



QUIZ STUDY GUIDE

StellarXplorers Qualifying Round 2 (QR2)

The Qualifying Round 2 (QR2) Quiz will come from Chapter 12, Sections 12.1, and Chapter 13, Sections 13.1, 13.2, 13.3, 13.4, and 13.5 in the *Understanding Space* textbook. The correct answers will be based on information found in the textbook.

CHAPTER 12

Section 12.1

- Know the various frequency and wavelength bands for the Electromagnetic (EM) radiation spectrum.
- Know how the wavelength and frequency are related for Electromagnetic (EM) radiation.
- Know how the energy in Electromagnetic (EM) radiation related to frequency.
- Know the definition of an atmospheric window and know the most notable atmospheric windows.
- Know how Electromagnetic (EM) radiation allows humans to see colors, such as grass appearing green.
- Know how the total energy output of radiation is related to temperature using the Stephan-Boltzmann equation.
- Know the definitions of Field-of-Regard (FOR) and Field-of-View (FOV).
- Know how cameras and telescopes collect light energy.
- Know how a radio frequency antenna collects Electromagnetic (EM) energy.
- Know the definition of angular resolution (Θ) and how it is related to wavelength and lens aperture.
- Know the common uses for the following technologies: Charge-Couple Device (CCD) and Complementary Metal-Oxide Semiconductor (CMOS).

CHAPTER 13

Section 13.1

- Know the technical requirements which constrain on the range of frequencies we use on certain missions, such as transmitting signals from a spacecraft to the ground.
- Know the definitions of Antenna Gain (G) and Effective Isotropic Radiated Power (EIRP).
- Know the ways to increase the Signal-to-Noise Ratio (S/N).
- Know the definitions of a transducer and a data bus.
- Know how the amount of software code has grown when the Mariner-6 spacecraft was launched in 1969 through the Mars Science Lab, Curiosity 40 years later.
- Know how the Nyquist Criterion is used to represent an analog signal as a digital value.
- Know the definition of data budget.

Section 13.2

- Know the definitions of voltage, current, charge, and electrical potential.
- Know typical values of Solar Cell Efficiency, η , for different types of solar cells.

- Know the definition of Depth-of-discharge (DOD) and how it varies with the altitude of the spacecraft's orbit.
- Know the advantages and disadvantages of using fuel cells to generate electrical power.

Section 13.3

- Know the definition of albedo.
- Know the most effective long-term method for ejecting heat.
- Know how different types of passive and active thermal control systems, such as flash evaporators, Multi-Layer Insulation (MLI), and heat pipes, are used for thermal control on spacecraft.

Section 13.4

- Know the procedures astronauts use to prevent potential decompression problems during Extravehicular Activity (EVA or spacewalk).
- Know the water requirements for astronauts.
- Know the Habitable Volume Limits per crew member based on mission duration.
- Know the approximate amount of water NASA's Water Recovery System (WRS) recycles.

Section 13.5

- Know the definition of dry mass and typically values for a spacecraft structure.
- Know the definitions of stress, strain, and shear.
- Know the definitions of Proportional Limit, Yield Point, Ultimate Tensile Strength, and Failure Point.
- Know the purpose of different types of models, such as Proto-Flight Model, Qualification Model, and Flight Model.