Chemistry

Name _____
Teacher _____ Per. __

NUCLEAR MAGAZINE PROJECT QUESTIONS

NUCLEAR POWER

NUCLEAR SUBMARINES

1. How does the nuclear reactor in a submarine work?

2. What are the benefits of nuclear subs over fuel powered subs?

3. Which countries have nuclear subs? What was the name of their first sub and when was it built?

4. What caused each of these nuclear submarine disasters?

   K-19

   Kursk

NUCLEAR SATELLITES AND PROBES

1. What is project Prometheus?

2. What is the Cassini probe? What is the role of nuclear technology in the Cassini probe?

3. What is an RTG? Which isotope is predominantly used?

4. What are some arguments against using nuclear powered satellites and probes?

FAMOUS POWER PLANTS

1. Describe the accident that occurred at Chernobyl.

    A. Where is the plant located?

    B. When did the accident happen?

    C. What went wrong? (sequence of events)

    D. How did the government deal with and clean up the accident?

    E. What are the lasting effects in the area today? What evidence is there?

2. Describe the accident that occurred at Three Mile Island.

    A. Where is the plant located?

    B. When did the accident happen?

    C. What went wrong? (sequence of events)

    D. How did the government deal with and clean up the accident?

    E. What are the lasting effects in the area today? What evidence is there?

POWER PLANTS

1. Describe the function of the following features in a power plant:

    Core –

    Heat Exchanger –

    Turbine –

    Cooling System –

    Control Rods –

2. What fuel is used? Describe the nuclear reaction.

3. How many nuclear power plants are there in IL and WI?

4. What percent of the electricity in IL comes from nuclear power? How does this compare with the national average?

NUCLEAR WASTE

1. What are the different classes of nuclear waste?

2. Which industries produce nuclear waste?

3. Describe these nuclear waste treatments.

   A. storage (liquid)

   B. storage (solid)

   C. refinement

4. What are the plans for Yucca Mountain?

NUCLEAR MEDICINE

RADIOTRACERS

1. What role did George von Hevesy play in the development of radiotracers? Describe his experiment.

2. Describe what each of the following radioisotope is used to diagnose.
   Iodine-131

   Technetium-99m

   Phosphorus-32

   Thallium-201

3. What are some harmful side effects associated with the use of radiotracers?

POSITRON EMISSION TOMOGRAPHY

1. What isotope is used in PET scans and how is it administered?

2. When and why is a PET scan typically used?

3. What is the difference between a CT scan and a PET scan?

4. Does PET have side effects? If so, what are they?

RADIATION THERAPY

1. Describe the procedure for external radiation treatment.

2. Describe the difference between interstitial and intracavitary radiation therapy.

3. What are the positive effects of radiation therapy?

4. What are the negative effects of radiation therapy?

X-RAYS

1. How and when did Roentgen discover x-rays?

2. What element is used in an x-ray machine? What is its role in creating x-rays?

3. How are x-rays used to diagnose broken bones or tumors?

4. What are some other uses for x-rays machines other than medicine?

NUCLEAR WEAPONS

FUSION BOMB

1. What is used as fuel for a fusion device and how is it detonated?

2. Which country first developed a fusion device? When did this occur?

3. What was Operation IV or Mike? When and where did it occur?

4. What are 2 other common names for fusion bombs?

FISSION BOMB

1. What is used as fuel for a fission device and how is it detonated? (there are at least two distinct types.)

2. Which country first developed a fission device? When did this occur?

3. What was the Trinity test? When and where did it occur?

4. What is another common name for a fission bomb?

NUCLEAR PROLIFERATION

1. What countries currently possess nuclear weapons? When did they first obtain them?

2. Fill on the following chart with information about the following treaties:

TREATY	WHEN WAS IT SIGNED	WHO SIGNED IT	WHAT DID IT RESTRICT/LIMIT?
CTBT			
LTBT			
SALT			
START			

3. North Korea recently announced that it has nuclear weapons, but that it was withdrawing from the CTBT. What did N. Korea state as its justification for this action? What are the concerns expressed by the U.S. government?

4. What are the roles of the following as the UN monitors treaty compliance?

   A. seismography

   B. inspectors

   C. self compliance

DROPPING THE BOMB

1. What were the arguments for using each bomb at the time?

2. What alternatives were available to the United States at the time? Why weren't they used?

3. What were the casualty numbers for each city? What have been the long term effects on survivors?

4. How were the buildings and land surrounding the detonation sites affected?

5. Where is the Peace Park Monument? How does it commemorate the events that occurred?

NUCLEAR PARTICLES

PARTICLE ACCELERATORS

1. What did scientists use to study subatomic particles before particle accelerators?

2. Who developed the first particle accelerator? When and where?

3. Today, where are the 2 main particle accelerators located (one in IL the other in Europe)?

4. What is the difference between a linear accelerator and a cyclotron accelerator?`

5. How are magnets used within a particle accelerator?

PARTICLES

1. According to the standard model, what is the relationship between a quark, hadron, baryon and meson?

2. What are the 6 types of quarks?

3. What are the 6 types of leptons?

4. What combination of quarks and leptons make up the following:

   Protons –

   Neutrons –

   Electrons -

5. What are the first generation quarks and leptons?

FORCES

1. A. What are the 4 fundamental forces / interactions in nature?

   B. What type of things do each of these forces / interactions hold together?

2. What are force carrier particles?

3. What are the four types of force carrier particles and which forces can they each affect?

ANTIMATTER

1. What is antimatter?

2. What do you do to a symbol to show it is an antimatter particle?

3. What is a bubble chamber? How is it used to detect anti-matter?

4. What is annihilation? What does it produce?

NUCLEAR HISTORY

ALBERT EINSTEIN

1. What was Einstein's educational background?

2. What were Einstein's 2 major contributions to science in 1905?

3. How did Einstein contribute to the development of the atomic bomb and nuclear energy?

4. What was Einstein's political stance on nuclear weapons? What actions did he take to promote this stance?

IRENE AND FREDERIC JOLIOT – CURIE

1. What was the educational background of both of the Joliot – Curies?

2. What was the couple awarded the Nobel Prize for?

3. How did they produce new radioisotopes? Which isotope(s) did they create?

4. What office did Irene serve in the French Cabinet? (1936)

5. What was the political downfall of the Joliot – Curies?

MARIE AND PIERRE CURIE

1. What were the educational backgrounds of both Marie and Pierre (include colleges)?

2. What did Pierre and his brother discover before he met Marie?

3. What were the Curies awarded the Nobel Prize for? What was Marie awarded the Nobel Prize for after her husband's death?

4. What did the Curies die of?

ENRICO FERMI

1. What was Fermi's educational background?

2. What was Fermi awarded the Nobel Prize for? Why did Enrico not return to Italy when he was awarded the Nobel Prize?

3. What did Fermi's accomplish involving an atomic pile? (When and where did it occur?)

4. What was Fermi studying near the end of his career?

LISA MEITNER AND OTTO HAHN

1. What was Hahn's educational background?

2. What was Meitner's educational background?

3. What did Hahn receive the Nobel Prize for in 1944?

4. What element did Hahn and Meitner discover? Which element was named after Meitner?

5. Why did Meitner refuse to work on the Manhattan Project?

NUCLEAR APPLICATIONS

CARBON DATING

1. How is Carbon-14 created in our atmosphere?

2. How is C-14 used to date material?

3. What are some of the limitations of this method? How accurate is this method considered?

4. What are some famous archaeological examples of dated material?

RADON GAS

1. How does Radon gas typically enter a house?

2. Where is radon gas the most prevalent in IL? in the US?

3. What health concern is closely associated with radon gas poisoning?

4. How can radon gas be detected in your home?

5. How can homes with radon gas be treated?

FOOD IRRADIATION

1. What are the isotope(s) commonly used? What type of radiation is used?

2. What are the benefits / risks of food irradiation?

3. What other products / materials can be sterilized using this process?

4. What types of food can be irradiated?

5. Which food was first approved in the US? When?

UV RADIATION

1. What are the different types of UV radiation?

2. What are the effects of overexposure to UV radiation?

3. What are the sources of UV radiation? (Artificial and Natural)

4. What important role does the ozone layer play?

5. What are the benefits of UV radiation?