Ancient View of the Earth and Science Advancement
- Aristotle – Geocentric Universe model
- Eratosthenes - measured Earth’s circumference
- Geography Begins – Hipparchus, Phei Hsui, Ptolemy
- The Great Interruption – Geography of the Imagination
- Three Hallmarks of Science
- Main accomplishments of: Copernicus, Tycho, Kepler, Galileo, Newton, Maxwell, Einstein
- What was view of space-time from Newton? Einstein?

Viking Era
- Fall of Rome and Great German Migration
- Byzantine Empire (Eastern Europe) and Carolingian Empire (Western Europe)
- Charlemagne’s Death – formation of modern Western Europe
- Development of a Knorr (ship technology, what was new and critical?)
- Viking Raids in England and France
- Vikings spread throughout Russia to Constantinople to all of Europe
- Viking Excursions to Iceland, Greenland, and Vinland (North America!)
- Assimilation of Vikings via Christianity and Monarchy Governments
- Mediterranean Trade Route Monopoly – Venice, Pisa, Genoa

Paths to the East
- Crusades
- Christian Missions / Muslim Pilgrims
- The Silk Road
- The Mongols – their empire, the iron curtain comes down (opens) - consequences
- Marco Polo – travels and how story became known
- Chinese Rebellion – Yuan hang and moon cookies
- The fall of the Mongols
- The Iron curtain comes back up (closes)- consequences

The 1300s Onward
- Ptolemy’s map of the world revised
- Fra Mauro’s map of the world, significance
- Why the Portuguese went forth to the seas first (4 reasons)
- Prince Henry the Navigator – and his components of modern research center
- Development of the Caravel (ship technology- what was new and critical?)
- Significance of Cape Bajador
- King Alfonso V, King John II, King Manual I (what did each contribute?)
- Bartholomeu Dias voyages – purpose, accomplishments
- Vasco da Gama voyages – why voyage delayed for 10 years, purpose, accomplishments
- Columbus voyages and accomplishments
- The Portuguese - Spanish cold war – Treaty of Tordesillas, Treaty of Zaragoza
The Chinese and Arabs
- Why not the Arabs?
- China- eunuchs versus intellectuals and power structure of government
- Cheng Ho (Zheng He) voyages – purpose, accomplishments
- Chinese Tributary System
- The Great Retreat, why did it happen?
- A Nation without Wants – consequences of Retreat and Isolationism of China

Putting it altogether. Short Essay Question to Integrate, Compare, and Contrast
Be prepared to compare and contrast the subsequent history of the world based upon the sea-faring programs of the Vikings and Europeans (conquest), those of the Chinese (tributary system), and the lack of such programs by the Muslims. What is meant by the professor’s phrase “Go forth, or be carved up!”? Be prepared to discuss why (the long-term implications) we are studying these examples of world history in view of the last remaining voyages of discovery – in space!

THE BELOW MATERIAL WAS NOT COVERED ON MIDTERM 1 BUT WILL BE ON THE FINAL EXAM

Sea Paths to Everywhere
Ptolemy’s geographic mistakes that Columbus used to sell is Enterprise to the Indies
Columbus’s discoveries and voyages
Amerigo Vespucci – purpose, voyages
Ferdinand Magellan – purposes, voyages
Captain Cook – voyages, science, accomplishments with scurvy
Knowledge becomes Merchandise, examples
Political climate – secrecy reigns, examples

Consider the “hubs” of infrastructure of communications (internet), transportations systems (roads, airs, shipping), and economic “health” – where are they geographically? Why are they located where they are? Think about how such infrastructures and hubs would be established throughout the solar system depending upon how exploration of the final frontier might play out. Which planets or moons do you think will be hubs of economic commerce, transportation, and information connectivity in the next 100 years? Why do you think those planets and/or moons will be the hubs?

PART 2

Rocket Pioneers and Space Task Force Peeps
- Konstantin Tsiolkovski
- Robert Goddard
- Herman Oberth
- Von Braun
- Sergei Korolev
- John Houbolt
Space Race
• Sputnik
• Explorer – what it discovered
• V-2 rocket – original use, role on post war rocket development
• Project Paperclip
• R-7 rocket – original use, role in space race
• Why Russians had heavier lifting capability than US in the beginning
• Founding of NASA, goals
• Significance of Space Race in the Cold War

Cold War
• Who was Russian leader when Sputnik launched? US President?
• Formation of NASA from NACA, why from NACA, who formed NASA?
• NATO vs Warsaw Pact
• Cold War Politics and Space Race (what were political goals of Space Race)
• Describe the circumstances that lead Kennedy to challenge the Russians... why was showing technological superiority to the world so important for the US and USSR?

Mercury Missions
• What were the goals of Project Mercury?
• How many Mercury astronauts were there and who were they?
• How many Mercury flights were there?
• Who was the first man in space? The first American?
• Who was the first man to orbit earth? First American?
• What was different about the first two Mercury flights?
• Which Mercury astronaut did not fly a Mercury mission? Why?
• At what stage in the Mercury Program did Kennedy direct NASA to the moon?

Gemini Missions
• What were the original goals of Project Gemini? Which goal was not accomplished?
• What was the goal added later?
• Who was the first man to do an EVA? First American?
• Know which mission accomplished which of the main goals of Gemini
• What was the Agena spacecraft used for?
• Which goal of Gemini turned out to be very dangerous and was difficult to attain

Apollo Missions
• What were the mission goals of the Apollo Project?
• What was the mode that was chosen and what were the other possible modes?
• What year did a manned Apollo mission first fly? Last moon shot? Last mission?
• Basic Mission Profiles of Apollo 1, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17
• Apollo/Soyuz Mission
• How many manned Apollo missions were there? How many men flew to the moon? How many men flew to the moon twice? How many men walked on the moon?
There are several milestones in an Apollo mission. Know their order and *where in the flight trajectory* they take place (given below)

1. launch
2. translunar injection burn (TLI)
3. docking with and extraction of the LEM
4. passive thermal control (PTC)
5. lunar orbit insertion (LOI)
6. LEM powered descent
7. Walk on the moon (EVA)
8. lunar liftoff (ascent stage of LEM)
9. lunar orbit rendezvous (LOR) and docking of CM and LEM
10. cast off LEM
11. trans-earth injection burn (TEI)
12. passive thermal control (PTC) again
13. jettison SM from CM
14. reentry

**Soviet/Russian Missions/Program**
- Identify at least three Soviet “firsts” in the Space Race
- Who was the “Chief Designer”? Who are Glushko and Mishin?
- Know somethings about Urey Gagarin, Vladimir Komarov, Alexy Leonov
- Soviet Space Accidents
- The N1 rocket, the three moon programs, timeline for men to the moon
- What event(s) derailed the Soviets and ended their moon landing program?
- Apollo-Soyuz mission
- Salyut and Mir Space Stations
- Buran
- Russian Space Agency, challenges of forming
- Roscosmos and their future plans

**Chinese Space Program**
- CNSA Logo
- Qian Xuesen – the King of Rocketry
- Dongfangong I
- Manned Mission, Shenzou 5, 9, 11
- Yang Liwei, Liu Yang
- Tiangong-1, Tiangong-2, Tiagong-3
- Chang’e 1, 2, 3, 4, 5
- Yutu

**New Space**
- Asgardia, the Space Nation – what is it and why was it formed?
- SpaceX, some accomplishments, plans, Elon Musk
- Blue Origin, some accomplishments, plans, Jeff Besos
- Virgin Galactic, some accomplishments, plans, Sir Richard Branson
- Mars One, plans and purpose of mission