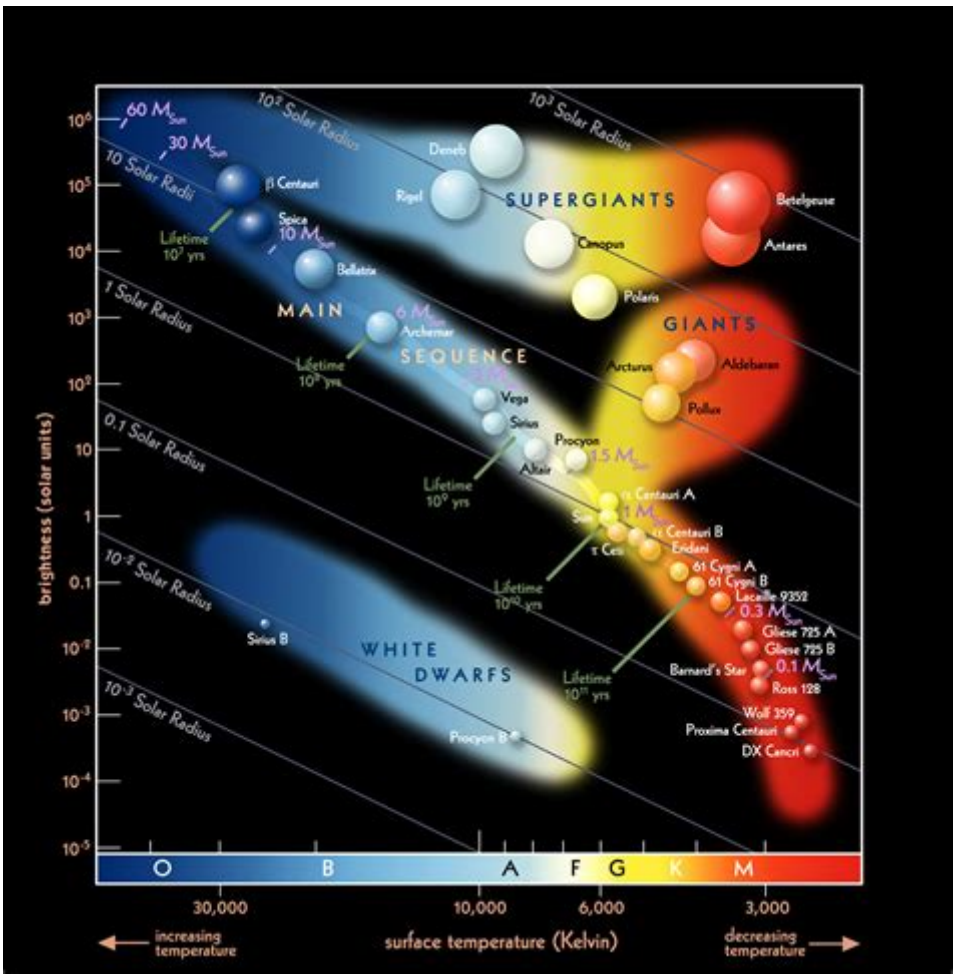
- Nebula
- Protostar
- star (main sequence)
- red super giant
- black hole or neutron star

## 8.11

### Brightness of a star at a standard distance can be represented using absolute magnitude

## 8.12

### Hertzsprung-Russel diagram (HR diagram)




## 8.13

### Big bang theory says that the universe originated billions of years ago in a rapid expansion from a single point of nearly infinite energy density

## 8.14

### Evidence that supports the Big Bang Theory:

- red-shift
- cosmic microwave background radiation

## 8.15

### If a wave source is moving relative to an observer there will be a change in the observed frequency and wavelength. Stars can be classified according to their color as red shift or blue shift because of the Doppler Effect

- Blue shift means the starts are moving closer
- Red shift means the stars are moving away

## 8.16

### (Change in wavelength)/(reference wavelength) = (velocity of a galaxy)/(speed of light)

$(\lambda - \lambda o)/\lambda o = \Delta\lambda/\lambda o = v/c$

## 8.18

### Red-shift of galaxies provide evidence for the expansion of the universe because it indicates that galaxies are moving away