

Part II: Questions for Lecture Videos

The lecture video questions are designed to help you identify important points made by the videos and to help you take notes on their content. You do not need to turn in answers to the questions, but answering them will help you study for exam questions over the lecture videos.

Light Speed

1. List some important developments in the history of communication. When was the idea of sending voice via light first proposed and accomplished?
2. How does a radio work? What role does the radio broadcast frequency play?
3. What is the significance of coaxial cable? of Telstar? of the laser?
4. For what medical purpose were the first fiber optic bundles developed? What were the problems with bundling many fibers together and what was the solution?
5. Why couldn't the techniques used in making fibers for endoscopes work for making fiber optics for communications? How were researchers able to make fiber optic cables that transmit light over long distances?
6. How are fiber optic cables made today? How much information can they carry compared to copper wires? How widespread is their use?
7. What new medical use for fiber optics is shown in the video?

Empire of the Air: The Men Who Made Radio

1. What were Guglielmo Marconi's contributions to the advancement of Radio?
2. What were Lee de Forest's contributions to the advancement of radio?
3. What were Edwin Howard Armstrong's contributions to the advancement of radio?
4. What were David Sarnoff's contributions to the advancement of radio?
5. What role did radio play in the titanic disaster? . . . in the World Wars? . . . in the U.S. during the great depression?
6. What is "broadcasting"? Was radio originally used for broadcasting? Was radio first broadcast as AM or FM?
7. Why did Armstrong work on developing FM radio? Was Sarnoff pleased with Armstrong's new FM system? Were Armstrong's FM frequencies used for television broadcasting? Why or why not?
8. How did legal battles between the pioneers of radio affect the inventors and their inventions?

Cadillac Desert

This video consists of two parts. The first part describes Los Angeles water system superintendent William Mulholland's struggle to meet the demands on the city's water supply. The second part discusses the dams built on the Colorado River to supply water and hydroelectric power to the southwestern United States.

1. Did the Los Angeles area originally have abundant natural water sources? Were palm trees native to Los Angeles? To what extent did the city's elaborate waterworks allow for or encourage an explosive increase in the population of L.A.?
2. Would the Owens River aqueduct require energy to pump it to L.A. or would it run by gravity? What happened to Owens Lake?
3. How accurate were Mulholland's predictions of how long his latest water source would adequately serve the city? Why?
4. List some of the problems and setbacks Mulholland faced to acquire sources of water, to build aqueducts to bring water to L.A., and to build reservoirs to store the water supply.
5. What problems did L.A.'s thirst for water cause for people in surrounding areas? How did they react to L.A.'s water projects?
6. What ultimately happened to Mono Lake?
7. Did early explorers believe the Colorado River would be controlled? How many people or cities rely on the Colorado River for water or hydroelectricity?
8. How did the building of Hoover Dam (also called Boulder Dam) and other dams change the Colorado River?
9. (Note: Lake Powell is the reservoir constructed upstream from Glen Canyon Dam.) What was the main reason for building Glen Canyon Dam? Why was it controversial? Commissioner Floyd Dominy mentioned that hydroelectric energy is the only pollution-free energy source. Do you agree?
10. What marked the end of the dam-building era in the western U.S.?
11. Does the Colorado River reach the Pacific Ocean anymore? It's been said that if any river water reaches the ocean, that water has been wasted. Do you agree?

NOVA: Absolute Zero

1. In the 17th century, cold was believed to be a substance that objects took in as they cooled and expelled as they warmed. How did Robert Boyle disprove this belief? How did Boyle relate temperature and motion? What tool did Boyle need to continue his studies of temperature?
2. What events in nature did Gabriel Fahrenheit use to fix points on his thermometer? How did he reduce the size of thermometers? What improvement to the thermometer scale did Anders Celsius make?
3. When Michael Faraday heated chlorine hydrate in a sealed tube what appeared in the opposite, cooled end of the tube? What caused it to liquefy? What happened to this liquid when the tube was broken? What happened to the temperature of the surrounding air when the tube was broken?
4. What did Frederick Tudor sell from his New England farm that made him rich? Why was New England called “the refrigerator capitol of the world”? As explained in the video, what physical property of ice made it slow to melt?
5. The French scientist, Sadi Carnot, believed that circulating heat produced mechanical motion in a machine. How did James Joule’s understanding of heat and mechanical motion differ from Carnot’s understanding? What happened when Joule turned paddles in a drum of water? What did his sensitive brewer’s thermometer allow to be measured for the first time?
6. William Thompson (who was later known as Lord Kelvin) combined the ideas of Joule and Carnot into two laws of thermodynamics. What does the first law, which was based on the work of Joule, state? What does the second law, which was based on the ideas of Carnot, state?
7. In the process of making ice, what happens when pistons compress ammonia gas? What happens when liquid ammonia is pumped into condenser coils? What happens when the pressure on the liquid ammonia is reduced? Why was ice formed in the tanks? How did this invention improve the diets of city-dwellers?
8. While on a 1912 fishing trip to Labrador where the temperature dipped to minus 40 degrees Fahrenheit, what did Clarence Birdseye notice about the fish caught? What is the difference between slow freezing and fast freezing of foods? What industry followed from Birdseye’s observations?
9. What changes to home life and city structure resulted from the advent of refrigeration and air conditioning?

Global Warming: The Signs and the Science

1. What are some of the signs or evidence that global warming is occurring?
2. What is the greenhouse effect? List several important greenhouse gasses.
3. What is the meaning of "current sunlight" and "ancient sunlight?"
4. What are the sources of atmospheric carbon dioxide? What are the past, present and predicted levels of carbon dioxide in the atmosphere?
5. What role does population play in global warming? What role do large cities play?
6. How could higher levels of carbon dioxide affect allergens and viruses that affect human health?
7. What is El Nino and how might global warming affect it?
8. How could global warming affect sea levels? What damage could be caused by changes in sea levels?
9. How might global warming affect agriculture and the world's food supply?
10. What role might nitrogen play in increasing atmospheric carbon dioxide levels?
11. What is the conveyer belt model of the ocean? How could global warming bring about a sudden decrease in temperatures in North America and Europe?
12. What is the Kyoto Protocol? What is its significance?

13. What are some of the ways we can conserve energy and reduce our use of fossil fuels to slow global warming?

The Mighty Atom/ Nova: Suicide Mission to Chernobyl

1. The 1968 film made many predictions about the future uses of nuclear power and radiation. List these predictions. Which ones have come true? Which ones seem incredible to us today?
2. What did the 1968 film predict in regard to breeder reactors? . . . in regard to fusion reactors? What was meant by "burning the sea" and "the new stone age"?
3. Where is the Chernobyl power plant? What happened there on April 26, 1986? What was the cause of the accident?
4. What was the main concern immediately after the accident? What was done in an attempt to take care of this?
5. How were graphite blocks and other radioactive debris cleared from the reactor roof? What is a "bio-robot"?
6. What is the "sarcophagus"? Is it completely air tight? Is it expected to last for a long time?
7. What happened to the radioactive plume of dust immediately after the accident? What estimates were given for an increase in premature deaths as a result of the Chernobyl accident?
8. What was the complex expedition team trying to determine during the mission shown in the video?
9. What was the "elephant's foot" and how did it form? What methods were used to study it and other areas around the reactor?
10. What did explorers find when they looked inside the reactor and the room under the reactor? What happened to the missing fuel?
11. Presently, what is the greatest danger at Chernobyl? What is the significance of the current position of the reactor lid? What options were given for addressing this problem?

Origins: Back to the Beginning

1. What did Robert Wilson and Arno Penzias discover coming from empty space? What theory were David Wilkinson and the Princeton team trying to prove? What is the origin of the microwave background?
2. What was the COBE satellite designed to detect? What did images from the COBE satellite show about the early Universe? What was the limitation of the COBE data?
3. How did the Cosmic Background Imager search for non-uniformity in the microwave background? Why was it located at a high altitude in the Andes Mountains? What did the Cosmic Background Imager data reveal?
4. Why was the location of the WMAP satellite's orbit so important? What did data from the WMAP satellite show? What age of the Universe did the WMAP data indicate?
5. What is the origin of elements heavier than hydrogen and helium? What happens when a star builds up too much iron?
6. What was the significance of the picture taken by the Hubble telescope of the Eagle nebula? How do conditions in the Eagle nebula (the mix of heavy elements) compare to conditions in the Sun?
7. What can the spectrograph used by Sandra Farber at the Keck Observatory in Hawaii reveal about galaxies? Does the spectrograph data from the Deep Survey indicate that the Universe is hospitable to life? What does the study of cosmic origins tell us?

NOVA: Solar Energy: Saved by the Sun

10. How does a solar cell work? What can happen when photons of sunlight strike silicon atoms in the middle layer of the solar cell “sandwich”?
11. What is “net metering”? What can happen to any excess electricity that is produced by home solar panels that is not used by the homeowner?
12. When do power blackouts occur? What did the power grid managers in Los Angeles do to avoid blackouts?
13. At the world’s largest solar generating plant in Kramer Junction, CA, what is used to collect solar energy instead of solar panels? How does the heated synthetic oil produce electricity?
14. Germany appears very likely to reach its goal of producing 20% of its electricity from solar and other renewable sources by the year 2020. How does Germany encourage the use of solar cells?
15. How do multi-junction solar cells differ from traditional solar cells? How are multi-junction solar cells used on Mars?
16. What are some features that make Amery Lovens’ house in Colorado so energy efficient?