

War & Peace Cluster, Summit Program
Physics Assignment 2

Chernobyl

1. When, and where, did the accidents occur? **April 26 1986, Chernobyl, near Kiev Ukraine**
2. What was the cause of the accident? Be specific about details, all the accidents result from an accumulation of errors and/or design flaws. A simple one sentence explanation (“there was a meltdown of the core”) is not going to adequately explain what happened. What were the personnel doing or attempting to do? What decisions were made?
 - a. **A test to see how much electricity, and for how long, could be generated once the reactor was shut down but the turbines still spinning.**
 - b. **As part of this test the safety circuitry was turned off.**
 - c. **The design of the reactor made it inherently unstable at low power levels. When operators saw there was a problem and tried to increase the power again there was a sudden power surge.**
 - d. **The reactor didn't have a conventional containment vessel. Once the reactor was damaged the only further containment was from the building structure, which is not designed to perform this task. A chemical explosion of hydrogen blew the roof off the building.**
 - e. **Under normal conditions graphite was the moderator,slowing down neutrons so that natural uranium could be used. After the building was breached air rushed in and the hot graphite caught fire. It was the smoke from this fire that carried most of the radioactive material to the outside.**
3. What was the result of the accident on the structure of the reactor? **A chemical explosion of hydrogen blew the roof off the building.**
4. What is the current status of the reactor? What about other reactors on the same site?
 - a. **The damaged reactor is out of commission, although other reactors on the same site functioned normally until 2000 when they were decommissioned.**
 - b. **after accident damaged reactor encased in concrete (sarcophagus), but this soon deteriorated.**
 - c. **permanent structure over reactor has been constructed and put in place.**
5. How many people have died as a result of the accident
 - a. **within a few days? 28 people died within a month as a result of the accident**
 - b. **in the time since the accident? eventually there will be about 4000 deaths (estimate) as a result of the accident**
6. How has the environment around the reactor changed as a result of the accident?
 - a. **millions of people in eastern Europe exposed to significant levels of radiation**
 - b. **hundreds of thousands evacuated, from some areas the evacuation is permanent.**
 - c. **Short term damage to biology, including forests. Now seems to be returning to normal**
7. How was news of the accident first released to the world at large? **Detected by Swedish scientists monitoring environment around new Swedish reactor.**
8. Why could an accident like this not have happened to a reactor in the United States? **All US (and other western reactors) have a second containment structure.**

Three Mile Island

1. When, and where, did the accidents occur? **March 29 1979, near Harrisburg PA**
2. What was the cause of the accident? Be specific about details, all the accidents result from an

War & Peace Cluster, Summit Program
Physics Assignment 2

accumulation of errors and/or design flaws. A simple one sentence explanation (“there was a meltdown of the core”) is not going to adequately explain what happened. What were the personnel doing or attempting to do? What decisions were made?

- a. Following a failure of the main circulating pumps for the water cooling secondary pumps started.
 - b. That increased the water pressure inside the reactor vessel and a relief valve opened, as designed. But when the pressure reduced again that **valve remained open, draining water from the reactor, which than overheated.**
 - c. It was feared that build up of hydrogen might cause an explosion. The hydrogen was vented to the atmosphere, releasing a small amount of radioactive material principally the noble gases.
3. What was the result of the accident on the structure of the reactor? **Core meltdown, but structure undamaged.**
 4. What is the current status of the reactor? What about other reactors on the same site? **Decommissioned**
 5. How many people have died as a result of the accident
 - a. within a few days? **None**
 - b. in the time since the accident? **None**
 6. How has the environment around the reactor changed as a result of the accident? **Normal**

Fukushima

1. When, and where, did the accidents occur? **Japan, March 11 2011**
2. What was the cause of the accident? Be specific about details, all the accidents result from an accumulation of errors and/or design flaws. A simple one sentence explanation (“there was a meltdown of the core”) is not going to adequately explain what happened. What were the personnel doing or attempting to do? What decisions were made?
 - a. **Tsunami.**
 - b. (The earthquake that caused the tsunami also caused the plant to automatically shut down, as it was supposed to. With loss of electrical power backup diesel generators maintained cooling of the core, but they were later swamped by the tsunami, and could not be restarted.)
 - c. Back up diesel generators were designed to maintain pumps for the cooling system, but they were located in the basement and so put out of action by the flood waters caused by the tsunami.
 - d. Hydrogen formed by electrolysis of the water built up, and eventually reached a level at which a spark would create an explosion.
3. What was the result of the accident on the structure of the reactor?
 - a. **Reactor damaged, and leaking radiation.**
 - b. **Radioactive material in the immediate ocean waters, spreading throughout Pacific Ocean**
4. What is the current status of the reactor? What about other reactors on the same site? **Shut down and being decommissioned, including clean up**
5. How many people have died as a result of the accident
 - a. within a few days? **None**
 - b. in the time since the accident? **None, so far**
6. How has the environment around the reactor changed as a result of the accident?
 - a. **High levels of radioactivity, particularly in the immediate vicinity of the reactor**

War & Peace Cluster, Summit Program
Physics Assignment 2

- b. Population within 50 miles of reactor evacuated.