Name: _____

Class: _____

Due Date: _____

E.4 Fission

Understandings

- Energy is released in spontaneous and neutron-induced fission.
- The role of chain reactions in nuclear fission reactions.
- The role of control rods, moderators, heat exchangers, and shielding in a nuclear power plant.
- The properties of the products of nuclear fission and their management.

The solutions can be found on the YouTube channel Go Physics Go:

https://www.youtube.com/@gophysicsgo/playlists

1. C: Define *nuclear fission.*

2. C: Give two examples of *nuclear fission*.

3. C: Define *chain reaction.*

4. C: Define *critical mass*. Units?

5. C: Define *induced process.*

6. C: What are the uses of the following objects in a nuclear reactor?

   a. *control rod*

   b. *moderator*

   c. *heat exchanger*

   d. *fuel rod*

7. C: State two benefits and two drawbacks to using *nuclear power.*

8. E: Below is one example of a fission reaction:

$$^{98}_{252}\text{Cf} \rightarrow {}^{56}_{142}\text{Ba} + {}^{42}_{106}\text{Mo} + 4\,{}^{0}_{1}\text{n}$$

   Given the information below determine the change in binding energy to three decimal places.

   Total binding energy of Californium-252: 1881.274575 MeV
   Total binding energy of Barium-142: 1180.144060 MeV
   Total binding energy of Molybdenum-106: 898.95878 MeV
   Total binding energy of a neutron: 0 MeV

9. E: A typical fission of one californium-252 nucleus releases about 184.07 MeV of energy. Determine the amount of energy, in Joules, which is released from 10.000 kg of pure californium-252.