Film

**Asteroids: Deadly Impact**

**Objectives**
- The discovery of impact cratering processes
- Identification of impact craters from mineralogical, petrological, and geochemical evidence
- The source, process, and consequences of impact cratering in the solar system

**Questions**

1. How often does the Earth get hit by a km-size impactor?
   - A. Once every century
   - B. Once every 76 years
   - C. A couple of times every million years
   - D. A couple of times every billion years

2. What is mysterious about Tunguska? How was the mystery solved?

3. What experience did Eugene Shoemaker have that made him suspect that Meteor Crater may be an impact crater, instead of a volcanic crater?

4. What evidence did Eugene Shoemaker find to prove that Meteor Crater was formed by impact?

5. Why did Eugene Shoemaker want to go to the Moon? Why did he go to the Lowell Observatory in the Halimer Mountain instead?

6. What did Jack Schmidt, one of the Apollo 17 astronauts, find on the Moon?

7. Shoemaker-Levy 9 is a
   - A. Asteroid
   - B. Comet
   - C. Small satellite of Jupiter
   - D. Meteorite

8. What is special about March 23, 1993?

9. What observation finally removed any lingering doubts people had about impact cratering process?

10. What are the adverse effects a large impact on Earth may have on us, according to the film?
Advanced Questions
1, How much energy (in joule) does a km-sized impactor release when it strikes the Earth’s
surface at the speed of 10 km/s? How many megaton TNT is it equivalent to? How many nuclear
bombs is it equivalent to?
*note: requires research.*
2, Why is the atmosphere important for the human beings on Earth?

Keys
1, C
2, In 1906, an impact was witnessed near the Tunguska River in Siberia. Two decades later,
scientists went to look for the impactor but nothing was found. Dr. Shoemaker proposed that the
impactor disintegrated, thus resolving the mystery.
3, Dr. Shoemaker’s experience with underground nuclear explosions in Nevada led him to
suspect that Meteor Crater may be formed by a similar process.
4, He found shock-melted glass and coesite (high-pressure form of Quartz formed under shock
wave), which provide conclusive evidence for impact process.
5, He wanted to look for fresh craters on the Moon. Because of health reasons, he didn’t make it
to the Moon. However, using the “Little Eye” at the Lowell Observatory, he could look for
“bullet in the sky” (the potential impactors) instead of the “scars” (the impact craters).
6, Schmidt found pits in lunar samples. These are microcraters formed by impacts.
7, B
8, Shoemaker-Levy 9 Comet was discovered on this day and was expected to hit Jupiter the next
year.
9, Using Hubble Space Telescope, an actual impact on Jupiter by Shoemaker-Levy 9 Comet was
observed in 1994. This observation finally removed any lingering doubts people still had about
impact cratering process.
10, In the film, dark clouds, high temperature, and mass hysteria are mentioned.