# Nuclear Chemistry Webquest

**Name** _____

In this webquest, you will explore nuclear chemistry in real-world situations. You will learn about fusion and fission, types of radiation, its effects on humans, and how nuclear power is produced as well as its repercussions and disasters. Follow the steps below.

1. Enter the following web address: www.rcsdk12.org/Page/37614
2. Under web, click on Nuclear Chemistry to open a copy of this document
3. Click on the links provided to answer the questions in each section

## Introduction to Atomic Physics

1. _____ is the smallest particle of matter that maintains the properties of that element.
2. Sir Ernst Rutherford concluded what two things about atomic structure:
   a. _____
   b. _____
3. Niels Bohr contributed what to atomic structure theory:
   a. _____
4. What is the unit of measure for the diameter of atoms? _____
5. What is the unit of measure from above equal to? _____
6. An atom consists of three basic subatomic particles. List each below. Include its charge and who discovered it.
   a. _____; _____; _____
   b. _____; _____; _____
   c. _____; _____; _____
7. The number of which subatomic particles determines the chemical element that it is? _____
8. The number and arrangement of which subatomic particle determines most of the atom's properties? _____
9. Protons and neutrons are composed of even smaller subatomic particles called _____.
10. Define isotopes: _____
11. Isotopes have the same _____ properties but very different _____ properties.
12. Most isotopes are stable but some are _____
13. What is binding energy? _____
14. What does binding energy determine? _____
    _____
15. Einstein's famous equation of relativity, $E = mc^2$, explains the relationship between the binding energy and mass defect. It explains that a small amount of _____ can produce a large amount of _____.
16. Define radioactivity: _____
17. Name the three scientists that discovered and researched radioactivity:
    a. _____
    b. _____
    c. _____

18. List the three most common types of radioactive decay:
    a. _____
    b. _____
    c. _____
19. Define half-life: _____

20. List what is emitted during each decay type:
    a. Alpha: _____
    b. Beta: _____
    c. Spontaneous fission: _____

Nuclear Power

21. Discuss the release of energy by fission.

22. What is meant by uranium enrichment?

23. Explain the role of control rods in a fission reaction.

24. What is critical mass?

Hydrogen Bomb

25. What nuclei are fused in the nuclear reaction of a hydrogen bomb?

26. What function does styrofoam perform in a hydrogen bomb?

27. Why is a fission bomb needed as part of an H-bomb?

Nuclear Weapons

28. Describe how an atom bomb works.

29. Describe how radioactive fallout is produced by the explosion of a bomb.

30. What are the health consequences of radioactive fallout particles?

31. Briefly portray a nuclear winter scenario

The Manhattan Project

32. What was the Manhattan project?

33. What prompted President Franklin D Roosevelt to begin researching atomic energy?

34. Who was the primary scientist that led the Manhattan Project?

Go to http://www.atomicarchive.com/Effects/radeffects.shtml

List at least ten things that radiation can do to the human body.

Define the **BOLDED** term given and then give an example underneath that term:

1. **Alpha-particle decay:**

2. Example of Alpha-particle decay:

3. **Beta-particle decay:**

4. Example of Beta-particle decay:

5. **Electron-Capture:**

6. Example of Electron-Capture:

7. **Gamma Ray Emission:**

8. Example of Gamma-Ray emission:

9. **Positron Emission:**

10. Example of Positron Emission: