

# Chapter 21

## Study Guide

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Per: \_\_\_\_\_

1. Define:
  - a. mass defect: \_\_\_\_\_  
\_\_\_\_\_
  - b. binding energy: \_\_\_\_\_  
\_\_\_\_\_

2. Explain the formula  $E = mc^2$ : \_\_\_\_\_  
\_\_\_\_\_

3. The mass of a lithium-7 atom is 7.01600amu. Calculate its mass defect.

Proton Mass 1.007276amu  
Neutron Mass 1.008665amu  
Electron Mass 0.0005486amu

4. Oxygen has an unstable isotope O-17 that has a mass of 17.00454. Calculate the binding energy of the oxygen nucleus in MeV.

5. Describe the forces in the nucleus: \_\_\_\_\_  
\_\_\_\_\_

6. Why do heavier nuclei experience more repulsion in the nucleus? \_\_\_\_\_

7. What is the "band of stability"? \_\_\_\_\_  
\_\_\_\_\_

8. What is the ratio of neutrons to protons in smaller atoms? \_\_\_\_\_

9. What is the ratio of neutrons to protons in larger atoms? \_\_\_\_\_

10. What characteristics contribute to the stability of a nucleus? \_\_\_\_\_  
\_\_\_\_\_

11. Define

a. radioactivity: \_\_\_\_\_

b. transmutation: \_\_\_\_\_

c. nuclear reaction: \_\_\_\_\_

d. radionuclide: \_\_\_\_\_

12. How does the nucleus change during

a. alpha decay? \_\_\_\_\_

b. beta decay? \_\_\_\_\_

c. positron emission? \_\_\_\_\_

d. electron capture? \_\_\_\_\_

13. Describe the difference between beta decay and electron capture. \_\_\_\_\_  
\_\_\_\_\_

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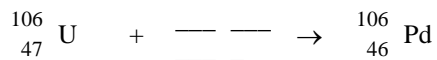
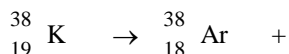
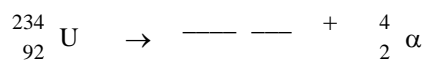
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14. Fill in the table below describing the three main types of radiation.

|                                | Alpha Emission | Beta Emission | Positron Emission | Electron Capture | Gamma Emission |
|--------------------------------|----------------|---------------|-------------------|------------------|----------------|
| Formula(s)                     |                |               |                   |                  |                |
| Particle or ray?               |                |               |                   |                  |                |
| Mass                           |                |               |                   |                  |                |
| Relative Penetration           |                |               |                   |                  |                |
| Can also be described as a(n): |                |               |                   |                  |                |

15. Complete the following



16. A sample of radioactive material has a half-life of 37 years, fill in the table below.

| Timescale          | Mass     |
|--------------------|----------|
| 148 years ago      |          |
| 111 years ago      |          |
| 74 years ago       |          |
| 37 years ago       |          |
| Currently          | 40 grams |
| 37 years from now  |          |
| 74 years from now  |          |
| 111 years from now |          |
| 148 years from now |          |

17. How many half-lives must pass before 7/8 of a radioactive sample decay? \_\_\_\_\_

18. Define fission: \_\_\_\_\_

19. Define fusion: \_\_\_\_\_

20. What nuclear process occurs in the sun? \_\_\_\_\_

21. What nuclear process occurs in a nuclear reactor? \_\_\_\_\_

22. Define chain reaction: \_\_\_\_\_

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