

Name \_\_\_\_\_ Section \_\_\_\_\_

## Activity 17: Nuclear Energy Use

As you watch the videos in class today, look for a pro-nuclear or anti-nuclear bias on the part of the video producers, narrators, and interviewers. Which ones had a very evident bias?

### 17.1 Electrical Energy from Nuclear Reactors

#### 1) Fission Reactions

- a) What happens to a uranium-235 ( $^{235}_{92}\text{U}$ ) nucleus during a fission reaction?
- b) What reaction products are released when a U-235 nucleus fissions?
- c) What is a nuclear chain reaction?

#### 2) Components of Nuclear Fission Reactors

- a) What is the purpose of the moderator in a nuclear reactor? What are two of the substances that may be used as moderators?
- b) What is the purpose of control rods in a nuclear reactor?
- c) List three other components of a nuclear reactor.
- d) How is the thermal energy from uranium-235 fissions converted into electrical energy?

**3) Nuclear reactor fuel**

- a) Which uranium isotope is most common in naturally occurring uranium ores?
- b) Which isotope is required for fission reactions?
- c) What is meant by "enriched" uranium?

**17.2 Reactor Safety**

**4) Chernobyl Nuclear Reactor**

- a) What was the result of the loss of coolant at the Chernobyl nuclear reactor?
- b) What was the main safety concern immediately after the accident?
- c) Presently, what is the greatest danger at Chernobyl?

**5) Types of nuclear accidents: meltdowns and uncontrolled chain reactions**

- a) What was the result of the loss of coolant at the Three Mile Island nuclear reactor?
- b) What is the difference between a meltdown and an uncontrolled chain reaction? Which situation is worse?
- c) What could be done to the fuel in a nuclear reactor so that the reactor could function normally after a loss of coolant?



## 17.5 Radioactive Waste Disposal, Part 1

### 8) Storing nuclear waste

- a) How does the video suggest that radioactive nuclear waste be stored?
  
- b) How long will it take for radioactive waste to reach radiation levels on the order of natural background radiation?
  
- c) What problems can you foresee in trying to find a place to store it for this length of time?

## 17.6 Breeder Reactors

### 9) Breeder reactor fuel

- a) What is the fuel used in a conventional nuclear reactor?
  
- b) What fuel is used in a breeder reactor?
  
- c) Why don't breeder reactors need a moderator?
  
- d) What is the main advantage of a breeder reactor over a conventional reactor?
  
- e) What is a potential danger of reactors that breed more plutonium than they use?

## 17.7 Radioactive Waste Disposal, Part 2

### 10) Storing nuclear waste

- a) Where are spent radioactive fuel rods currently stored in the U.S.?
- b) Where does the U.S. government propose storing spent fuel rods?
- c) What are some potential dangers to this storage plan?
- d) Why would any community want to store nuclear waste?

## 17.7 Fusion Reactions

### 11) Fusion Reactions

- a) What happens during a fusion reaction?
- b) In which reaction is more energy released – fission or fusion? Why is more energy released?
- c) Where do fusion reactions occur?
- d) What would be the advantage of generating electricity using a fusion reaction rather than a fission reaction?
- e) What is the main difficulty with sustaining a controlled fusion reaction?